12th Annual

Undergraduate Research Conference

A Symposium of Scholarly Works & Creative Projects

April 28th, 2023

8:00 am – 4:45 pm

Jordan Student Success Building

undergradresearch@msudenver.edu

Metropolitan State University of Denver

UNDERGRADUATE RESEARCH & CREATIVE SCHOLARSHIP PROGRAM

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WELCOME

It is my pleasure to welcome you to the 12th annual Undergraduate Research Conference, hosted by the Undergraduate Research and Creative Scholarship Program (URCSP)! I am continuously impressed by the amazing work the students at MSU Denver are doing, and today you, too, will get a glimpse at the diverse and inspiring interests and expertise of our students.

As you pass by presenters in the hallway or see their talks and posters today, don't forget to extend a huge congratulations on their work – the amount of effort, dedication, and perseverance required to get to this point is commendable. Undergraduate research is an excellent way for students to take an active role in their own education, expand their experience outside of the classroom, and prepare themselves for whatever career trajectory lies ahead of them. I am extremely proud of all the students at MSU Denver who are undertaking or intend to undertake this challenge!

As you read through the abstracts and program, please also take the time to appreciate the faculty mentors and all their work going above and beyond to rise to the occasion to support MSU Denver undergraduates. This, I promise you, is no small task, and their work should not go unnoticed.

It is bittersweet to say that this will be my last Undergraduate Research Conference as Faculty Associate of the URCSP and as a professor here at MSU Denver. Working with mathematics undergraduates on research and interacting with students and faculty across the university through my involvement with the URCSP and the *Rowdy Scholar* has truly been the highlight of my time here at MSU Denver. I thank the students and faculty involved in undergraduate research for everything they have taught me over the years and all of the subsequent knowledge I will take with me going forward. You are all truly amazing and irreplaceable.

Now, go forth and enjoy what I know will be a fantastic day showcasing our MSU Denver undergraduates!

Dr. Mandi A. Schaeffer Fry
Professor of Mathematics
Faculty Associate for Undergraduate Research
MSU Denver

KEYNOTE

Allison Skerrett, PhD

"Biography and Identity in Academic Inquiry"

Allison Skerrett is Professor of Curriculum and Instruction and Director of Teacher Education in the College of Education at The University of Texas at Austin. Professor Skerrett's teaching and research focus young people's literacy practices, secondary English education, and transnationalism toward educational justice for diverse students. Her publications appear in leading educational journals such as the *American Educational Research Journal* and *Reading Research Quarterly*. Dr. Skerrett's book, *Teaching Transnational Youth: Literacy and Education in a Changing World* (Teachers College Press 2015), is the first to examine the educational opportunities and challenges arising from increasing numbers of students living and attending school across different countries. Her new book, *Teaching Literacy in Troubled Times: Identity, Inquiry and Social Action at the Heart of Instruction*, (Corwin Press, 2022) showcases teachers and students engaged in developing critical literacies and taking social action to create more just worlds.

Dr. Skerrett has received awards for her research and teaching including the Literacy Research Association's Early Career Achievement Award, Edward B. Fry Book Award, and the Elizabeth Shatto Massey Award for Excellence in Teacher Education. She is currently an Editor for the Journal of Literacy Research and serves on other national and international journal editorial review boards. Dr. Skerrett also serves on national and international educational advisory boards including the US National Assessment of Educational Progress (NAEP) Reading Panel, the Research Advisory Committee of the Caribbean Education Council, and Scotland's International Council of Education Advisors.

OUTSTANDING MENTOR FOR UNDERGRADUATE RESEARCH : ***Dr. Sheryl Zajdowicz***

"Dr. Z is an incredible mentor who is extremely knowledgeable and passionate about antimicrobial efficacy. We were able to choose the direction we wanted to go with our research as long as pertained to antimicrobial properties. When I first signed up for undergrad research with Dr. Z I was extremely intimidated as I did not think I was capable of being able to conduct more independent research. However, Dr. Z was extremely helpful and gave guidance where needed. While we had background in biology related concepts and lab techniques, Dr. Z was always open to helping in clarifying any questions we may have had or any ideas that needed a little more direction. She was also very flexible with her time if we needed help, had questions, or needed clarification on operating any lab equipment i.e., the autoclave. It was always good to see that she was just as enthusiastic as we were about our research and any results we obtained." – Rose Cruz

Why should students get involved with research at the undergraduate level?

"Becoming involved in undergraduate research and other high impact practices is valuable to students because it provides them with enhanced academic skills, engages them in their discipline outside of the classroom, stimulates inquiry and critical thinking, promotes integration and synthesis of knowledge as well as its application in a practical setting, enhances communication skills, fosters personal/social development, and facilitates interactions with their peers and faculty mentors in a variety of ways. Students also gain confidence in their content knowledge and their overall abilities, and the experience sets them up with transferrable skills for their graduate school or career pursuits."

What advice would you give students wanting to get started in research?

"Attend the Undergraduate Research Conference and other research presentations/seminars on campus to learn more about what's being done on campus- it's an outstanding opportunity to learn about the research and what the experience means to the students who are presenting their work. Speak with your professors to ask about their research and what opportunities exist to join their projects. Don't be afraid to ask questions! Explore internship opportunities and summer fellowships that may offer more intensive research opportunities in your field."

Any additional advice?

"Passion and enthusiasm go a long way when it comes to research. Be excited! Don't be afraid to explore research in a similar field to your discipline and don't limit yourself - you'll be developing skills no matter what the focus may be. Once you're engaged in research experiences, don't let failure or a feeling of a lack of progression get you down. As Albert Einstein said, "If we knew what it was we were doing, it would not be called research, would it?" Embrace the little successes! Finally, don't be disappointed if you realize that research isn't where your passions lie- it's beneficial to know what you don't want to do and it can help to direct you down other paths."

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

UNDERGRADUATE RESEARCH GRANT RECIPIENTS

Meet this year's Undergraduate Research Mini-Grant Recipients! They were each asked to describe their research and then tell us what they like best about undergraduate research.

Nikki Beavers, Social Work Major
Mentor: Perri Corvino, LCSW, MA, LAC, ABD

Research: My project examines the general awareness and accessibility of different addiction treatments across Colorado.

"I love being able to connect with different people and dive deeper into an important topic that I am passionate about."

Ian Daugherity, Biology
Mentor: Maria Cattell

Title: PCR Cleanup and Limiting Factors

Audi Fineran, Biology
Mentor: Andrew Bonham

Research: Non-Tuberculous Mycobacteria (NTM) causes NTM pulmonary disease and currently takes months to years to diagnose. We are developing an E-DNA sensor that can detect the presence of NTM in patient samples within two minutes**.**

"I enjoy the challenge of applying my knowledge and skills to real-world issues that, when researched, have the potential to help communities and improve lives."

Frost Gordon, Biology and Biochemistry
Mentor: Vida Melvin

Research I do: Study genes related to the development of the palate in zebrafish.

"What I like best: getting hands on lab experience that can be applicable to many other lab jobs."

Maria Green, Biology
Mentor: Maria Cattell

Research: Using a creative PCR protocol to identify the unknown sequence of a coral gene.

"It exposes me to real lab situations that require troubleshooting, as well as reinforcement of material I've learned in my classes."

Naomi Jacquez, Biology
Mentor: Jennifer Gagliardi-Seeley

Research*:* We will analyze if sympatric species of Thamnophis radix and T. elegans exhibit habitat partitioning. Acquiring data by catching snakes in the field in sympatric and allopatric locations and recording their distance to water.

"I really enjoy the fieldwork and opportunity to see how our contributions can help an environment/species thrive."

Jessica Lee, Biology
Mentor: Vida Melvin

Research: We are examining ndnf (neuron-derived neurotrophic factor) gene expression at important time points for zebrafish craniofacial development using in situ hybridization that will broaden our understanding in human craniofacial development**.**

"Being in research allow me to use my knowledge I learn in class and apply it to my own research."

Shannon Myers, Psychology
Mentor: Cynthia Erickson

Research: We wanted to determine the effects of news media on a person's pain tolerance. Participants took various scales and then were subjected to a cold pressor test after viewing news media and a mindfulness video.

"I love research because we get to use creative ideas to discover new things about the world around us."

Phobe Nguyen, Communication Design
Mentor: Shawn Meek

Research: The thesis "hòa" explores the topic of cultural identity and the assimilation of immigrants in the United States, utilizing augmented reality to create a simulacrum to initiate the conversation on identity, tradition, and heritage of immigrants.

"I love to learn how to incorporate new technology to deliver new ideas through art and design."

Dale Pittman, Communication Design
Mentor: Shawn Meek

Research: Who Do You Think QR? - A fully branded and packaged QR Code based Card Game about hidden and underrepresented identities. Designed to educate, build culture, and entertain.

"As a designer, I believe my project encapsulates the kind of engaging tool for effective social change that design can facilitate powerfully."

Devon Rapken, Psychology
Mentor: Cynthia Erickson

Research: Our research project examines what factors contribute to risk competence. Risk competence describes optimal risk-taking behavior patterns.

"What I enjoy most about research is that there is no such thing as failure. Even if you find that your hypothesis is wrong you walk away with more information than before."

Eric Reeve, Biology
Mentor: Vida Melvin

Research: My project is focused on the genetics controlling head/face development. I am using CRISPR-Cas9 to target and switch off a gene in zebrafish to examine its potential role in this complex process.

"The amazing mentors and friends I've found and the real-world experience of learning to think and act as a professional scientist!"

GRANT RECIPIENTS (Continued)

Eric Rodriguez, Music
Mentor: Elizabeth Macy

Research: What does it take to get a gig? I hope to show you how to show your best self on stage through my experience and research.

"Anything involved with art is my favorite experience on earth, research or otherwise."

Andrew Schlink, Biology
Mentor: Shailesh Ambre

Research: We are developing a new methodology for determining RNA secondary structure via modifying ribose sugar using thioester electrophiles.

"My favorite part about research is attempting to answer a question that has to date, gone unanswered. "

Sage Vinson and Chayse Enriquez, Psychology
Mentor: Pamela Ansburg

Research: Our research project investigated what relationship state anxiety has on creative performance and whether higher or lower amounts of state anxiety would inhibit the ability to generate alternative uses for an item.

"I enjoy how rewarding and intellectually stimulating research can be, namely because it advances our understanding of the world itself." ***– Sage Vinson***

"What I enjoy the most is opening my mind up to new ideas and being willing to shift my mindset when presented with new information. " – Chayse Enriquez

Who do you think QR?
by Dale Pittman

Maria Green

Audi Fineran

hòa – by Phoebe Nguyen

SACNAS

The Society for the Advancement of Chicanos/Hispanics & Native Americans in Science

From the MSU Denver SACNAS President, **Victor Hugo Lemus**

"SACNAS is a national society of scientists dedicated to advancing Chicanos/Hispanics, Native Americans, and any other underrepresented minorities in science. Metropolitan State University of Denver SACNAS fosters the success of Chicano/Hispanic and Native American scientists–from college students to professionals–to attain advanced degrees, careers, and positions of leadership in science through mentoring and resources.

One of the ways we aim to accomplish our mission is through the SACNAS conference. The conference serves to equip, empower, and energize participants for their academic and professional paths in STEM. Over the course of the event, college-level attendees are immersed in cutting-edge STEM research, professional development sessions, motivational keynote speakers, and the Graduate School & Career Expo Hall, as well as multicultural celebrations and traditions, and an inclusive and welcoming community of peers, mentors, and role models. The National Diversity In STEM Conference will take place October 26-28, 2023 in Portland, Oregon.

If you are interested in joining SACNAS please email: vlemusgo@msudenver.edu"

Student experiences at the National SACNAS Conference

"The best part for me was experience all the Indigenous from around the country coming together with the same goals and ambitions in mind. Where they are researching and trying to get Indigenous a platform in all STEM areas. It was so inspiring and reassuring that we are not in the fight alone and anything is possible when you find the communities that are helping one another succeed and navigate policy and bigotry. The conference was lifechanging, this experience gave me so much hope and knowledge that I could pass down to others and my people. I was beyond inspired and exposed to so many resources and perspectives that I just left filling full in my soul, my mind, and my heart." - Naomi Jacquez

"The conference was truly exceptional. Everyone in attending was kind, ambitious and intelligent and I learned extensively about culture, science, and history. I made great friends that I believe will last a lifetime and was able to talk to many graduate school programs about my interests and improve upon my networking abilities. It was a once in a lifetime experience and I would love to go again if the opportunity arises." - Connor Sullivan

Want to earn money while working on your

Apply for the Research Scholars Program

Deadline: April 30th

Accepting 30 students across representing a diversity of majors and backgrounds

Program Requirements

- Commit a minimum of 4 research hours a week but not to exceed 15 hours a week ($17/hour) or 225 hours a semester
- Submit a report on their progress each semester
- Attend at least 2 (per semester) of the 1-hour workshops presented by the Undergraduate Research & Creative Scholarship Program
- Present at MSU Denver's Undergraduate Research Conference in April 2024
- Must have a faculty or staff mentor to apply

MSU Denver Research Symposium

A forum for faculty to present their research to the MSU Denver Community

October 13th, 2023

Deadline to apply:

September 1st, 2023

Contact Megan Hughes or Kristy Duran for more information

mhughe47@msudenver

kduran16@msudenver

ACKNOWLEDGEMENTS

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:

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Former Provost & Executive Vice President Academic Affairs

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Associate Vice President for Undergraduate Studies

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Interim Provost & Executive Vice President Academic Affairs

Thank you to our Keynote Speaker Allison Skerrett, Ph.D., our Session Moderators, and all Volunteers!

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

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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 – JSSSB

Room 202 Room 204
Room 203 Room 205

10:45 am - 12:00 pm: **CONFERENCE SESSION II**

Oral Presentations – JSSB

Room 202 Room 204
Room 203 Room 205

Poster Presentations (10:30-12:00) – JSSB

Mezzanine / 1st Floor

12:15 pm: Lunch in Tivoli Turnehall
12:45 pm: Keynote: Allison Skerrett

2:00 – 3:20 pm: **CONFERENCE SESSION III**

Oral Presentations – JSSB

Room 202 Room 204
Room 203 Room 205

Poster Presentations (2:00-3:20) – JSSB

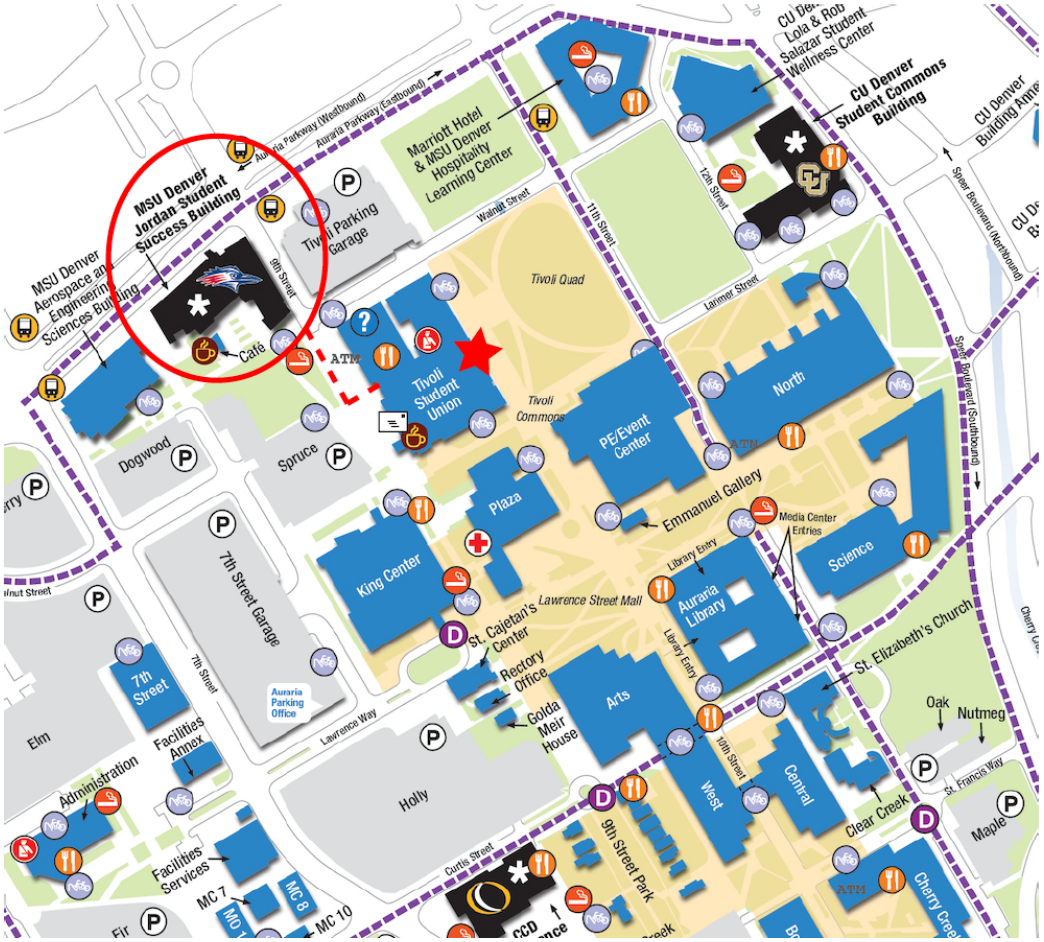
Mezzanine / 1st Floor

3:30 – 4:40 pm: **CONFERENCE SESSION IV**

Poster Presentations (3:30-4:30) – JSSB

Mezzanine / 1st Floor

MAP



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

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

Oral Presentations will be held in upstairs classrooms 202, 203 ,204, and 205, and Poster Presentations will be held on the 1st floor and Mezzanine. Enter the building using the doors under the Student Success sign and the staircase to the left will lead to the Mezzanine, walking further past that to the right will be the classrooms.

ABSTRACTS

ABSTRACTS

(listed alphabetically by primary presenter's last name)

Impacts of COVID-19 on Homicides in Denver

Alaniz Lasly – Criminal Justice & Criminology
Faculty Mentor: Hyon Namgung

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

Research on homicides is critical due to its impact on victims, families of victims, and their communities. Specifically, many have raised concerns about the increase of homicides in major cities in the US during the pandemic. In this context, it will be beneficial for students, researchers, and practitioners to examine whether there have been any changes of homicides in the city of Denver. The goal of this research is to examine the possible changes of spatial and temporal patterns of homicides in Denver for the past five years using publicly available data from the Denver Open Data Catalog. This secondary data analysis uses homicides reported in Denver from three different stages: 2018 and 2019 ("before" COVID), 2020 and 2021("during" COVID), and lastly 2022 and 2023 ("after" COVID). Hot spot and density analyses through ArcGIS Online, a cloud-based geographic information system, may reveal spatial patterns of homicides in Denver over time, particularly before and during the pandemic. Furthermore, this exploratory research will investigate any correlation between socioeconomic factors (e.g., poverty, education, etc.) and homicides in the city. This study will shed light on our understanding of geography of homicides in Denver, focusing on the role of the COVID-19 pandemic. In addition, the results will inform policy makers and practitioners of the vulnerable places and some potential strategies to tackle this important problem.

The relationship between Racial trauma, Social and Political influences, and the experience of pain

Lexie A. Allen – Psychology
Co-Authors: Madison E. Barber, K. Alden Gruidel, Sara C. Hobbs, Kaysie McGurk, Shannon L. Myers, Julia Sickrey, Peyton M. Steiner, Jenny Valadez Fraire
Faculty Mentor: Cynthia Erickson

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

Racial trauma is a chronic stressor related to discriminatory experiences a person encounters in their daily life (APA, 2012). Research surrounding this stressor and its devastating consequences have historically been overlooked. Thus, we wanted to understand how one's experiences and beliefs related to racial trauma may impact their physiological stress response and in turn, their pain tolerance. First, participants filled out various scales, three of which were the Racial Trauma Scale (Williams et al., 2022)

measuring traumatic experiences due to marginalization, Right-Wing Authoritarianism Scale (RWA), measuring authoritarian personality (Altemeyer, 1981), and Social Dominance Orientation (SDO) to measure social and political attitudes (Pratto et al., 1994). Participants were then randomly assigned to two conditions. In one condition, participants watched two videos, a video on BlackLivesMatter, and an opposing video on BlueLivesMatter, the order of these videos were counterbalanced. In the second condition, participants watched a video on mindfulness. Afterward, a blood pressure cuff was used to measure physiological stress. Participants then took a cold pressor test to measure pain tolerance. The cold pressor test involved the participants sticking their hands in a bucket of ice water approximately 33 degrees Fahrenheit. They were instructed to remove their hands from the water when the pain became intolerable. The pain was measured on a scale ranging from one to ten. Our results showed good consistency within the scales, with racial trauma α=.92, SDO α=.86, and RWA α=.91. The Racial Trauma scale was negatively correlated with an Adverse Childhood Experience Scale (ACES) ($r(20) = -.45$, $p=.04$). Our future directions are to collect a larger and more diverse sample of participants to further understand how stress and pain tolerance are impacted by racial trauma and social attitudes. With this knowledge, we can better understand how to push for more equitable and equal treatment amongst all people.

Improving Arson Accelerant Detection with PLOT Column Extraction

Lisa Archibald – Chemistry
Faculty Mentor: April Hill

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

In fires that involve potential arson, it is very important to gather evidence in order to provide assistance in court proceedings. Arsonists often use accelerants (fuels) to start and sustain a fire, so accelerant residue is a key piece of evidence in most arson cases. It is very difficult to extract accelerants because they are often burned away completely, leaving little to no evidence to be extracted. Passive headspace sampling using an activated charcoal strip is the standard method for extracting accelerant residues from arson evidence. Debris is placed in a can with a charcoal strip; the can is sealed and heated under controlled conditions. Any remaining accelerant vapors are volatilized and trapped in the activated charcoal, which is then eluted with solvent for analysis via gas chromatography-mass spectrometry (GC-MS). Although this method has been very reliable, a suggested additional method of data collection may be added, with little time and low cost. Porous layer open tubular (PLOT) columns lined with alumina can be added to the collection method, which can provide an additional set of data for analysis. The PLOT column is inserted into the can via a septum prior to heating and is flushed with solvent into a GC vial for testing. Both methods were evaluated separately and in combination under several different conditions, including unburned samples, burned samples, and samples contaminated with fire retardants. The results obtained from the charcoal strips had higher background compared to the PLOT columns, which makes the resulting chromatograms more difficult to interpret. The lower background achieved with PLOT columns allows for easier identification of the extracted hydrocarbons. The addition of PLOT columns to the current standard method using charcoal strips can provide more conclusive results with little additional time.

Volunteer Work at Denver Rescue Mission

Conscience Barber – Health Care Professional Services
Faculty Mentor: Garvita Thareja

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

The Denver Rescue Mission is a non-profit organization that is dedicated to providing food and shelter to those in need. My volunteer work at the Denver Rescue Mission served as a major eye-opener to the amount of help that people in our communities need. Before I volunteered here, I was under the assumption that I would only be feeding homeless people. However, I quickly learned that not everyone there was homeless. As a volunteer, my workload was very simple. I was in charge of putting foods on people's trays from 8:30 am to 1:00 pm. There were a decent number of other helpers there, so the work was evenly dispersed amongst us. While I feel like feeding people was amazing, the portion of food wasn't quite enough. This was due to a lack of donations, therefore I had to be careful with the amount of food I was giving out. My time at the Denver Rescue Mission showed me that people who are more fortunate still need to do more for their less fortunate counterparts because homeless people are not the only ones benefiting from organizations such as the Denver Rescue Mission.
Keywords: Less-fortunate, communities, donate

Yoga Interventions for Perceived Stress: A Meta-Analysis

Madison E. Barber - Psychology
Co-Authors: Gabriel Balbuena Trujillo, K. Alden Gruidel, Milly Wathen
Faculty Mentor: Michael Rhoads

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #9

Anxiety is the most diagnosed mental disorder affecting upwards of 45 million people worldwide in 2019 (Xiong et al., 2022). Numerous studies published globally have found yoga-based interventions were significant in decreasing and managing symptoms of anxiety (Snaith, et al., 2018; Zoogman et al., 2019). The purpose of this study is to conduct a meta-analysis which explores the benefits yoga has on symptoms of stress as measured by the Perceived Stress Scale (Cohen et al., 1983). Our main hypothesis is that yoga is an effective complementary treatment for perceived stress. We searched for articles using a variety of electronic databases including PubMed. In total we found 30 articles to code that met criteria for this meta-analysis. Articles were coded using Microsoft Excel and many variables were coded including randomization, type of yoga, and gender of participants. Pretest and posttest variables including mean, standard deviation, and sample size of both the experimental and control group were also recorded. An overall weighted effect size (Hedges' g) and variance were computed using the "metafor" package in R (Viechtbauer, 2010). The overall summary effect size, based on the fitted random effects model, is g = 0.62 (SE = 0.07), with 95% CI [0.48, 0.75]. This mean difference was statistically significant (z = 9.10, p < .001). This study reveals that yoga as a treatment for stress is an effective complementary or alternative therapy. The overall weighted effect size of g = 0.62 is considered a medium effect size. In other words, yoga moves the average participant from the 50th percentile to the 73rd percentile in terms of improvements in stress symptoms. This study indicates that yoga is a valid complementary treatment for depression. Future meta-analysis could focus on only using randomized control trails or participants with a diagnosis of anxiety.

The Impact of Painful Stimuli on Mood

Madison E. Barber – Psychology
Co-Authors: Lexie A. Allen, Jenny Valadez Fraire, Brandon Gaito, K. Alden Gruidel, Sara C. Hobbs, Eric R. McCabe, Shannon L. Myers, Julia L. Sickrey, Peyton M. Steiner
Faculty Mentor: Cynthia Erickson

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

The objective of this study is to examine how visual media and painful stimuli alter mood. Mood was measured with The Positive and Negative Affect Scale (PANAS) (Watson et al., 1988), a scale that measures both a person's positive and negative state and trait affect. In Study 1, which was conducted online, participants were administered the PANAS before, and after, watching either political news videos or a mindfulness video. Positive affect increased after watching either video ($F(1,40) = 19.61$, $p < .001$, $\eta^2 = .33$), but negative affect did not change. Nor was there a main effect or interaction for the type of video. Study 2 was conducted in the laboratory and was identical except for the inclusion of physiological measures and the cold pressor test (a measure of pain tolerance in which participants stick their hands in a bucket of ice water). In Study 2, we observed the same result as in Study 1. Positive affect increased after watching either video ($F(1, 23) = 36.95$, $p < .001$, $\eta^2 = .16$). Again, negative affect did not change after watching the video. There are several possible reasons why the PANAS Positive Affect increased in both studies. Results from the online study could indicate that participants are habituated to current events; therefore, exposure does not have an impact on mood. One possible explanation is that students were glad to be a part of research so the positive affect increased. Another possible explanation is for the in-person study students were relieved to be done with the experiment. One student commented "Was the cold water to calm me down because in a way it did" which could indicate that for some students the painful stimulus had a calming effect. Currently, we are unable to differentiate which is the correct explanation for this finding.

The Rising Cost and Decreased Accessibility for College Students Seeking Female Reproductive Healthcare

Lexi Bauer and Lillian Smith – Integrative Healthcare
Faculty Mentor: Garvita Thareja

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

Female reproductive healthcare has become increasingly less affordable with a decrease in the quality of care. This matter of research must be addressed because female reproductive health needs to be accessible to all, affordable, and provide good quality care. Women and anyone with a uterus, vagina, or cervix, in their adult life, could spend an estimated $15,000 on pap smears, HPV tests, birth control, and menstrual products (Kulkarni, 2018). Thus, evidently revealing the problematic concern of affordability and accessibility. The unaffordable prices negatively affect the diversity of populations that can receive accessible and quality care, creating challenging health disparities. Therefore, many people seeking female reproductive care are not receiving quality care and proper healthcare due to the rising cost and low coverage.

One of the most vulnerable populations affected by this issue is college students who need female reproductive care. College students already have numerous tasks to focus on like their studies, grades, and paying their heavy tuition bills. College students seeking female reproductive care are also at their

prime stages in life for their reproductive health. Thus, emphasizing their need for good-quality reproductive care.

The research for this issue will assess the question, "Are college students who need female reproductive healthcare at a disadvantage in accessing quality care compared to other demographic populations?" A variety of cohort, cross-sectional, case, and correlational studies will be assessed to address the relationship between the rising cost of female reproductive care and the aftereffects of low-quality care and accessibility for college students.

Causality Scales: Examining Potential Buffers of Motivational Orientations on Stress

Lillian Beattie – Psychology
Faculty Mentor: Lisa Badanes

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

Everyday people make attributions for why things happen to them. Why was I late for work? Why did I fail that exam? Desi & Ryan's (1985) causality theory describes the ways in which individual differences emerge in motivational orientations. Autonomously oriented individuals experience a high degree of personal choice and agency (Desi & Ryan, 1985). These individuals typically do not require external prompts or rewards, instead demonstrating intrinsic motivation to complete a task (deCharms, 1968). In contrast, impersonally oriented individuals experience their behavior as beyond their control, believing that their behavior will not lead to a desired outcome regardless of effort (Desi & Ryan, 1985). These individuals may show high levels of depressive and anxious feelings when faced with stress (Desi & Ryan, 1985).

According to data from the American College Health Association (2019), 65.7% of college students reported "overwhelming anxiety," and 58.7% reported "more than average" stress in the prior year. Additionally, both minoritized and female students are at an increased risk for overwhelming stress (David et al., 2022; Hoyt et al., 2021) and higher rates of psychopathology (Polanco-Roman et al., 2022; Tineo et al., 2021; Hoyt et al., 2021).

The current study aims to understand the potential link between autonomous and impersonal orientations and stress and depression in a sample of college students. It is hypothesized that the higher sense of agency typically associated with an autonomous orientation will buffer these individuals against negative outcomes in the face of early and current stress. As the study is ongoing, we expect a sample of over 100 introductory college students and are assessing them using the Center for Epidemiological Scale of Depression Scale (CESD), Generalized Anxiety Disorder Scale (GAD-7), Current Life Stress Events Checklist, Generalized and Frequency of Discrimination Scales, and General Causality Orientation Scale (GCOS-17).

Creating a More Equitable World in Addiction Treatment

Nikki Beavers – Social Work
Faculty Mentor: Perri Corvino

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

Substance use disorder (SUD) is a disease in which a person's ability to function normally at work, home, or in their social life becomes impaired because of their reliance on a substance such as alcohol or prescription painkillers. There are a number of evidence-based treatments that can be used to treat substance use disorders, each with a varying level of effectiveness and awareness. Things like relapse prevention groups, medication assisted treatment, harm reduction, 12-step programs, and group or individual talk therapy are just a few ways people suffering with SUD can find help, although they are not all as well-known or affordable. Low-income communities face significant barriers in accessing these treatments not only because of the cost of healthcare in the United States, but also because of an inability to afford childcare, an inability to afford to take time off of work to devote to treatment, an inability to travel to the treatment clinic, and a lack of access to a telephone or computer to schedule an appointment, among other things. For this presentation, I will examine the success levels of awareness of different treatment types across Colorado, and the costs of different treatments that are being utilized for substance use disorder to determine if income plays a significant role in receiving effective help.

Seasonal Variation in Utilization of Inactive and Active Beaver Lodges by River Otters

Bree Belardinelli – Biology
Co-Authors: Kirsten Inghilterra, Rimley Bauer
Faculty Mentor: Jennifer Gagliardi Seeley

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

North American beaver (*Castor canadensis*) and North American river otter (*Lantra canadensis*) populations have diminished since the fur trade in the 1600's. Reintroduction efforts have taken place since the 1970's involving both species. Colorado is one of the states who have implemented reintroduction projects of beavers and otters. It has been suggested that beavers and otters are an example of commensalism, with river otters being the species that benefits from the relationship. River otter activity has been shown to occur throughout all four seasons. Previous research shows that river otters will use active and inactive beaver den sites throughout the year. In summer months, river otter activity based on feces presences has been associated with active beaver lodges. Our research objective is to determine if there is seasonal variation in the utilization of active and inactive beaver lodges by river otters. If there is variation in seasonality of beaver lodge usage by otters, then we will see a difference in activity near active and inactive lodges based on the time of year. Inactive and active beaver lodges were and continued to be identified. Once lodges are identified, each active and inactive lodge will be surveyed throughout the year. A 100 m radius plot will be surveyed for evidence of river otter activity (e.g. tracks or otter sightings). Thus far, preliminary data has suggested that river otters are near active beaver lodges during summer months and are active near inactive lodges more often in fall months. We are currently collecting data for spring months and hopefully we will continue into the next winter. If our future data follows this trend, then our hypothesis that there is seasonal variation in the utilization of active and inactive beaver lodges by river otters will be supported.

Playing Billiards on the Sphere and other Surfaces of Revolution

Bjorn Cattell-Ravdal – Mathematics
Faculty Mentor: Daniel Visscher

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

Have you ever wondered what it would be like to play pool on a table that isn't flat? The game of mathematical billiards is a type of dynamical system in which we determine the long term behavior of "billiard balls" bouncing around a table. The mathematical billiard game is classically played on a flat surface, however the billiard game can also be played on non-flat surfaces. Billiard behavior on flat surfaces are well understood while non-flat billiards have had much less study. While the billiard problem can be challenging to consider even on the flat plane, the problem becomes much more complex on non-flat surfaces. Due to this complexity we can begin study by considering billiards on a familiar type of surface: the surface of revolution. During this presentation I will introduce the concept of mathematical billiards as well as present results from research completed over the summer of 2022 into billiard dynamics on non-flat surfaces. I will discuss formalisms surrounding billiards and the dynamical properties which can be exhibited by a flat billiard table and will then extend the discussion to include dynamics on surfaces of revolution. I will conclude by presenting the results of original research into the dynamic properties of multiple types of billiard tables on surfaces of revolution.

Community Development Health Action Plan

Samantha Claravola and Taylor Bargas – Health Care Management
Faculty Mentor: Garvita Thareja

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

Purpose: The purpose of the study was to understand the health disparities and challenges of the community, gauge from the community members, and understand better what is valued most about their living environment. The information is a consideration when designing new buildings and developments in the local area.

Background: The research community has been an integral affordable living community in Longmont, CO, since its opening in 2018. This affordable living community is the product of a partnership between the Local Housing Authority (LHA) and an affordable housing developer, MGL Partners, to alleviate housing strain among lower-income families and the workforce due to limited availability and access and growing demand for affordable housing with weld county.

Methods: The researchers chose a qualitative, observational approach to data collection by distributing a Community Development Health Action Plan survey in English and Spanish. The survey was anonymous; therefore, no personal information was collected or used, including names, phone numbers, and addresses. The completion time was 10 – 15 minutes, with a Likert scale and open-ended questions, including general questions about your demographics, income, education, etc. Researchers encouraged community participants to share their experiences living in the community authentically and how it affects individual health and well-being.

Results: Results were inconclusive. Researchers identified Multiple problems during the data collection process; participants were hesitant to engage with the researchers, survey incompletion, and lack of support from the property managers.

Conclusion: Although the research team could not complete the study or collect data and complete surveys, the team has concluded innovative approaches to reach out to new residents from additional secured community partners eager to participate. Researchers will replicate the study at two new properties over the Spring and Fall 2023 semesters.

Correlation of Swelling Potentials in Clay Loam Soils within the Denver & Arapahoe Formations investigated with semi-quantitative X-Ray Fluorescence (XRF) Elemental Analysis

Byron Clayton – Applied Geology
Faculty Mentor: Uwe Kackstaetter

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

Research objective will focus on identifying relationships between elemental ion ratios and soil swelling potentials. Field specimens are cored from a depth of 4 feet below surface within the Denver & Arapahoe Formations. Geological context of research to focus on regional quadrangle topography. Samples collected will be processed to isolate fine aggregate particles (less than 75µm). Elemental data collection procedures will utilize X-Ray Fluorescence (XRF) Elemental Analysis to collect data regarding major (light) elements, and trace (heavy) elements. Loss on Ignition (LOI) processes will be performed to determine mass loss on sieved specimens. Major elemental data gathered will be analyzed to identify any ratios between Calcium/Magnesium (Ca/Mg) ions. Results will be correlated with sample swelling potential data to identify if any relationship exists between Ca/Mg ionic ratios and swelling potentials. Trace elemental data may be utilized for mineralogical identification. Linear regression methods and statistical software will assist in interpretation of data collected. Results of investigation are expected to verify a correlation between Ca/Mg ion ratios and clay loam swelling potentials.

Mycoplasma Detection via Lipoprotein Specific Electrochemical Biosensor

Victoria Colling – Biochemistry
Faculty Mentor: Andrew Bonham

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

Mycoplasma infections primarily effect the respiratory and urogenital systems. Such infections are estimated to impact 2 million people in the United States per year. In addition to human disease, Mycoplasma is a very common source of contamination in laboratory human cell cultures. Current detection methods for such contamination include molecular-based assays, PCR, and serological analysis. These techniques typically take from hours to days to provide results, and require specialized equipment. This creates a critical gap where Mycoplasma infection of cell cultures may go undetected for long enough to jeopardize experimental conditions. In response, we present a method to provide quick, continuous monitoring, and more accurate results using a diagnostic electrochemical DNA-based

(E-DNA) biosensor to detect the lipoprotein P48. P48 is a surface antigen shed into surrounding blood serum by most pathogenic Mycoplasma strains into the surrounding blood serum, making it a good target for media-based detection. To enable this strategy, we recombinantly expressed P48 in E. coli to serve as a positive control. A modified DNA aptamer that binds to P48 with high affinity was previously integrated into an oligonucleotide scaffold and was used in a gold electrode-bound fashion to give a dose-dependent electrochemical signal change upon binding of the P48 target protein. However, purification of the recombinant P48 protein has proved challenging, as it is poorly soluble and its folded conformation may obstruct N- and C- terminal affinity tagging strategies. Thus, our efforts have been focused on providing a more effective purification method of the recombinant P48, in order to validate our candidate biosensor. If validated to display it's predicted, low nanomolar affinity, and with the known capacity for rapid with continuous sensing, the E-DNA biosensor would serve as a quick and reliable diagnostic tool for Mycoplasma. Such tools can improve prevention, diagnosis, and treatment of Mycoplasma infection in cell culture or in human disease.

PCR Cleanup and Limiting Factors

Ian Daugherity and Brianna Winkler – Biology
Faculty Mentor: Maria Cattell

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

In this project, PCR (polymerase chain reaction) is being used to find, isolate and replicate large quantities of the GFP (Green Florescent Protein) gene to regulate expression in the targeted coral species. This is a potential way to help corals survive further coral bleaching events, as research has shown the emission of this pigment to be proportional to the likelihood of recovery in bleached corals, since it draws in photosensitive algae species. These algae provide food for the coral by undergoing photosynthesis, and also give the coral its color, which is why bleaching is a way to diagnose stress in coral species. The coral species *Echinopora 23amellose* is believed to somehow be limiting the PCR reactions from continuing normally, hindering the expression of all genes present. To do this we will be diluting the coral DNA in 1:10 and 1:100 ratios, as well as running the coral through multiple runs of phenol chloroform extractions to determine the best practices of coral DNA extraction to prepare for further experimentation.

Examining How Academic stress and Academic Self-Efficacy Changes Over the Course in Undergraduate Years—A cross-sectional model?

Otavaia Davis – Psychology
Faculty Mentor: Aaron Richmond

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

Numerous undergraduates lack success in finishing a bachelor's degree (BAs)—this large number is a considerable concern for policymakers and scholars (Attewell, 2012). Furthermore, Bas completion in

the United States is grouped by race and class with white and higher-class pupils earning more regularly than underrepresented minority and lower-class pupils (Eller & DiPrete, 2018). Also, first-time bachelor's degree recipients completed their degree 48 months or less after first enrolling in postsecondary education in the year 2015-2016. In addition, One-half of those aged 23 years or younger graduated in 45 months or less, compared with 162 months or less for those aged 30 years or older (Velez et al., 2019).
Academic stress in education is unavoidable and can be a positive motivator for students, but at higher levels, it can result in negative consequences, like dropping out (Pascoe et al., 2020). Perception of academic stress varies among different identities of college students (Lee al., 2021). Given studies that reflect a low sample size of non-white races/ethnicities(cite), more studies need to tackle this gap in research to aid in recognizing subgroups that may be disproportionately impacted by academic stress. In higher education, students' belief in their academic capabilities has been correlated with their academic achievement and functioning (Hitches et al., 2022). Just like stress, university students' academic self-efficacy may range, across gender, age, and how far students have progressed in their course (Hitches et al., 2022).

The purpose of this study is to recognize and examine subgroups within university students that experienced academic stress on the academic-related outcome. Mainly, we are interested in looking at how age, race/ethnicity, and gender identity has on retention, academic stress, and academic efficacy. The results from the linear regression models could inform Interventions to better students and aid in retention rates. This may be particularly relevant for students who identify as an underrepresented minority and nontraditional students.

Herbarium Update and Specimen Verification

Makayla DeHerrera – Biology
Faculty Mentor: Erin Bissell

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

Taxonomy, the science of naming and classifying organisms, has ancient origins in both Eastern and Western traditions based on grouping organisms according to similarities in morphology and biochemistry critical for their use in medicine and agriculture. Modern taxonomy is rooted in biological systematics, which places greater emphasis on grouping organisms according to their evolutionary relationships. In the 20th century, several competing approaches to botanical systematics were proposed that still relied on morphological characteristics to identify and group plant taxa. These morphology-based systems, such as those developed by Cronquist, Tahktajan, and Thorne, have since been largely replaced by molecular-based systems, specifically that of the Angiosperm Phylogeny Group (APG), which uses genetic information to characterize and group plant taxa according to their evolutionary relationships. While morphological-based systems still have practical use in fields such as paleobotany, where molecular data is unavailable, the modern botanical taxonomic designations currently recognized by the International Botanical Congress follow the APG system. The Metropolitan State University (MSU) of Denver Herbarium is a collection of preserved plant specimens used in teaching botany courses and currently follows the Cronquist system that was prevalent in the 20th century. The purpose of this project is to assess and update current specimens housed in the MSU Denver Herbarium to match APG IV standards. We use academic journals and botanical biodiversity databases to verify and reorganize specimens according to APG IV Family designations. By updating the

MSU Denver herbarium to follow modern taxonomic systems, we aim to increase accessibility to students and lay the groundwork for further reassessment at the genus and species levels, as well as accessioning and digitization of specimens for an online, public facing database. A modernized herbarium will be more aligned with current courses and teaching methods in biology and botany, making specimens more approachable as a teaching resource and as demonstration tools.

Nonbinary Representations in Television: Containment of Nonbinary Genders and People

Elliotte Enochs – Gender, Women, & Sexualities Studies
Faculty Mentor: Stephanie Santos and Sonny Dhoot

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

By containing the idea of being nonbinary, media limits our understandings of gender. If nonbinary people are all seen as having one experience or looking one way, it may only become at best, seen as a third gender or worse, an extension of one of the binary genders. The point of understanding gender as expansive, diverse, and complex could be lost to many people. If the dominant society sees being nonbinary as simply a new category—a new box to put people in—then ideas about gender might become more constrained rather than less so. It would challenge the radical ideas of queerness, questioning, and rejection of a binary if all perceptions inside and outside of nonbinary communities are to conceive of a new box to be assimilated rather than an expanse to explore. With the new surge of representation of nonbinary people in television recently, I analyze characters "Sex Education" and "The Owl House". My thesis aims to explore the containment and categorizations of nonbinary people and experiences in television over the last few years. I ask: how are nonbinary genders and people represented in television over the last five years? How are nonbinary people contained and/or liberated through television representations? What knowledge is created about nonbinary people through television? I argue that the recent insurgence of nonbinary representations in scripted television over the last five years serves to contain understandings of nonbinary genders which limit the radical potential of gender expansiveness.

Habitat Parameters that Promote Group Aggregate Feeding in Non-Breeding Northern Shovelers

Laura Farnsworth and Drew Bender – Biology
Faculty Mentor: Christy Carello

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

Northern Shovelers (*Spatula clypeata*) are a type of dabbling duck with resident and migratory populations that winter throughout Colorado. Northern Shovelers in Colorado have been observed performing a type of group aggregate feeding behavior in the winter where multiple ducks gather and form a vortex in the water to aid in group feeding called “spinning”. While “spinning” has been reported at various waterbodies across Colorado, the exact conditions that facilitate this behavior are still unclear and are the focus of our research. Preliminary research suggests that Shovelers routinely feed on a specific waterbody within a network of closely related lakes. We evaluated 64 waterbodies located throughout the Denver Metro Area, including single-standing and networks, to determine what

parameters are important for winter foraging and promote large group aggregate feeding behavior. Biotic data such as bird and plant observations along with abiotic factors such as weather, ice coverage, and water properties were recorded. In addition, we documented the interactions of other aquatic birds with Shoveler spinning behavior. Understanding the habitat parameters that Northern Shovelers rely on for feeding, and their association with other waterfowl in the non-breeding season, will provide useful information for conservation management decisions.

Detection of Non-Tuberculous Mycobacteria (NTM) using Electrochemical DNA Biosensors

Audi Fineran – Biology
Faculty Mentor: Andrew Bonham

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

Nontuberculous Mycobacteria, referred to as NTM, is an opportunistic pathogen becoming a growing concern. NTM causes NTM Pulmonary Disease, which often presents similarly to Tuberculosis infections. The current diagnostic "gold standard" for NTM Pulmonary Disease is a microbial culture-based method, a week-to-months-long process. To expedite patient diagnosis and care, we propose a new efficient diagnostic method using a novel electrochemical biosensor that would efficiently detect the presence of NTM. This biosensor's target is GPL, an NTM-specific Glycopeptidolipid found within the cell walls of the prominent NTM species. The biosensor will use an electrode-bound DNA aptamer that conformationally changes when GPL binds. The conformational change is measured using 26oltametric analysis, which will show a difference when GPL, and therefore NTM, is present. The development of this sensor is applicable both medically and environmentally, with our primary goal being a sensitive and rapid detection of NTM for the purpose of elevated patient care.

Using CRISPR Cas9 to Edit NDNF Gene In Zebrafish

Roy Freyta – Biology
Faculty Mentor: Vida Melvin

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

According to The March of Dimes cleft lip and/or palate occurs every 1 in 1600 babies born in the United States making orofacial clefts one of the most common birth defects. The cause of orofacial clefts is not completely understood but involves a combination of genetic and environmental factors. Mutations in the Neuron Derived Neurotrophic Factor (NDNF) gene in humans is associated with congenital hypogonadotropic hypogonadism (CHH), which also shows a low penetrance of cleft lip and /or cleft palate. Interestingly, loss of *ndnf* expression in zebrafish led to significantly reduced or absent ethmoid plate which forms the base of the skull. The ethmoid plate in zebrafish is homologous to the palate in humans. Zebrafish are a good model for orofacial clefting because genes studied in palatogenesis are conserved between fish and humans. The overall goal of our lab is to investigate the role of the *ndnf* gene in palatogenesis using zebrafish. Toward this end, we are generating a stable, heritable loss of function mutation in *ndnf* using the CRISPR Cas9 genomic editing system in zebrafish. In the CRISPR-Cas9 system, guide RNAs bind to specific target sequences in DNA to recruit the Cas9 enzyme, which will

create a double strand break. The normal cellular machinery that repairs the DNA break can sometimes create an indel (insertion or deletion) mutation. We have injected guide RNAs that target the *ndnf* gene and are using PCR and ABI fragment analysis to identify CRISPR induced mutations in *ndnf*. Once we have identified loss of function mutants in *ndnf*, we will mate heterozygous fish to examine palatogenesis phenotypes in homozygous mutants.

Best.Selfie.Ever: Using Selfies to Build Student Rapport

David Frost – Psychology
Co-Authors: Jackson Maxwell and Ethan Greenwood
Faculty Mentor: Michael Rhoads and Cheryl Sanders

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

The intent of this quasi-experiment was to determine whether an intervention involving taking selfies with classmates would increase professor-student rapport. Participants were 173 undergraduate students enrolled in psychology courses during the Spring 2023 semester, as well as five professors whose classes participated. For the experimental condition, students were put into groups of 4-5 students on the first day of class and instructed to take group selfies at two locations: the office of their professor and a location on campus of their choosing. Next, they were asked to email the group photos to the professor with the student names labeled on the photos. The professors were then asked to incorporate the selfies into their power point slides used during lectures in the first few weeks of the semester and utilize them to learn student names. The control group did not participate in the selfie activity. During the 4^{th} –6^{th} weeks of the semester, research assistants attended the classes and provided instructions on how students could access a survey assessing their rapport with the professor and with students in their classes. During this two-week period, participating professors completed online surveys measuring their perceived rapport with students and their recollection of student names. Results from an independent samples t-test revealed a significantly stronger teacher-student rapport ($M = 4.58$, $SD = 0.42$), compared to the control group ($M = 4.42$, $SD = 0.41$), $t(166) = 2.46$, $p = .02$. However, no significant difference in student-student rapport was found. Additionally, an independent samples t-test revealed no significant difference in professor-student rapport when comparing the professors of the experimental classes with those of the control classes. This research provides preliminary evidence that a selfie icebreaker activity is effective for building professor-student rapport from the students' perspective. Strengths, limitations, and future directions for research are discussed.

Applying the Hemotek® Membrane Feeding System in Developing an Infrared Video Bioassay to Study the Behavioral Feeding Process of the Bed Bug, Cimex lectularius (Hemiptera: Cimicidae).

Mahexabel Garcia Nuñez and Christina Perez – Biology
Faculty Mentor: Robert Hancock

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

Bed bugs were eradicated from the United States for nearly 50 years until they reinvaded in the late 1990s. They continue to be an issue for many businesses, families, and individuals, as they can cause

allergic reactions, skin infections, and anxiety. Denver is on the top twenty list of cities for bed bug infestations. The behaviors of bed bugs allow them to be a pest that is difficult to control. After hatching from eggs, all bed bug life stages are hematophagous, feeding preferentially on human blood. They engage in aggregation behavior, typically being in contact with each other and surfaces (thigmotaxis). Bed bugs cluster together in tight, hidden spaces to create their ideal harborage. As modes of orientation, they use thigmotaxis, chemotaxis, and are negatively phototactic. At this time, little is known about their return to harborage after feeding. Our study focuses on observing their feeding behavior with the least possible influence of researcher interaction. To do this we created a prototype bioassay using a clear acrylic box, an infrared camera (Ximea, MQ013RG-ON), infrared lights, and an incubator. The Hemotek system was set up using stretched parafilm and defibrinated goose blood. For our data collection, we will conduct video tracing using Ethovision XT to measure several variables including; the time it took for the bed bugs to feed, the time it took the bed bugs to get to their host, the total distance traveled, the time back to harborage, and a number of turns they made. Using a smaller container than the prototype, our preliminary results show that the bed bugs will readily engorge on blood from the Hemotek system. Our overall goal is to characterize for the first time the entire behavioral feeding cycle from harborage to host and back.

Do Contrasting Insect Orders Show Variability in Highly Conserved CG8399 Motifs Putatively Implicated in Iron Reduction?

Caleb Garris and Nataliya Yusupov – Biology/Chemistry
Faculty Mentor: Emily Ragan

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

Iron is essential for survival in nearly all organisms, and arthropods (including insects and arachnids) are no different. However, when compared to mammals, much less is known about the unique mechanisms for iron homeostasis in arthropods. CG8399 is a protein hypothesized to be involved in iron reduction, a step preceding cellular uptake. Understanding iron metabolism in arthropods is important for gaining insight into iron homeostatic mechanisms and their path through evolution, as well as for suggesting new methods of insecticide and pesticide design. Insects alone are responsible for nearly 10-20% of all major grain crop loss, causing billions in damage each year, and crop loss to insects is predicted to increase 10 to 25% per degree C° of global warming. With this in mind, we expanded upon previous analysis of nine CG8399 proteins and investigated more than 50 other CG8399 homologs. Utilizing A.I. generated 3D-protein structures and comparative sequence analysis, we analyzed CG8399 proteins from various orders of arthropods and confirmed key conserved histidine residues, and structural motifs that suggest the CG8399 cytb561 domain functions in interdomain electron transfer. Within the DOMON domain, we confirmed highly conserved histidine and methionine residues hypothesized to coordinate a heme, and a conserved aspartate pocket that may function as an iron binding pocket. The predicted structures show the putative heme-coordinating region of the DOMON domain spatially oriented near the cytb561 heme-binding region, further suggesting cytb561 electron transfer activity. The presence of a ferric reductase in arthropod iron uptake to convert dietary ferric iron to ferrous iron is yet to be functionally verified. Herein we confirm preliminary findings that the overall structure of CG8399 proteins are promising for both ferric reductase and interdomain electron transfer activity, and expand the investigation to see if distinct insect orders show significant differences in key residues.

Non-Visual Delivery of Accurate Volumes to Improve Laboratory Access for Blind Students

Charis Glatthar and Amanda Frankish – Environmental Science
Faculty Mentors: April Hill and Alicia Palmer

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

In the analytical chemistry laboratory, volumetric glassware is used to transfer accurate and precise quantities of liquids for analysis. These devices require the analyst to visually align the level of liquid with a fill line printed on the glassware. For blind chemists, this is not possible, which creates a barrier for their participation in this field. As an alternative, we investigated the amount of error between tacked syringes and notched syringes as a method for measuring liquid chemicals for blind and low-vision (BLV) students to determine which are a better suited for analytical laboratory work. Seven syringes of differing brands and/or volumetric quantities were marked with tactile indicators, either a notch cut into the fin of the plunger or a tack pushed into the syringe to physically stop the plunger. These were calibrated with deionized water and their accuracy and precision were compared to the tolerance of class A volumetric pipettes. Variation between individuals was analyzed using a group of 10 volunteers measuring trials from a notched and tacked syringe while wearing sleepshades, and the results were compared using ANOVA compared to syringe calibration data. Once we determined the tacked syringe was more precise and accurate, we used a common analytical procedure, the spectrophotometric analysis of iron, to compare the accuracy and precision obtained by a blind student using the tacked syringe to that obtained with the standard method using volumetric glassware, which was carried out by sighted analytical chemistry laboratory students.

Rideshare Denials among the Blind and Low-vision Community

Charis Glatthar and Amanda Frankish – Earth and Environmental Science
Faculty Mentors: Sarah Schlieman, Sara Jackson Shumate, and Syliva Brady

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

The Blind and Low-Vision (BLV) community (and the disability community at large) routinely encounter discrimination in transportation methods, including but not limited to, public transportation, paratransit services, and taxis. In the past decade, as ridesharing companies have become more prevalent, discrimination has also been documented among the BLV community while utilizing these services. Ridesharing is popular among BLV individuals because it can be more cost-effective and readily available compared to cabs, buses, and other public transportation options. Many BLV individuals prefer using rideshare over paratransit services because paratransit services require advanced booking and require users to agree to wide time ranges that can make it impractical to use. However, there is concern about how these companies treat individuals with disabilities and in particular those with service dogs. With that in mind, this project is investigating whether the BLV community is experiencing discrimination. We will use an IRB-approved survey which will be circulated to disability communities. In addition, survey respondents will be invited to participate in a voluntary interview upon completion of the survey.

Spatial and Temporal Distributions of Illegal Drug Sales in Denver, 2018-2022

Julian Gonzalez – Cybersecurity
Faculty Mentor: Hyon Namgung

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

It has been reported that illicit drugs are frequently abused in the city of Denver, and drug sales have been of significant concern for many residents. This research explores the spatial and temporal distribution of the selling of various illicit drugs in the city for the past five years. The types of drugs examined in this study include barbiturates, cocaine, hallucinogens, heroin, marijuana, methamphetamine, opium, and synthetic narcotics. This secondary data analysis presents the results of density and hot spot analyses of drug sales crime in the city using the ArcGIS Online application. Further, this cloud-based geographic information system examines the spatial relationship between drug crimes and the locations of public transportation sites of the Regional Transport District (RTD), including bus and train stops. This research will help us understand the spatial patterns of drug crimes in Denver and guide us to develop policies to address the problems. In addition, the relationships examined may provide implications for RTD security operations and strategies within the area.

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

Adam Gordon – Biology
Faculty Mentor: Vida Melvin

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

Congenital hypogonadotropic hypogonadism (CHH) is a disease that leads to a lack of puberty, infertility, and in some cases associated cleft lip and cleft palate. In one family loss of function (LOF) in the neuron derived neurotrophic factor (NDNF) gene has been shown to cause CHH. Interestingly, knock down of *ndnf* in zebrafish is also associated with deformation of the ethmoid plate, which is homologous to the palate in humans. To further examine the link between *ndnf* and palatogenesis, we are using the CRISPR-Cas9 genome editing system to produce a heritable, loss of function in the *ndnf* gene. The CRISPR system uses a guide RNA to selectively bind a target gene in the genome and recruit the cas9 enzyme. The cas9 enzyme then induces a double stranded break, which is repaired by the normal cellular machinery and can in rare cases cause an insertion or deletion (INDEL) mutation. Guides specific to *ndnf* were injected into 1-cell stage zebrafish embryos to generate the founding (F0) generation. PCR and fragment analysis were used to identify injected embryos that harbor *ndnf* mutations. Based on our data, F0 fish are mosaic, different cells in the fish have different mutations. The F0 fish were mated to wild type producing the F1 generation, which should each have one mutation in the *ndnf* gene. F1 mutations in *ndnf* will be sequenced and characterized to identify small INDELs that lead to loss of *ndnf* function. With these FI and later fish, we hope to characterize phenotypes associated with homozygous LOF in the *ndnf* gene.

Single-primer amplification of a coral gene with an unknown sequence

Maria Green – Biology
Faculty Mentor: Maria Cattell

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

Corals have been observed to increase the expression of the GFP gene during symbiont recruitment after bleaching events. This upregulated expression can be manually induced using gene editing tools, such as CRISPR/Cas9, but in order to do so, the entire sequence of the target gene must be known. The complete GFP sequences of many coral species have not yet been documented, which creates limitations for these genetic-based conservation efforts. *Echinopora 31amellose* is a coral species that's commonly used in reef-restoration projects, making it a promising candidate for successful transgenic propagation. While the entire GFP sequence of *E. 31amellose* is not known, two short fragments of this gene were produced by previous work in our lab. The unknown regions flanking one of these fragments, that we named "fragment 4", were amplified during a creative form of PCR using various combinations of complementary primers with random hexamer primers. The PCR products were cloned and sequenced to provide an expanded area of known sequence for the *E. 31amellose* GFP gene. The results from this study will provide data on the use of this creative primer design method with incomplete genetic sequences; in addition to contributing genetic information on *E. 31amellose*, which will allow for its use in future conservation work.

ADHD Traits Predict Risk-Taking Behaviors

Alden Gruidel – Human Development and Family Studies
Co-Authors: Devon Rapken and Heidemarie Streicher
Faculty Mentor: Cynthia Erickson

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

Risk-taking is an essential part of navigating the world around us. The process of making risky decisions can be attributed to a variety of factors, including self-reflection (Lyons & Zelazo, 2011), impulse control, and neurodevelopmental differences (Shoham, 2016) among others. A potential influence of risk-taking behaviors and risk competence is Attention Deficit/Hyperactivity Disorder (ADHD). ADHD traits are a topic of interest we are exploring as part of a larger study, in which we are trying to understand risk competence, which we have defined as optimal risk-taking behaviors. ADHD is considered a neurodevelopmental disorder, and has been defined by the American Psychiatric Association, in the DSM-5 as, "a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development" (APA, 2013). Rather than focusing on ADHD as a diagnosis, we are interested to see if certain traits of ADHD predict risk-taking decisions. Particularly, if ADHD traits play a significant part in a high-risk, low-reward outcome. ADHD traits were measured through the Adult ADHD Self-Report Scale v1.1 (ASRS; Kessler, et al., 2005). Risk competence was measured through a virtual risk-reward task that we developed. There were four conditions, risk competence was defined as greater responding to the low-risk high-reward relative to the high-risk low-reward condition. In Introductory to Psychology students, individuals who scored higher on the ADHD scale exhibited more

risk-taking behaviors and less risk competence ($F(1,72) = 6.02$, $p = .02$). In the future we look at the development of this behavior in children.

"A little to the left!": Feedback as a tool for learning

Alden Gruidel – Human Development and Family Studies
Co-Authors: Jenny Valadez Fraire, Lexie A. Allen, Sara C. Hobbs, Eric McCabe, Devon Rapken, & Mirka Jara Rivas
Faculty Mentor: Cynthia Erickson

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #16

Feedback is vital in the process of learning and adjusting behaviors. Whether in the classroom or acquiring a new skill, feedback is a crucial part of reaching desired behaviors and minimizing undesired behaviors; a process known as generalization and discrimination by B.F. Skinner (1933). Despite this, many students find feedback uncomfortable and will avoid providing and receiving corrective feedback. Feedback can provide us with a second perspective through which we can gain knowledge to improve our work, yet not all feedback approaches are equally effective. Positive feedback alone has been found to be insignificant in performance improvement in a study that examined teachers' revisions of students' essays (Ferris, 1997). Similarly, medical students receiving corrective feedback during surgical training had significant improvement in performance in comparison to students only receiving compliments (Boehler et al., 2006). The aim of this project is to better understand the impact of corrective feedback, positive feedback and lack of feedback (silence). To convey the importance of corrective feedback to students, we developed an interactive demonstration where students split into groups and play a game of cornhole while blindfolded. During the game, their teammates give them three different kinds of responses: positive-only feedback (e.g., "Good job!"), corrective feedback (e.g., "Throw a little further") followed by no feedback. This demonstration will show the students that there is no difference in score between positive feedback and no feedback. After the game, the facilitator (e.g., a professor or teaching assistant) could utilize students' experiences in the demonstration to open a dialogue about why there is not a difference between positive feedback and no feedback, and why corrective feedback is effective. Future research could investigate different feedback approaches not examined by the demonstration or other factors that could influence participants' performance such as stress, motivation, or perceptions of authority.

Effects of Color and Motion on Flight Patterns of Bumblebees

Kristen Gustafson – Biology
Faculty Mentor: Jonathan Dyhr

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

Animals make constant life and death decisions based on sensory information collected from the environment. The brain integrates and assesses the reliability of sensory information to make decisions, resulting in adaptive behaviors. We can use an animal's movements to understand how the brain is processing information from the environment. To evaluate these movements, we built a flight arena and tunnel for bumblebees. Bumblebees are good model organisms because they are very visual animals and have goal-oriented behaviors such as foraging. We designed the tunnel to test how bees respond to

real and (video) projected objects of different colors. Bumblebees possess sophisticated trichromatic visual systems that are sensitive enough to detect the flicker of projected images, but it is unclear if that sensitivity translates to differences in behavior. The flight arena will allow us to test how the bees process and use information about color and obstacles to navigate around objects, complete their foraging, and make the flight back home successfully. We believe that bees will respond similarly to real and projected images, but that navigation will be influenced by color. This is because motion detection in bumblebees is more sensitive to green light compared to blue or ultraviolet light. In addition to setting up the flight arena, we tested using multiple cameras to track the bee flight paths and analyze how the three-dimensional flight data changes with different obstacles. This included testing an open-source program called DeepLabCut to automatically track multiple body parts during flight to better characterize how sensory information influences different flight and sensory acquisition strategies. The goal is to understand how the brain processes and combines different information streams, e.g., color and motion, to create a unified "picture" of the environment.

Teen Gun Violence in Colorado

Faud Habbas – Criminal Justice & Criminology
Faculty Mentor: Hyon Namgung

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

It seems that nightly an individual can turn on the news and be informed about another shooting and especially in the bigger metro areas. Among the shootings, many are teens and typically the result of the shooting is death. This lead to compare the temporal and spatial change of teen gun violence in Colorado from 2018 to 2022. The goal of this research is to show spatial changes to teen gun violence within the state to hopefully begin to mitigate the loss of lives in teens with gun violence. Using the data from Gun Violence Archive, this study analyzed spatial distribution of teen deaths in Colorado on ArcGIS Online. The results showed that Denver, Aurora, and Colorado Springs (the 3 most highly populated in the state) contained the highest amounts of teen gun violence and death. All but one death by teen gun violence occurred west of the front range of the Rocky Mountains, and over 42 deaths by gun violence has occurred in Colorado with teens since 2021. New policies need to add more restrictions to teens to make guns less accessible to help lower teen gun violence and death.

Viking Horror: Abjection of the Past in Film

Amy Hollingsworth – English
Faculty Mentor: Kim Klimek

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

The medieval is frightening, films remind us, and horror films capitalize on this preexisting notion. Horror movies are powerful in their ability to elicit both physical and mental distress, enhancing the experience of participation in what's shown, suggested by, and obscured on screen. Horror films in a historical setting have been a mainstay of the screen nearly since the inception of the cinema and their popularity hasn't waned in the intervening years, expanding in subject matter and scope to probe and

exploit audience fears with increasing sophistication. When it comes to historical settings, Middle Ages are depicted using cinematic signals that, even if the film is not explicitly classified within the genre of horror, tie this time period to horror. This reinforces prevailing conceptions about the Middle Ages and confronts the viewer with a unique form of horror– that of the past. One of the most striking and popular figures from our conception of the Middle Ages is the Viking, whose media presence is ubiquitous. These figures are detached in media from their historic reality to become emblematic of a perceived barbaric, roughly heroic, and frightening past. Films about Vikings are typically darker, dirtier, and more primal than others, and are more likely to feature monsters, the supernatural, and horror. Taking cues from both Freud's definition of the uncanny and Kristeva's examination of abjection, this presentation explores Viking Horror as a discreet genre of historical horror films, with its own tropes, formalistic elements, and specific methods of eliciting fear, dread, and existential revulsion.

An Island Without Boundaries: The Kingdom of Sicily and Medieval Globalism

Amy Hollingsworth – English
Faculty Mentor: Kim Klimek

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

The Mediterranean island of Sicily occupies a unique position in the history of the Middle Ages. Sicily's centralized location within the Mediterranean World made it an island of cultural, economic, and political crossroads. Never entirely independent, Sicily changed hands between many empires from late antiquity through the close of the Middle Ages. Between 400 CE and 1200 CE, the island passed from Germanic Vandals and Ostrogoths to the Byzantines, the Fatimids, and finally to the Normans over the course of the late 11th century. A distinct mixed culture influenced by Greek, Latin, and Arab elements emerged as a result of these successive empirical takeovers. Much has been written about Roger II's multi-ethnic, multicultural, and religiously tolerant court at Palermo and the brief "Golden Age" of the Kingdom of Sicily under the Hautevilles in the 11th-13th centuries. By evaluating contemporary primary sources from Greek, Norman, and Arab writers, and using archaeological data surrounding the lived experience of peoples of Sicily, this presentation explores the policies that allowed the Kingdom Sicily to succeed as an example of the permeability of geographic, cultural, and economic boundaries in the Middle Ages.

Insect Transferrin 1: a structural examination across species

Kyle Husted – Biochemistry
Faculty Mentor: Emily Ragan

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

Lactoferrin and serum transferrin proteins in mammals serve an important role in iron sequestration and homeostasis by transiently binding and transporting iron(III) ions to different places around the organism. In insects, this process remains less understood but one key protein with a similar function stands out—Transferrin 1 (Tsf1). To date, there is only one solved insect transferrin structure, the Tsf1 protein from Manduca sexta. This structure revealed iron binding in the N-terminal lobe but not the C-

terminal lobe, a contrast with mammalian proteins that bind iron in both lobes. Structural comparisons were then performed with the *M. sexta* AlphaFold protein model to compare the known structure with the AlphaFold prediction to see strengths and limitations of the AlphaFold predicted structure. To expand insights from this structure to other insect Tsf1s, a structural alignment of fourteen different species of insect Tsf1 proteins was performed and overlaid with the solved *M. sexta* Tsf1 protein to identify highly conserved amino acids. Structural comparisons showed that most of the iron coordinating and anion coordinating residues are very well conserved across all investigated species. Interestingly, non-iron binding lobes also contain well-conserved residues that suggest they also play an important role in protein function.

Garter Snake (*Thamnophis spp.*) Exhibit Habitat Partitioning in a Sympatric Urban Population

Naomi Jacquez – Biology
Co-Authors: Kierstin Darrow and Mackenzie Rogers
Faculty Mentor: Jennifer Gagliardi Seeley

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

Habitat partitioning is a behavior commonly practiced among sympatric species to reduce competition. Edgehouse et al. (2014), showed that garter snake species *Thamnophis sirtalis* and *Thamnophis atratus* partition their resources and display interspecific aggression near water sources. Here, we will determine if sympatric species of *Thamnophis radix* and *T. elegans* exhibit similar habitat partitioning. If habitat partitioning is occurring, then we hypothesize that *T. elegans* will be located closer to a consistent water source than *T. radix* in sympatric populations, but both species will be found close to water in allopatric populations. Both species of snakes were caught by hand in sympatric and allopatric populations. Once caught, morphometric data on the snakes were collected, and a GPS device was used to get the coordinates of the catch location. Data from 2010-2022 was entered into ArcGIS Pro to determine the distance of snake capture from water. Preliminary data suggests that T. elegans is found closer to water than *T. radix* in sympatric populations. In allopatric populations, T. elegans is found close to water, but currently *T. radix* sample size is too low to analyze. Thus far, our data suggests that our hypothesis will be supported, but further *T. radix* data in allopatric populations needs to be collected and analyzed to determine if this is truly habitat partitioning. Collecting allopatric *T. radix* data has been challenging due to smaller population size and distance to these sites.

Cognitive Communication Disorders of Mild Traumatic Brain Injury

May Johnson – Speech, Language & Hearing Sciences
Faculty Mentor: Kathryn Hardin

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

This project was the complete rewrite of the mild traumatic brain injury chapter of the cognitive communication disorders textbook by Michael L. Kimbarow. I was the editor assisting co-authors Dr. Hardin as a primary contributor and Dr. Wiseman-Hakes as a secondary contributor.

Our chapter focuses on educating SLPs on the recovery from Mild TBI and its influence on clinical decision-making as well as understanding the intersectionality of TBI patients and their clinical impacts (incarceration, refugees, violence victims, unhoused). We focus on strategies such as family-centered and patient-centered practice to address SLP intervention of mild TBI.

TBI is an area where trauma-informed practices and intersectionality are of paramount importance and bringing this to the attention of clinicians both future and practicing is a major focus of this chapter. There are several examples of high-profile multi-provider care models for persistent symptoms of mTBI. The University of Colorado Anschutz medical campus shows one such example of where care comes from and demonstrates a true interdisciplinary model, where providers interact regularly, and that care planning incorporates all discipline perspectives in client-centered care.

I will be presenting concepts from this chapter we have worked to include as well as having the audience go through a brief section of clinical training for communication partners with moderate to severe TBI from the University of Sydney's ABI programs. This is valuable information for Speech and Hearing Sciences clinicians (SLPS, AuDs, and assistant personnel) and healthcare workers, in general, to directly interact with clients with TBI and advise clients' social support network individuals about how to communicate with them.

Children of COVID: Did the Pandemic Impact Social and Mental Health of Children?

Lizzie Johnson – Integrative Health Care
Faculty Mentor: Garvita Thareja

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

The global pandemic of 2020, collectively referred to as COVID impacted every aspect of our way of life. While communities seek to repair the fallout from this burden, one question poses itself which will unfold in years to come, did the pandemic impact mental and social health in children? Childhood provides our foundation for forming life-long skills, habits, and even traits. During these formative years, social and mental health play a critical role in development. Brain development plays a crucial role in long term mental and social health (Fuser-Poli, 2019). Children experience a unique disadvantage in mental and social health, largely disconnected from the autonomy that adults are afforded (Fuser-Poli, 2019). Children had the added burden of academic pursuits abruptly halted, social community eliminated, and for those that rely on school for nutrition, nurturance, and mental health services, basic necessities removed. COVID provided us with an opportunity to study the impacts of trauma on social and mental health through a real-time anthropologic lens. While the presence of individual stressors such as personal loss and the physical, financial, and mental toll of early contraction of COVID varied among populations, the social isolation and emotional insecurity was virtually a global experience. COVID being such a universal event means that we are on the precipice of a generational change where new norms and practices will evolve from. Understanding the implications of COVID to mental and social health might precipitate how to best navigate the children of COVID through the rest of their developmental years and prevent further recourse. This review evaluated the impact of COVID globally on mental health in youth. With particular respect to the social determinants of mental health. The intended impact of this review is to provide some opportunities to harness resilience through preventative care strategies for our aging youth, as they age out of COVID.

Trauma-Sensitive Yoga as a Treatment for Post-Traumatic Stress Disorder: A Meta-Analysis

Eden Latham – Psychology
Co-Authors: Kaylee Cross, Sariah Leon, Eliza Steele, K Alden Gruidel, Ethan Greenwood
Faculty Mentor: Michael Rhoads

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

This study aims to conduct research for a meta-analysis on the influence of trauma-sensitive yoga for Post-Traumatic Stress Disorder (PTSD). Research has indicated that yoga has demonstrated many benefits for those struggling with mental health disorders, including PTSD. For example, PTSD can cause symptoms of re-experiencing; avoidance; hyperarousal; and a negative mood. Traditional yoga interventions include various postures, in addition to breathwork exercises. Trauma-sensitive yoga varies from what most know as westernized yoga in the sense that components like the movements or gestures are designed to be mindful of those who may be struggling with PTSD (van der Kolk et al., 2014).

The meta-analysis included a total of 12 studies coded by mean, standard deviation, and effect size. Measures of PTSD were the dependent variable in these studies, while assignment to the control of experimental condition (yoga) served as the independent variable. We also coded for a variety of moderator variables, such as type of yoga, the duration of yoga, along with demographic variables like age and gender of participants. Lastly, we tracked if the studies were experimental or quasi-experimental, based on the presence of random assignment to groups.

Through this meta-analysis, we hoped to gain a thorough perspective on the practice of trauma-informed yoga and its influence on symptoms of PTSD. Unique features of this practice have included the avoidance of vulnerable stances and potentially triggering language. Based on our results, trauma-informed yoga offers a novel approach to PTSD symptoms we hope to further study as a complementary therapeutic practice to treat symptoms of PTSD.

API Evolution

David Lee – Computer Information Systems
Faculty Mentor: Daniel Haupt

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

This body of research examines the role and evolution of the Application Program Interface in modern computing. This evolution is examined from the perspective of the end-user and the software developer. The Representational State Transfer Application Program Interface (REST API) has significantly improved both the end user and developer experience in the client-server computing model by providing a standardized and simplified way for applications to communicate and exchange data. Incorporating evidence from open-source codebases, personal correspondence, and various other reputable online sources, this study has demonstrated that REST APIs have revolutionized the way client-server applications are built and have significantly improved both the end user and developer

experience by providing a standard and efficient way to communicate and exchange data.
For end users, REST APIs have made it easier to interact with web-based applications and services. With REST APIs, developers can create applications that can seamlessly interact with a wide range of services, such as social media, payment gateways, and cloud storage. This means that end-users can access and use these services from a single application without having to switch between different platforms.
For developers, REST APIs provide a simple and efficient way to integrate with other services and applications. REST APIs use standard HTTP methods, such as GET, POST, PUT, and DELETE, to perform CRUD (Create, Read, Update, Delete) operations on resources. This means that developers do not need to learn new protocols or languages to communicate with different services. Additionally, REST APIs use standard data formats, such as JSON and XML, which are easy to parse and manipulate using popular programming languages.

Keywords: rest api, end-user, developer, client-server, social media, protocol, programming languages, data.

Expression pattern of the *ndnf* gene in zebrafish craniofacial development

Jessica Lee – Biology
Faculty Mentor: Vida Melvin

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

Craniofacial development involves complex genetic and tissue interactions that produce a specific pattern of cartilages in the face of vertebrates. The craniofacial cartilages come from cranial neural crest cells that migrate into the developing head and respond to signals to form facial structures. Zebrafish are a vertebrate animal and are a good model to study craniofacial development, because the genes that are involved in this process are conserved from fish to humans (Swartz, 2011). Identifying genes that are involved in zebrafish craniofacial development has the potential to broaden our understanding of craniofacial development in humans. In a previous study, neuron-derived neurotrophic factor (*ndnf*) was identified through a reverse genetic screen as a candidate gene that could regulate craniofacial development in zebrafish. Knockdown of *ndnf* gene expression caused reduction or loss of neurocranial cartilage in zebrafish embryos. That study also examined spatiotemporal gene expression of *ndnf*, but at only two timepoints in development. The goal of our study is to expand and refine the *ndnf* gene expression studies in zebrafish embryos to better understand the roles of *ndnf* in craniofacial development. Using in situ hybridization, we have examined *ndnf* gene expression at time points between 10-72 hours post fertilization (hpf). Our data confirm the previous study showing that *ndnf* is expressed in the forebrain and trigeminal ganglia at 24 and 48hpf. In addition, our data shows that *ndnf* is also expressed in developing cartilages as the embryonic skeleton forms between 36 and 60hpf. This *ndnf* gene expression pattern overlaps the expression of other genes known to be important in craniofacial development supporting the hypothesis that *ndnf* also plays an important role in this process.

Impact COVID 19 has had on Organ Donation

Angela Maj and Rachael Molnar – Health Care Management
Faculty Mentor: Garvita Thareja

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

The importance of organ donation is a serious and lifesaving industry whose process is rewarding but also very challenging. Many issues and disparities are part of this process. A person who is in need of an organ transplant may be an individual who was involved in a serious accident, a cancer patient, or anyone who is in need of a new vital organ. Surgical transplants can be from a living person or one who has recently passed. Organs including the liver, kidney, pancreas, heart, lungs, eyes, intestine, or even skin, can be transplanted from one individual to the next. According to UNOS; "United Network for Organ Sharing; Every 9 minutes another person is added to the transplant waiting list. About 106,545 men, women, and children are on the national transplant waiting list. 17 people die each day waiting for an organ transplant."(UNOS, 2023) Receiving a new organ is quite a hard process. Those on the waitlist can go months to years of waiting for what they need, and the process can be quite extensive. When a donor organ becomes available, the matching system dynamically generates a new, specific list of potential recipients based on the criteria defined in that organ's allocation policy (e.g., organ type, geographic local and regional area, genetic compatibility measures, details about the condition of the organ, the candidate's disease severity, time spent waiting, etc.). (UNOS, 2023)

My Journey Down the Rabbit Hole: Seeking Radical Queer Sexuality on the Fringes

Cricket Malament – English
Faculty Mentor: Mikkilynn Olmsted

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

This abstract presents ethnographic research regarding a local folk group known as Kinky Kweers, a community of predominantly transgender and genderqueer individuals engaged with each other for purposes of kink play, social connection, and sexual interactions. I had the opportunity to get involved with Kinky Kweers first as a participant and then became an intentional participant observer. As the group recently and rapidly expanded from around ten or so close friends into an intentionally structured social network of close to two hundred, I want to understand why it has become so deeply meaningful to so many, so quickly. I hypothesize that the group must be meeting some sort of unique need for the queer community in Denver and will continue examining this by attending monthly play parties, observing interactions on the group's Discord server, and by conducting participant interviews to augment my observational research. This work builds upon research conducted by Madison Moore and Georgia Verkuylen exploring the ephemerality of queer culture and the way in which this enables the queer community to rapidly and radically envision alternative ways of being and relating. The course of my research thus far has revealed distinct patterns of benefit perceived by group members, including feelings of enhanced interpersonal safety and of being desirable and desired without being fetishized for their bodies or identities as queer and trans people. At this time, my research suggests that queer communities on the fringes of society are worthy of additional study as these unique folk groups appear to reclaim their experience of marginalization and instead utilize their social peripherality as fertile ground for the radical exploration and reimagining of sexuality, identity, and patterns of relationship and connection.

Automation of the Workforce as Social Progress

Brandon Martinez – Philosophy
Faculty Mentor: Kathryn Schmidt

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

Automation of the workforce began in the industrial revolution when the US began to expand their economy from mostly agricultural to more industrial. The term "automation" came in the 1940s with Henry Ford's assembly lines, which increased efficiency and decreased labor costs. Automation of the workforce promotes jobs growth, which creates wealth, resulting in social progress. Although, many jobs that used to be seen as careers have been fully automated such as travel agents. Only 25 years ago you would have to call a travel agent to book plane tickets and now one can do this by spending a few minutes on google. People raise concerns about the automation of the workforce believing that large portions of the US labor pool will be displaced. The concern is especially high for truckers as some researchers believe that the job of a trucker is routine based, low skilled, and a non social job. Jobs that are rated low on these three criteria are seen as high risk for automation causing a labor pool disruption. Some researchers even predict that all trucking jobs will be automated in the next 10 years. With roughly 350,000 truckers in the US, a near majority of them being parents who are the primary provider for their family, the idea that all of these jobs could be fully automated is scary. In reality, the job of a trucker requires mechanical skill, interpersonal communication skills, and is unpredictable. The job of a trucker could never be fully automated.

Dying to Know? The Impact of Death Education on Undergraduate Students

Sophia Mattingly – Psychology
Co-Authors: Jackson Maxwell and Ethan Greenwood
Faculty Mentor: Michal Rhoads

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

Formal death education in higher education has grown exponentially since the first college course on death and dying was taught in 1963 (Hasha & Kalich, 2019). Additionally, student interest and enrollment in these types of undergraduate courses significantly increased during the Covid-19 pandemic (Weisskirch & Crossman, 2022), with some institutions reporting 4-year waitlists (Chan, 2022). Limited research has been conducted on the effectiveness of these courses (MacDougall & Farreras, 2016). Most research attention has focused on death education and its impact on fear and anxiety related to death, with many studies reporting a significant reduction in death anxiety after taking a semester course on death and dying (McClatchey & King, 2015; Weisskirch & Crossman; 2022; Wong, 2009). Thus, this quasi-experimental study assessed the impact of an experiential death and dying course on comfortability and knowledge of death-related issues. 35 undergraduate students enrolled in a death and dying course during Fall 2022 completed a death awareness assessment on the first and last days of the semester. On the last day of the semester, perceived changes in death anxiety and comfortability in talking about death were assessed on a 5-point scale (1 = decreased significantly to 5 = increased significantly. Results from a paired-samples t-test revealed a significant increase in death

knowledge and understanding when comparing the death awareness pre-test (M = 2.70, SD = 0.61) with the post-test scores (M = 4.49, SD = 0.30), t(27) = 17.97, p < .001. In addition, participants reported that their death anxiety decreased (M = 1.94, SD = 0.83), z = -1.28, and their comfortability in talking about death increased (M = 4.34, SD = 0.94), z = 1.43. These data support the idea that formal death education has a positive impact on death awareness. Strengths, limitations, and future directions will be discussed.

Airport Simulation for Analysis Using MATLAB, Systems Tool Kit, and FlightAware

Isabella McLeod – Individualized Degree Plan
Faculty Mentor: Jose Lopez

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #17

Using a wide variety of software's and online resources to produce a useful and multifunctional data set that will take public flight data at specific airports for various times and create files that are compatible with Systems Tool Kit (STK). This will be accomplished by using the public database FlightAware to supply critical flight data such as latitude, longitude and altitude as well as time elapsed, and MATLAB to select necessary data sets and write ephemeris files that can be put directly into an STK scenario. The design of the code with its counterparts could be used by Flight Instructors, Pilots, Air Traffic controllers and their instructors to three dimensionally visualize the operations at specific airports for any period of time. The design is meant to be multifunctional, multidisciplinary with practical applicability.

Food for Thought: How food insecurity is related to academic achievement and mental health

Madison Murdock – Psychology
Faculty Mentor: Lisa Hagan

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

As the cost of college continues to rise, financial aid has failed to maintain the purchasing power of indirect expenses (Peterson et al., 2022). In turn, students report missing meals, disrupted eating patterns, or reduced food intake to compensate for limited financial resources (Crutchfield et al., 2020) which leads to food insecurity. Food insecurity in college students has been linked to a number of disturbing outcomes, including higher rate of mental health issues (Diamond et al., 2019; Bruening et al., 2016) and poorer academic performance (El Zein et al., 2022; Martinez et al., 2016). Past research on food insecurity has focused on students from community colleges and 4-year residential colleges. The present study extends the literature by examining food insecurity at a non-residential, commuter-based university and the relationship between college students' food insecurity and their mental health and academic success. Three hundred and one Introductory Psychology students from a diverse commuter campus were recruited to participate in a 15 minute survey. Upon giving consent they reported their cumulative GPA, experiences with food insecurity, and two measures of mental health for depression and anxiety. One-way ANOVAs determined that there is statistical significance of the effect of food insecurity on anxiety and depression. However, there was no statistical significance of the effect of food insecurity on academic achievement. Consistent with the prior research of Oh et al. (2021), this study

also found that students who experienced food insecurity were more likely to experience mental health concerns such as depression and anxiety. Contrary to the findings of Silva et al. (2017), this study did not find a relationship between food insecurity and academic performance.

Impact of Trauma and Stress on Pain Tolerance When Exposed to News Media

Shannon Myers – Psychology
Co-Authors: Lexie A. Allen, Madison E. Barber, Jenny Valadez Fraire, K. Alden Gruidel, Jackeline Martinez Haro, Sara C. Hobbs, Lauren J. Lobsinger, Julia L. Sickrey, Peyton M. Steiner
Faculty Mentor: Cynthia Erickson

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

This study aimed to examine the relationship between childhood trauma, pain tolerance, and stress levels when subjected to news media on current events or a mindfulness condition. One factor that may influence a person's pain response to potentially stressful news content could be the experience of childhood trauma and stressful situations. Trauma of all kinds has been historically linked with adverse psychological outcomes including, but not limited to, PTSD and depression. The consequences of perceived stress can have a variety of adverse effects in many areas of a person's life. Someone's interpretation of stress may induce them to feel overwhelmed, depressed, or anxious (Myers et al., 2022). In this study, we measured adverse childhood experiences (ACES-Q) and perceived stress (PSQ) to assess the relationship between the amount of trauma and stress the participant reported. Then, after they randomly reviewed the videos with either news media or a mindfulness condition, we compared the individual response to the cold-water immersion test and pain scale. Prior stressors may modulate or mediate the stress response in this condition. Although our study is ongoing, initial findings show no significant correlation between stress, trauma, and the outcome of the cold pressor test. We did find a relationship between video and pain tolerance (see Steiner et al, 2023). Future studies on this topic are essential. We could purposefully limit our consumption by pinpointing how much impact news media has on our daily lives. Especially, if we have had trauma in our lives and/or are perceiving our lives as very stressful.

hòa

Phoebe Nguyen – Communication Design
Faculty Mentors: Shawn Meek and Rebecca Forgash

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

hòa (verb)
- To mix, to mingle, to dissolve
- Depending on the word it is paired with, "hòa" can become "acculturation" ("hòa nhập") or "assimilation" ("hòa tan")

As of 2021, there are approximately 1.4 million Vietnamese immigrants in the United States, representing one of the largest foreign-born groups in the country[1]. Starting a new life in America

affords them countless opportunities and insurmountable challenges. Similar to other ethnic groups, they often feel the need to discard their native language and repertoire of practices, eventually creating a new identity to make sense of their experience.[2]

Similar to these findings, when I first arrived in the United States, I created a new identity by changing my name, learning the language, and adapting to the new lifestyle to make myself "fit in" with the culture. Especially with the support of modern technology and contemporary media, the acculturation process has never been easier for young immigrants.

Using Homi K. Bhabha's theory on the "in-between spaces"[3] of culture, the thesis "hòa" resembles a traditional Vietnamese dining room, where the significance of acculturation and preserving national heritage are discussed. Through personal experience and ethnographic research, the findings are visualized by way of a series of digital graphic screens (or "bình phong" in Vietnamese) and a replica of a dining table. Accompanied by augmented reality, "hòa" is an immersive digital experience highlighting how modern technology and media influence culture, identity, tradition, and heritage of immigrants in the United States. By utilizing the mobile devices, the audience can observe the duality of Vietnamese and American culture that has been integrated into the immigrants' way of living for generations. This thesis aims to initiate the conversation on cultural identity, celebrate the unique values of Vietnamese culture, and create a representative voice for generations of immigrants in America through art and design.

The Impact of the Covid-19 Pandemic on Asian-American Hate Crimes in Denver

Angelica Olivo – Criminal Justice & Criminology
Faculty Mentor: Hyon Namgung

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

The COVID-19 pandemic has brought to light the issue of racism against Asian-Americans, leading to an increase in hate crimes. The incidents are harmful to the community and must be addressed through education, policy changes, and community support. To understand the extent of this issue and its impact on the Asian-American community, this research used quantitative data to compare hate crime rates against Asian-Americans in Denver, Colorado from 2019 to 2022. Publicly available data on hate crimes in Denver were obtained from Open Data Catalog, and ArcGIS Online was used to display geographic distribution of the crime in Denver and other cities for comparative spatial analysis. This approach provides valuable insights into the issue and can serve as a basis for further research, specifically the spatial pattern of hate crimes. The research also underscores the importance of addressing hate crimes against Asian-Americans in the wake of the pandemic, as they have far-reaching consequences for the community's safety and well-being. The findings reinforce the urgency of the issue and the need for action to support the Asian-American community. This research can also serve as a call to action for policymakers, law enforcement agencies, and communities to work together to combat racism and hate crimes against all marginalized groups.

Skip oviposition by the neotropical jungle mosquito *Sabethes chloropterus* influenced by ovisite attractants

Tucker Payne and Rachel Blons – Biology
Faculty Mentor: Robert Hancock

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

The yellow fever vector *Sabethes chloropterus* is a zoophilic forest-dwelling mosquito found in dense, humid environments across Central and Latin America that, like other mosquitoes in the genus *Sabethes*, oviposits from hovering flight by abdominal "throwing" of individual eggs into tree holes with flicks of their abdomens. Two to three days after a blood meal, *Sa. chloropterus* are gravid and ready to oviposit. Due to their cryptic mannerisms and tropical forest habitat, it has been challenging for researchers to observe *Sa. chloropterus* in nature. It is unclear how they distribute their eggs and what factors if any characterize preferred holes. This study is meant to shed light on possible cues influencing oviposition preferences. Our experiment was designed to mitigate all confounding variables by placing the ready-to-lay females in clear, humidified boxes with their choice between 2 or 3 black ovicups to lay eggs in. By counting eggs/ovicup deposited by individual gravid females over 24 h periods we compared egg counts in tests between different combinations of 4 experimental ovicup contents: 1) dry (water-free); 2) nutrient poor abiotic water; 3) nutrient rich biotic water; and 4) water from colony pans containing immature *Sa. chloropterus*. Results indicate that dry cups are rarely selected, but that there was no difference in egg counts within cups containing different waters. *Sa. chloropterus* appears to exhibit a "skip oviposition" strategy whereby eggs from a single gonotrophic cycle are distributed in multiple containers as is common in fellow *Sabethini* tribe members *Wyeomyia smithii* and various *Aedes (stegomyia) spp*.

Demostrating Polarity Free Magnetic Repulsion and the Magnetic Bound State Using Neodymium N52 Magnets

Gerardo Perez-Llamas – Physics
Faculty Mentor: Azure Avery and John Martinez

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

Magnetic levitation is an effect that has various applications ranging from levitating trains to the levitated dipole used in nuclear fusion reactors. Our research will focus on a form of magnetic levitation that involves the rotation of magnetic dipoles that could be used in similar application to the more common forms of magnetic levitation. A magnetic dipole exposed to a magnetic field experiences a torque and a force if the magnetic field is not uniform. Rotating a magnet (magnetic dipole) generates a force known as, the Polarity Free Magnetic Repulsion (PFR). The attractive force between 2 magnetic dipoles will counter the PFR repulsive force, resulting in a bound state, known as the Magnetic Bound State (MBS). The MBS causes the 2nd non-rotating magnet to levitate. We explored how different parameters such as the speed of the rotation of the rotating magnet and the magnitude of the magnetic moment of that magnet affected the distance of the levitation. We reproduced the MBS effect and varied the size of both the rotator magnets and floater magnets. We predicted the levitation distance using a mathematical model of PFR and MBS and compared this prediction to our experimental results. We determined that the distance of levitation is dependent on the size of the magnets. In particular, the

larger the rotator magnet and the smaller the floater magnet, the greater the levitation. We also found that there is a specific rotational speed at which MBS will be stable for a configuration of magnets. Our research shows that the distance of levitation due to MBS is maximized when a big rotator magnet and a small floater magnet are paired, yet the stability being reliant on a specific speed showcases the limitations that a device taking advantage of MBS might consider.

Dysphagia Assessment & Treatment

Alexandrina Petrova – Speech, Language & Hearing Sciences
Faculty Mentors: Katia Bruno and Marcia Walsh-Asis

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

During my internship, I shadowed a speech-language pathologist who specializes in swallowing disorders, otherwise known as dysphagia. I learned about the nature of swallowing disorders, how to assess and treat them, as well as conditions that are often comorbid with dysphagia, or may cause it, and how they relate.

Dysphagia can occur as a result of different health events, such as stroke, being on a ventilator for a long period of time, and age. Assessing dysphagia involves looking closely at the movements in the throat – more specifically, looking at the pharynx and larynx. Speech-language pathologists analyze muscle movements and look for irregularities using tests, such as modified barium swallow (MBS) and fiberoptic endoscopic evaluation of swallowing (FEES).

The goal of treating dysphagia is to increase the protection of the airway and to allow the safe passage of food and drink to the stomach. It presents differently in each patient, requiring different treatment techniques to address specific issues. Treatment can consist of food consistency training using the IDDSI framework, neuromuscular electrical stimulation (NMES), and exercises of the neck muscles. Dysphagia treatment also takes into consideration how an individual may be affected by their quality of life and other conditions that might cause loss of appetite, uncoordinated movements, exhaustion, and weakness.

It is important for speech-language pathologists and related health professionals to not only understand why dysphagia might happen, but to consider the experiences of the individuals who have it. Dysphagia is a condition that decreases the quality of life, so healthcare professionals must be equipped to identify when there is an issue, properly assess the individual, and treat them, while also acknowledging and addressing their concerns with competence and respect.

Dreaming Of Solutions: The Relationship Between Daydreaming and Divergent Thinking

Alicia Phinnella and Crystal Bridgers – Psychology
Faculty Mentor: Pamela Ansburg

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

Can zoning out aid an individual's ability to zone in on creative problem-solving tasks? Daydreaming or mind wandering happens when an individual's attention drifts from engagement in an activity to an unrelated internal stream of thought. Daydreaming is a normal part of the cognitive process, which many individuals spend a considerable amount of their waking time doing. As a component of creative problem-solving, divergent thinking involves generating novel associations to produce original ideas. However, while previous research suggests a link between daydreaming and creative problem-solving, research on daydreaming and divergent thinking yields insufficient evidence of the relationship between the two variables. Thus, the study aims to contribute to current research and explore the potential link between divergent thinking and daydreaming frequency. The study utilized the Daydreaming Frequency Scale (DDFS) and the Alternate Uses Task (AUT). The DDFS is a 12-item multiple-choice questionnaire. The DDFS items ask respondents to self-report the amount of daydreaming they engage in their daily life to measure their daydreaming frequency. The AUT measures divergent thinking by calling on participants to generate unusual, creative, and uncommon uses for an item, such as a sock or tire. To measure respondents' divergent thinking, AUT responses were coded for fluency, flexibility, and originality. There were no statistically significant relationships between daydreaming frequency and any of the divergent thinking indicators. Participants' scores in the DDFS did not predict their originality, flexibility, or fluency in the AUT. The lack of statistically significant results may be due to the DDFS only measuring trait daydreaming rather than the amount of daydreaming that occurred while trying to complete the AUT. Further research is still needed to explore the relationship between daydreaming and divergent thinking.

Auraria Campus Agrivoltaics: Benefits from Synergized Technology & Flora

Evan Pierpont – Sustainable Systems Engineering
Co-Authors: Conor Mahoney, Nicole Halpin, Kam Fink
Faculty Mentors: Aaron Brown and Thomas Bellinger

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

Agrivoltaics, the combination of agriculture and photovoltaics, is a relatively new and promising way to incorporate reduced energy consumption and increased renewable energy output on existing buildings. Utilizing a green roof for the agricultural component, the synergy between these two systems allows for more green roof growth which promotes oxygen generation, carbon sequestration, and habitats for organisms not commonly found within dense city populations. Additionally, it increases the longevity of roofing membranes and reduces thermal flux through the roof of a building, decreasing HVAC costs, all the while generating cooler environments for more efficient production of photovoltaic energy. This relationship will be explored, and a report will be generated for a theoretical system on the Auraria Campus. The report will include associated costs for implementing a photovoltaic array onto an existing green roof on the Auraria Campus and methods to measure its performance in comparison with a non-agrivoltaic photovoltaic array. This will quantify energy production efficiency or lack thereof. It will also investigate procedures necessary for retrofitting an existing roof for an agrivoltaic array and for monitoring building energy performance.

Who Do You Think QR?

Dale Pitmann – Communication Design
Faculty Mentor: Shawn Meek

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

QR codes have become a familiar aspect of communication that is embedded in the urban spaces that most people experience every day, but can the facial orientation of QR codes be used to educate, foster empathy, and build a greater sense of culture through the disarming nature of play? This question takes the notion of making the invisible visible in everyday life and asks if that can be accomplished in a socially effective way that is similar to Maori Moko facial tattooing, yet with use of digital scanning technology that is readily available on every smartphone. Designer Stefan Sagmeister presented Lou Reed in a gritty fashion along these lines to great effect, and artist Hank Willis Thomas has shown that branding bodies in a permanent fashion can dangerously affect the historical and cultural "interpretation of reality" as a corollary. However, presenting underrepresented stories utilizing QR codes may offer the opportunity to disrupt systems of social hierarchy and equalize personal experience. It is said that ordinary practitioners of a city live "below the threshold at which visibility begins", but I will blur that threshold through my work and create the opportunity for greater identity to begin to be made visible. Creating these opportunities through the presentation of a QR code based identity game in the gallery space will challenge participants' notions of Self and Other through the power of digitally embedded vernacular communication.

Modern Interferometry: Measuring with Lasers

Kevin Polinski – Physics
Faculty Mentors: Azure Avery and Kamran Sahami

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

As technological progress has increased over time, so too has our need for higher-resolution instruments and more precise measurements. Interferometers offer an ideal way to measure very small changes things like length by exploiting the properties of light waves. One of the things that an interferometer can measure quite well is a change in the propagation medium, the "stuff" that a light beam travels through. The refractive index is a comparison of the speeds at which light travels through different propagation media. I measured the effect on this refractive index by placing a transparent gas chamber in the path of one arm of a Sagnac interferometer, filling it with different gases and shooting a Helium-Neon laser beam through it. Using this method, I measure the index of refraction of air and sulfur hexafluoride. I found a linear relationship between the internal pressure of the gas chamber and the speed of the light beam travelling through it. In this presentation, I will share my measurements of the index of refraction of these gases and compare them to accepted literature values. I have measured these indices to a high degree of precision and can show the effects of external conditions like temperature and atmospheric pressure on them. This is important because work conducted in laboratories and workshops in various industries in which lasers are utilized can be affected by these conditions. In the future, I plan to measure general relativistic effects of introducing rotation to the Sagnac interferometer, the application behind laser gyroscopes used in flight navigation and stability systems.

Spatial and temporal analysis of burglaries in Denver

Camilo Pulecio – Psychology
Faculty Mentor: Hyon Namgung

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

Residential burglary is a growing problem due to several factors in major cities across the country. The proliferation of technology has made it easier for criminals to gain access to homes and valuables, while also making it more difficult for law enforcement to track down and apprehend perpetrators. Additionally, the economic downturn brought on by the COVID-19 pandemic has led to an increase in poverty and desperation, which can drive people to commit crimes like burglary. In this context, this study will gather information of residential burglaries through Denver Open Data Catalog and examine the spatial and temporal patterns of the crime from 2021 to 2022. This research will also explore the association between income and burglaries on a neighborhood level in Denver. By integrating data from the Open Data Catalog and ArcGIS Online, this secondary data analysis will visually present the hotspots of burglaries for the past two years and try to identify possible factors that could contribute any existing high-risk areas. The results will guide police to focus their limited resources on some vulnerable places. Additionally, it can potentially help us understand the root causes of burglary, such as poverty and unemployment, in order to reduce the desperation that can drive people to commit crimes.

How COVID-19 Pandemic Impacted Motor Vehicle Theft

Amela Qershia – Criminal Justice & Criminology
Faculty Mentor: Hyon Namgung

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

Motor vehicle theft is the most common offense in Denver, Colorado. In fact, Colorado leads the nation in motor vehicle thefts, and it was ranked first in 2021. In a typical week, approximately 100 vehicles are stolen every day from the Metropolitan area according to Colorado Auto Theft Prevention Authority. In 2022, there were 14,046 cases of motor theft vehicles reported to the police. Therefore, it is important to analyze the spatial data and see how the spatial patterns of this crime has changed for the past five years. The purpose of this secondary data analysis is to examine the spatial and temporal distributions of motor vehicle theft in Denver. This research specifically examines different spatial characteristics of motor vehicle thefts by collecting publicly available data from the Denver Open Data Catalog from 2018 to 2022. It further investigates the neighborhood differences in motor vehicle thefts. It uses a cloud-based geographic information system, ArcGIS Online, to understand the effect of the COVID-19 pandemic on numerous types of crime, including theft for the acquisition of the whole vehicle or parts, fraudulent theft, theft for temporary use or transport use. This research has an important implication for developing crime prevention measures by identifying hot spots of motor vehicle thefts. Also, it explores how the pandemic has affected the criminal activities in the city. Spatial and temporal analysis of motor vehicle thefts will enhance our understanding of the effect of the global health crisis on local crimes.

Sterilization of American Indian Women: Removing a Right to Children

Nevaeh Ramon – History
Faculty Mentor: Kimberly Klimek

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

During the 20th century in the United States, women of American Indian and Alaska Native descent were targets of involuntary sterilization which was being funded by federal government agencies. Between the years of 1973-1976 approximately 15% American Indian women were surgically sterilized without proper if any consent being given to the patients. A groundbreaking study by Dr. Connie Pinkerton-Uri, revealed to the greater public that nearly 1 in 4 American Indian women had been sterilized. This practice of forced sterilization was a 20th century continuation of genocidal practices aimed at the destruction of American Indian communities, ensuring the destruction of tribal sovereignty within the United States. The policies which allowed for the sterilization of American Indian women come from the eugenicist policies of the early 20th century which were developed as a control over African American women, and directly targeted women of childbearing ages between 15-44. At the same time in United States history, the passing of the Indian Child Welfare Act was being officialized, and the rights of American Indian women and families to parent their own children were being allowed for the first time since the establishment of residential boarding schools. The belief that American Indian communities were not capable of raising their own children has a long history in the United States, and the use of sterilization without informed consent reaffirmed the Unites States belief in superiority over American Indian cultures. Now as the war against women, rages through the United States, the history of forced sterilization, reveals to outside groups what women of color have been experiencing for over a century.

The Study of Adult Kidnapping Data in Denver

Gabrielle Rankin **–** Criminal Justice & Criminology
Faculty Mentor: Hyon Namgung

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

Where in Denver is adult most likely to get kidnapped? Are there any spatial patterns of the kidnappings of adults? These are critical questions because kidnapping is a horrendous crime and people need to be more aware of where these kidnappings within Denver occur. The goal of this study is to examine spatial patterns of adult kidnapping in Denver during 2018-2022. By using data from Denver's Open Data Catalog, this research describes the spatial and temporal distribution of kidnapping in ArcGIS Online. The cloud-based online geographic information system (i.e., ArcGIS Online) visualizes the locations of kidnapping in Denver for the past five years. Furthermore, the application will analyze geographic crime data to summarize the adult missing person cases in each Denver police district to show where law enforcement needs to observe more closely and specifically what police districts should act upon. By finding these patterns of the kidnapping data, it will be able to identify these hot spots and develop possible strategies for local law enforcement to prevent further kidnapping cases.

Social Support and Risk Competence

Devon Rapken – Psychology
Co-Authors: Heidemarie Streicher and Alden Gruidel
Faculty Mentor: Cynthia Erickson and Kristy Lyons

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

One of the best predictors for succeeding in school and life is the ability to self-regulate behaviors (McClelland & Cameron, 2011; Moffitt et al., 2011). There has been much research focused on an individual's ability to inhibit inappropriate risky behavior (Geeraerts et al., 2020). However, not all risk taking is bad. In contrast to most of the literature, this study emphasizes self-regulation in both the activation and inhibition of risk taking. In other words, optimal risk-taking behavior requires individuals to either selectively inhibit, or take action, when doing so is likely to lead to the most positive outcome. This optimally regulated risk-taking behavior is what we define as risk competence. One factor that may influence risk competence is social support. As a part of a larger study, to see if social support is a factor in risk competence we developed a virtual risk-reward task to measure participants' risk competence. Social support was measured using the Multidimensional Scale of Perceived Social Support (MSPSS) as it has good internal reliability (Zimet et al., 1988; Dahlem et al., 1991). There was a significant interaction between risk and reward ($F(1, 150) = 98.13$, p < .001 , $\eta^2 = .07$), but no significant interaction between risk competence and social support. This suggests that social support does not modulate risk competence. However, this may be due to the novelty of our task and its unknown ability to generalize to real-life decision-making. Additionally, it is possible social support is not as significant as an individual's sense of social safety. Future research should focus on fine-tuning psychometrics for measuring risk competence as well as looking at other factors that may be associated with risk competence.

Generation of a stable mutation in the zebrafish *macc1* gene using CRISPR-Cas9 genome editing

Eric Reeve – Biology
Faculty Mentor: Vida Melvin

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

Metastasis Associated with Colon Cancer-1 (MACC1) is upregulated in human metastatic cancers and is known to increase cellular migration and proliferation of cancer cells in vitro. Though its function in cancer is well established, the normal function of *macc1* is not known. Interestingly, a loss of function in zebrafish *macc1* produced craniofacial phenotypes suggesting that it may be a regulator of craniofacial development. These findings, however, were not conclusive as previously used techniques to achieve gene knock down can produce nonspecific phenotypes that affect craniofacial development. To examine the normal function of *macc1*, we are using the CRISPR-Cas9 genome editing system to generate a stable, loss of function mutation in this gene. We injected 2 different guide RNAs targeting *macc1* into zebrafish embryos at the 1-cell stage producing F0 generation fish. PCR screening and fragment analysis demonstrate that these F0 fish are mosaic, where individual cells in a single embryo harbor different mutations in the *macc1* gene. Based on fragment analysis data, these mutations range from small insertions or deletions (1-3 base pairs) to insertions of several hundred nucleotides. To determine whether mosaic F0 fish can transmit *macc1* mutations to the next generation and to separate mutations

into different genetic lines, the F0 adults were mated to wild-type fish producing the F1 generation. F1 fish will be screened for *macc1* mutations to identify small insertions or deletions that would cause a loss of function allele. Once we have established a stable, mutant line, we will assess developmental phenotypes associated with homozygous loss-of-function in *macc1*, including those in the head and face.

The Influence of the Madden-Julian Oscillation on Rainfall in the Philippines

Erin Rhoades – Meteorology
Faculty Mentor: Scott Landolt

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #15

The Madden-Julian Oscillation (MJO) is a meteorological phenomenon that occurs year-round in the equatorial Indian and Pacific (Indo-Pacific) Oceans and is considered the dominant forcing mechanism behind intraseasonal tropical climate variability. An MJO event begins as a convective disturbance in the western Indian Ocean and propagates eastward bringing periods of enhanced rainfall. The archipelagic country of the Philippines is one of the many countries in the path of the MJO, where rainfall amounts can be influenced by this oscillation. For this study, the presence of an active MJO event will be determined by analyzing zonal wind anomalies, outgoing longwave radiation (OLR), and precipitation rates in the Indo-Pacific, which are all key observations in determining the existence of a MJO. Precipitation amounts in the Philippines during an active MJO will be compared to periods without an active MJO. By establishing whether a correlation between the MJO and enhanced rainfall in the Philippines exists, communities can be better prepared for potential impacts of enhanced rainfall during MJO events.

Intraspecific Variation of Mating Systems in Convict Cichlids (*Amatilania nigrofasciatus*)

Caroline Rice and Colette Dolby – Biology
Faculty Mentors: Hsiu Ping Liu and Jennifer Gagliardi Seeley

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

Intraspecific variations of mating systems can occur in some species. Convict cichlids are known as a model species for monogamy and biparental care. Recent genetic analyses of only the offspring suggested that 25% of a natural population exhibited social monogamy. Here, we performed a genetic analysis on both the parents and their brood. We hypothesized that genetic monogamy occurs more often than social monogamy and that extra-pair mating by the female will be more prevalent among defended broods. Thirty-five territorial pairs and their brood were collected in Costa Rica. DNA extraction using the CTAB method was performed and M13-labeled primers were used for DNA amplification. Microsatellite analysis of 4 loci was used to determine the paternity/maternity of each offspring. Results showed that social monogamy is more prevalent than genetic monogamy. Parentage proportions varied among the broods; 5-100% of the fry were genetically related to defending pairs and more female extra-pair mating was observed. Our hypothesis that genetic monogamy is more prevalent

than social monogamy was rejected, but extra-pair mating was more prevalent with females within the pair's territory.

It's another ozone alert day: could this be Colorado's new normal?

Lyn Riebel – Public Health
Faculty Mentor: Garvita Thareja

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

If you have ever lived or visited Colorado during the summers, you have likely become accustomed to seeing the numerous "Ozone Alert Day" warnings on the highway and in the news, but do we know what these warnings are for, and how we can prevent them? Ozone Alert Days warn residents of possible dangerous exposure to unhealthy air quality and remind us to avoid strenuous outside activity, especially for those who are vulnerable to respiratory issues. While becoming more common, there are many steps that we can take to reduce the number of these alerts in the future. There are many strategies that Colorado can, and already have started to look into, to reduce the number of Ozone Alert Days. From increasing the number free public transportation days to requiring vehicle emissions tests in all of our counties, these strategies will help reduce the number of unhealthy air quality days and increase the opportunities for Coloradans to safe enjoy the beautiful outdoor areas that our state has to offer.

Northern Shoveler food availability dictates habitat use and feeding behavior

Paige Rodriguez – Biology
Faculty Mentor: Christy Carello

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

Colorado waterbody complexes represent important year-round habitat for the Northern Shoveler (*Spatula clypeata*). Colorado's unique climate and habitat accommodate the various lifecycle requirements of the Northern Shoveler. Northern Shovelers have been found to be highly sensitive to anthropogenic disturbance and particular about waterbody selection sites, thus making the state particularly important to their conservation. It is unclear why Northern Shovelers only feed at specific waterbodies when other species of ducks are more widely distributed across waterbodies. In order to identify threats to Northern Shoveler preferred habitat, as well as guide conservation decisions, a greater understanding of habitat selection parameters must be achieved. I will focus on surveying invertebrates present in five waterbodies that have been observed to be preferred feeding habitat by Northern Shovelers, and five additional waterbodies in close proximity which are largely ignored by the species. At each selected waterbody, five benthic samples will be collected at random points, and invertebrate species therein shall be isolated, identified, and weighed collectively to survey species diversity and abundance. At each waterbody, aquatic plants will be surveyed via observation, and water quality data including pH, dissolved oxygen, salinity, conductivity, nitrates, and phosphates will be measured using both a Hanna Probe and testing strips. Finally, to determine the presence of food competition, data on fish stocks in each waterbody will be collected from Colorado Parks and Wildlife.

The data collected is expected to support the hypothesis that food resources present within the preferred waterbody habitats are greater than those in waterbodies which are not preferred. The data collected will provide potential insight into the priority level of food abundance as a habitat selection parameter for the Northern Shoveler – insight which holds great importance in conserving habitat.

How To Get A Gig

Eric Rodriguez – Music
Co-Author: Keddjra
Faculty Mentor: Elizabeth Macy

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

Music gigs are an important part of a musician's career and can lead to greater exposure, opportunities, and financial rewards. However, getting a gig can be a challenging task, especially for those who are just starting out. In this undergraduate presentation, we will discuss various strategies that musicians must use in order to secure a gig.

The presentation will begin by outlining the importance of networking and building relationships with other musicians, promoters, and venue owners. We will then discuss the value of creating a strong online presence through social media and websites, which can help musicians promote their music and attract potential gig opportunities.

Next, we will explore the importance of creating a professional press kit that includes a bio, photos, and music samples. This press kit can be used to showcase a musician's talents and help them stand out in a crowded market. We will also discuss the role of demo recordings and live performances in securing gigs, and provide tips on how to create an effective demo and deliver an engaging live performance.

Finally, we will touch on the business side of getting a music gig, including negotiating fees, contracts, and other logistical considerations. By the end of the presentation, attendees will have a better understanding of the various strategies that musicians can use to get a music gig and will be equipped with practical tips and advice to help them succeed in the competitive world of music performance.

Heavenly Bodies: Abjection, Holiness, and Death in Medieval Art

Ellen Sandlian – Art History, theory and Criticism
Faculty Mentor: Jessica Weiss

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

In the Basilica of San Domenico in Siena, Italy sits an elaborate vessel of metal and gems. The vessel's shape mimics Gothic architectural forms, with intricately carved columns, lobed spires, and even protruding grotesques and gargoyles. Golden figures rest within alcoves on the vessel's exterior, and a triangular pediment framed with carved roses frames a brilliantly painted scene of several figures kneeling before two others, who sit enthroned. The vessel forms a cathedral, but the entire front facade

of this cathedral is an open archway, in which sits a shriveled, mummified head. This is the reliquary of the head of St. Catherine of Siena (fig. 1), and the mummified head that sits within it is St. Catherines own. But the magnificent metalwork and inlaid gems of the reliquary reveal that this is no mere severed head, this is a sacred relic to be venerated by devotees of St. Catherine. The Medieval Cult of the Saints dominated much of religious culture and authority, and subsequently informed the production of innumerable artistic works. Whilst religious in nature, these works- ranging from painted images, manuscripts, sculptures, and relics- very frequently deal viscerally with torture, death, and the corpse in ways that ellicit horror and disgust in modern audiences. How is it that such strong reactions could be produced by objects of such religious meaning and significance? The answer to this question is revealed in the omnipresent and matter of fact nature of medieval death culture and its strong association with religious structures and institutions. Additionally, the materials used in these artistic works helped to elevate human remains and depictions of suffering to divine immateriality through biblical and historical associations. Finally, the religious doctrines of sainthood and resurrection recontextualized death and human remains in a way that prevented the breakdown in meaning that characterizes the abject.

Thioester electrophiles as a new class of SHAPE probes

Andrew Schlink – Biology
Co-Author: Zach Zimmerman
Faculty Mentor: Shailesh Ambre and Megan Filbin

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #17

RNA is a multifunctional molecule capable of regulating gene expression, in large part because it can form a variety of RNA secondary and tertiary structures. The emergence of RNA viruses like SARS-CoV-2 emphasizes the need to accelerate our understanding of how viral RNA structure dictates its function. One approach to map RNA secondary structure, called Selective 2'-OH Acylation Analyzed by Primer Extension (SHAPE), utilizes select electrophiles that unbiasedly modifies the 2'-hydroxyl of riboses in unpaired nucleotides, forming adducts that are detected through a variety of sequencing methods. While SHAPE is widely utilized, most existing SHAPE reagents suffer from several drawbacks: 1) poor water solubility; 2) limited commercial availability; and 3) they function optimally when freshly synthesized, requiring synthetic organic expertise. To overcome these obstacles, our goal is to develop a user-friendly SHAPE reagent kit that provides highly reactive, soluble SHAPE reagents capable of probing RNA structure *in vitro* as well as *in vivo*. We present our investigations on developing thioester electrophiles as a new class of SHAPE reagents. Our reagent is prepared by mixing two stable components to generate the reactive thioester electrophile *in situ*. We report our preliminary results in model systems and the scope to expand the library of our reagents.

Using a writing assignment to promote civic engagement in introductory chemistry courses

Salina Shafi – Psychology
Faculty Mentor: Shalini Srinivasan

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

One of the most frequently cited goals for science educators has been to provide students with the understanding and skills necessary to engage in science-related civic issues. However, the details on what science-related civic engagement entails or what practices can accomplish this goal are amorphous1. Strategies proposed to overcome this challenge include shifting attention from the top down visions of science understanding found in policy-document prescriptions to the everyday interactions individuals have with science2. The constant across these strategies is that they bundle together the variety of interactions a layperson might have with some science-related issue including everything from personal health issues to local environmental worries.

Using these guidelines, this project is an initial attempt to connect students with their communities via a writing assignment, thus fulfilling three learning goals – written communication - that is seldom addressed in introductory, general studies courses, expanding their views by better understanding their communities (also one of the outcomes in general studies courses) and discovering ideas, especially evaluating the credibility of scientific information. By broadening the scope of issues that students could address, this project offered a platform for students to not only find issues they were passionate about but that also impacted their communities. Results from a survey detailing feedback about this assignment will also be discussed.

Electrochemical DNA Biosensor to Detect Pap31 Protein of Infectious Bacterium Causing Carrion's Disease

Keaton Silver – Biology
Faculty Mentor: Andrew Bonham

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

Carrion's disease is a neglected tropical infection caused by the bacterium Bartonella bacilliformis. Native to South America and transmitted into human vectors via certain phlebotomine species, infection by B. bacilliformis includes both an acute phase of symptoms, such as fever, hemolytic anemia, and myalgia, in addition to a chronic phase, which triggers the proliferation of endothelial cells, often resulting in blindness, and/or skin lesions in the form of Peruvian warts. Indeed, the acute phase of Carrion's disease can be fatal if undetected and left untreated, making early detection of infection by B. bacilliformis in humans an essential effort. However, most current methods employed in the detection of Carrion's disease display low sensitivity and require lengthy, expensive workups in a well-outfitted lab setting. Electrochemical DNA-based (E-DNA) biosensors have proven to be rapid, portable, and effective in their ability to detect the presence of small molecule targets through binding to DNA aptamers specific to their target of interest. Therefore, to address the critical challenge of detection, we have selected an aptamer specific to Pap31, a protein found on the extracellular matrix of B. bacilliformis. This aptamer is being adapted to a biosensor format via guided truncation to a minimally active aptamer, then incorporation into a DNA structure that will change conformation upon binding Pap31. This conformation change is turned into an electrochemical voltammetric readout due to the incorporation of methylene blue, a redox-active tag. This will allow the transduction of Pap31 binding into an electrical current signal, and we are verifying the sensitivity and specificity of this biosensor approach. The successful development of an E-DNA biosensor that is fast, effective, and portable for the detection of Carrion's disease would offer new possibilities for treatment and health outcomes in many South American communities.

Consecutive Integer Partitions and its Identity

Joseph Skene – Mathematics
Faculty Mentor: John Ethier

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

An Integer Partition is a way to express a positive integer as a sum of positive integers. As is often the case with topics in Number Theory, something easy to say becomes deceptively complicated. But Integer Partitions often provide insight into many well-known sequences of numbers, from Fibonacci numbers to Catalan numbers. The purpose of this research was to investigate the relationship between Integer Partitions and consecutive numbers, then identify a generating identity mapping the two via a number theoretic function. Further, this research showcases the value of combinatorial proofs instead of strictly algebraic proofs by using Ferrers graphs as a visual representation of Integer Partitions.

Developing a macro photographic apparatus to measure coral health diurnally in situ

Zachary Synder – Biology
Faculty Mentor: Robert Hancock

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

We are developing a prototype underwater camera system that will enable us to photograph fluorescence and near infrared reflectance of Chlorophyll in endosymbiotic algae of corals. In our study, we will be conducting field research using SCUBA diving on the Florida Barrier Reef during May of 2023. We specifically aim to see if we can detect coral stress before there are visible signs of bleaching. We predict that the lack of Chlorophyll A and Chlorophyll C will be a sign of coral stress due to corals releasing their symbiont algae in the beginning stages of coral bleaching. Our novel design will implement an Olympus Tough TG6 camera that is full-spectrum modified to enable image capture of both IR reflectance and UV-fluorescence. The light source will be a 15,000-lumen submersible dive light with 2 modes: a wide spectrum light mode that also emits near infrared for photographing/measuring chlorophyll reflectance; and a blue light mode which will be used for chlorophyll excitation and will enable photographic measurement of fluorescence from the coral polyps. The camera and light will then be mounted onto a submersible camera rig with adjustable tripod legs. Our image-making will be highly controlled and consistent: all photos will be taken at the same magnification, the same camera-to-subject distance, and the same exposure/camera settings. Upon return from Florida, we will photometrically analyze our IR and UV images using Fiji ImageJ software, which is specifically designed for scientific image processing. Fiji Image J will enable separation of different light spectral bands so we can quantify and compare specific IR reflectance and fluorescence values.

The Impact of Current Events on Physiological Measures and Pain Tolerance

Peyton Steiner – Psychology
Co-Authors: Julia L. Sickrey, Lexie A. Allen, Madison E. Barber, Jenny Valadez Fraire, K. Alden Gruidel, Sara H. Hobbs, Shannon L. Myers, & Alicia Phinnella
Faculty Mentor: Cynthia Erickson

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

Watching the news can be an inherently stressful, one might even say painful, activity. One factor that can influence stress, ever-present in today's world, is the plethora of news coverage that we are regularly exposed to (McLaughlin et al., 2022). Thus, the purpose of this study was to look at the physiological impact of how watching news content may impact one's tolerance to a painful stimulus. Participants were randomized to one of two video conditions of similar length. These included political videos or a mindfulness video. The political videos related to the Black Lives Matter Movement (#SayHerName) and a video on the countermovement (#BlueLivesMatter), the order of which was counterbalanced. Following the videos, heart rate and blood pressure were measured. Pain tolerance was measured using a cold pressor test. The cold pressor test involved the participants' submerging their hands in ice water, which was approximately 33 degrees Fahrenheit. Our results found that participants who watched a #SayHerName or #BlueLivesMatter video, showed lower tolerance to pain relative to those who watched a mindfulness video of the same duration. The group who watched the political videos removed their hands from the cold water significantly faster than the mindfulness control group (t(20) = 4.17, p <. 001, d = 2.12). These results suggest that consuming video material alters the physiological response to a pain stimulus. Data collection is ongoing and at this point, we cannot determine whether political content reduces pain tolerance or that mindfulness increases pain tolerance. Future control studies will address this issue. Regardless, these results suggest that media content may alter the experience of pain.

Seeing the Saplings Through the Trees: Impacts of Intermittent Flooding on Canopy Cover and Sapling Recruitment

Drew Steinheimer
Co-Authors: Tasha Martin and Reece Bailey
Faculty Mentor: Erin Bissell

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

The Chatfield Storage Reallocation Plan, approved in 2014 to increase water storage capacity in Chatfield Reservoir in Littleton, CO, will also increase water levels and duration of flooding in existing cottonwood forests along the South Platte River and Plum Creek. In anticipation of higher water levels, project partners removed live trees, dead wood, and other riparian vegetation from impacted cottonwood forests along the South Platte River from fall 2018 through summer 2019. Removing trees and shrubs reduced canopy cover, potentially giving understory plants more access to light and increasing opportunities for recruitment of cottonwood saplings in the affected areas. The affected cottonwood forest can be divided into populations of different age and structure: 1) Cathedral forest with well-spaced trees typically more than 60 years old and located upstream of Kingfisher Bridge (Legacy sites) and 2) Successional forest with tightly spaced stands of trees typically less than 60 years old and located downstream of Kingfisher Bridge (Stand sites). Our goal is to compare impacts of tree

removal and intermittent flooding on canopy cover, tree density, and sapling recruitment in cathedral and successional stand forests before and after implementation of the reallocation plan. We collected data from five (5) legacy and five (5) stand sites in 2018 (before) and again in 2022 (after) as well as six (6) control sites not impacted by flooding and located in similar riparian cottonwood forests at Denver Botanic Gardens Chatfield Farms and Bear Creek Reservoir. If light is limiting sapling recruitment, then we predict a greater increase in cottonwood saplings after removing trees from denser stand sites when compared to less dense legacy and control sites. If water is limiting sapling recruitment, then we predict a greater increase in cottonwood saplings in legacy sites, which are flooded for a shorter duration, when compared to the stand sites.

Probing Acoustic Transparency in a 1-D Pipe

Kevin Stoeppel – Physics
Co-Authors: Mark Cook and Richard Krantz
Faculty Mentor: Azure Avery

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

The study of Acoustic Transparency allows modifications to change the impact of acoustic waves on a system, such as vibrations through a medium. Acoustic Transparency refers to the ability of acoustic waves to travel through a material. In this experiment, we used a Helmholtz resonator, which is a volume with a thin neck controlling fluid flow, to serve as a barrier to prevent a full acoustic wave from passing through and measured the resulting acoustic wave. We analyzed the acoustic wave transmitted through a Helmholtz resonator using transfer matrix analysis to characterize the acoustic wave properties in a space with a variable number of resonators. This allows us to determine how much an incident wave is transmitted in some region. We found the amplitude of the acoustic wave decreases in magnitude as it moves through more Helmholtz resonators, thus the Helmholtz resonators act like acoustic barriers. The impact of this on the system is small, averaging a decrease in magnitude of 0.02Ncm^(-2) . This result can be applied to systems susceptible to acoustic noise to improve system function. In the future, we plan to characterize more complex systems of Helmholtz resonators, using this technique.

The Role of Psychological Androgyny in Healthy Risk-Taking Behavior

Heidemarie Streicher – Psychology
Co-Authors: Alden Gruidel and Devon Rapken
Faculty Mentors: Cynthia Erickson and Kristy Lyons

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

Much of the current research on the relationship between gender and risk-taking focuses on gender alone, rather than assessing how masculine and feminine traits exhibited by a single individual impact their risk-taking behavior. Bem (1974) defined psychological androgyny as the state of possessing high levels of both traditionally masculine and feminine traits. The current study aimed to fill a gap in the

risk-taking literature by assessing the relationship between psychological androgyny and healthy, competent risk-taking behavior. Psychological androgyny and related constructs were measured using the Multifaceted Adult Gender Identity Scale (Jackson & Perry, n.d.). Risk competence was measured using a novel virtual card game. In this task, participants were presented with a series of scenarios where they had to make bets under different conditions with varying levels of risk and reward. Other-gender typicality (M = 2.20, SD = 0.62) was found to be negatively correlated with risk competence (M = 0.26, SD = 0.28), r(153) = -.21, p = .01. The relationship between same-gender typicality (M = 2.80, SD = 0.63) and risk competence was not statistically significant, r(153) = -.15, p = .07. Individuals who scored higher on same-gender typicality were more likely to experience higher levels of pressure to conform to gender expectations (M = 2.07, SD = 0.57), r(188) = .34, p < .001, which is consistent with Bem's concept of sex role flexibility. Overall results suggest that psychological androgyny is not a predictor of healthy risk-taking behavior. However, these results may be impacted by the inherent limitations of utilizing novel measurements and analysis methods for both risk-taking and psychological androgyny.

Psychological Androgyny as a Source of Resilience Against Stress and Discrimination

Heidemarie Streicher – Psychology
Faculty Mentor: Linda Badanes

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

Gender is a salient and critical schema used by individuals to navigate their daily lives. People are often judged by way of gender expectations and act according to norms dictated by the concepts of femininity and masculinity. Individuals who integrate high levels of both feminine and masculine traits into their self-identity and behaviors are considered psychologically androgynous. Bem (1975) postulated that psychological androgyny results in experiencing less felt-pressure to conform to gender expectations and better psychological adjustment overall. Findings regarding the advantages of psychological androgyny have been inconclusive. Some researchers have questioned whether psychological androgyny benefits only women, and whether it is the presence of masculine traits that serve as a protective factor rather than the presence of both masculine and feminine ones. Still, researchers have found that psychological androgyny is associated with fewer internalizing problems (Pauletti et al., 2017) and higher levels of self-esteem (Cooper et al., 2011). Psychological androgyny may act as a protective factor against perceived stress and related negative outcomes by diminishing stress felt from pressure to adhere to rigid gender norms, increasing adaptability in social situations, and providing individuals with a wider variety of traits and strengths from which to draw during stressful or ambiguous events. The current study aimed to assess the role of psychological androgyny as a potential source of resilience among MSU Denver students who report higher levels of stress compared to larger community samples. Depression was measured using the Center for Epidemiological Studies-Depression (CES-D) and anxiety was measured using the Generalized Anxiety Disorder-7 (GAD-7). Psychological androgyny was measured using the Bem Sex Role Inventory (BSRI) and the Multifaceted Adult Gender Identity Scale (MAGIS). Data collection is ongoing with an expected sample size of 100 participants.

AR Navigation MSU Denver

Erik Sundblad – Computer Science
Co-Authors: Tho Le, Brian Vasquez, Freeman Bacon, Seth Hamilton, Jose Garcia-Martinez
Faculty Mentor: Rajan Ranjidha

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #16

The current popular GPS-based navigation tools serve an excellent role for a destination on the scale of homes and buildings. However, these tools quickly lose accuracy and reliability in navigating and on the scale of rooms and floors. The lack of precision is addressed using a new tool "Unitrail". The proposed tool helps in assisted navigation through a vast campus such as the Metropolitan State University of Denver.

Unitrail is a mobile app augmented reality (AR) navigator. The goal of Unitrail is high-precision navigation operating on a scale of room-to-room navigation. Covering the existing building to building navigation, but additionally adding building navigation. Campus class buildings can be challenging to navigate, and maps often need to be more specific and clear to decipher. Room-to-room navigation solves this creating an easy and clear navigation for anyone operating on a given canvas.

For development and deployment, we designed this tool using the Dart programming language in a Flutter framework. Dart/Flutter is an ideal design framework for deploying iOS and Android applications. Flutter hosts a healthy ecosystem of APKs for development. We use several of these packages, such as Firebase API, for user authentication and management. Flutter gave us the frame and model to develop our app, ready for easy deployment to all phone types.

The heart of our tool is augmented reality, which we developed in Unity. The Unity AR core allows us to have the high level of accuracy and precision navigation we set out to achieve. Unity deploys a Nav-Mesh environment combined with an A-star path-finding algorithm. This tool also facilitates the visualization and overlay of our AR. We can create a Multiview complete campus model, allowing seamless navigation for any two points of interest. Unity easily integrates into a Flutter framework making it the overwhelmingly best choice for our application.

Collective Call to Action: An Analysis of Collective Identity Throughout the Me Too Movement

Mia Tanner – Communications Studies
Faculty Mentor: Christina Foust

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

The purpose of this research paper is to analyze the Me Too Movement through a collective identity lens in order to understand how #MeToo becomes a point of praxis for people to steer collective identity in a way that increases consequential action. I focus on primarily three timeframes within this movement, using different types of social media rhetoric (tweets, polls, public hearings) to analyze both the progression of the collective identity and the consequential action that has shaped this modern feminist movement into what it is today! From my research, I find that the Me Too collective has created levels of positive action toward issues of inequality, sexual violence, and women's voices in society as a whole. However, in doing so, we simultaneously see how social media has helped curate a divided, gendered, and politicized public energy to this movement's initial purpose, making it difficult for the collective to successfully grow. The implications of these findings point out how the negative consequential action of

online rhetoric from those outside and within the collective itself has shifted the movement into being strictly political while holding women to impossible standards of accountability. Keeping this in mind, I employ my research to reflect on the harmful ways this shift has affected women associated with this movement's collective and as a whole. Finally, from my analysis of this collective's divide, I begin to address future steps they need to take in order to produce more positive consequential action toward issues of accountability, the burden of proof in male-dominated court systems, and the presence of intersectionality within #MeToo.

Sex Education in Colorado

Gabriel Trujillo – Psychology
Faculty Mentor: Randi Smith

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

Sex education in schools is and has always been a controversial topic, and one that has gained a lot of attention in recent times, especially at the legislative level. Some states push for abstinence-only or abstinence-based sex education that has been deemed ineffective by experts in the field. Others advocate for a more comprehensive and inclusive model. They advocate for sex education to be medically accurate and go beyond the traditional cis-gender, heteronormative culture and be inclusive of diverse gender identities and sexualities. Some states have begun to implement legislations that require sex education to be comprehensive and inclusive whenever it is taught. One of them happens to be Colorado. In 2019, HB19-1032 Comprehensive Human Sexuality Education bill was passed, and it requires that sex education in the state be non-exclusionary of LGBTQ+ identities and inclusive of all pregnancy outcomes, including abortion. However, although Colorado requires comprehensiveness and non-exclusion, it does not mandate sex education to be taught in schools, similarly to many other states. While legislation and bills can be passed, it begs to question; how effective is the legislation in making sex education actually comprehensive? In other words, are these bills and legislation actually creating the change they are set to do? This study aims to do just that, discover the effect that legislation has on the content taught in K-12 sex education and the experiences of the students going through the programs. Furthermore, we hope to uncover the effect that the content has on students' overall sexual well-being.

Empowering A Community by Volunteering

Nikia Tucker – Public Health
Faculty Mentor: Garvita Thareja

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

Introduction: I volunteered at an Arc Thrift Store in Colorado Springs. I volunteered from 10 am -2 pm. I was placed on multiple tasks from stocking merchandise to sorting toys.

Methods: I spoke with coworkers, and asked them about working and their personal lives. I observed workers interacting with people they believed might have disabilities. During my shift, there were three

volunteers. I was the only volunteer not court-ordered. Volunteers showed up an hour later than me.

Results: Individuals with emotional and learning impairments don't want to be seen as their disability. Robert M. Hensel said" There is no greater disability in society than the inability to see a person as more."(Brightwater,2020) I saw individuals who only want to be judged on hard work. Employees took pride in the fact that they had employment and are working independently. Parents looking to give their children opportunities are very powerful! The Arc started with parents determined to ensure that their children with intellectual and developmental disabilities have programs, activities, and a community that supports them.(The Arc,2021)

Conclusion: Engagement plays a major role in Public Health." Contemporary society is too complex to respond effectively to community and public health problems on either an emergency or a long-term basis."(Seabert & Mckenzie,2022) I saw anything's possible it just takes one vision and consistency with the implementation of a goal. This reminded me that my career is pointing to advocacy and justice for all. I look to seek an organization that aligns with my same values of fighting for public health policies that help all. My goal is to be creating my own foundation. It's mission will be educating, empowering, and creating opportunities in the community focusing on many different elements of public health.

The Quadratrix of Hippias

Nichole Venner – Mathematics
Faculty Mentor: John Carter

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

While geometry with transcendental curves, like the Quadratrix of Hippias and the Spiral of Archimedes, played a significant role in our modern developments of geometry and algebra. The investigation has fallen off in the modern era despite advancements in algebraic tooling. This paper gives a description of the fields using modern techniques such as Galois theory while solving an open conjecture in a 1988 paper to provide an answer to if these curves can solve the problem of doubling the cube.

Expression of the *macc1* gene during zebrafish development

Isaac Vigil – Biology
Faculty Mentor: Vida Melvin

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

Craniofacial development relies on complex genetic and tissue interactions to shape the vertebrate face. Mechanisms regulating craniofacial development are conserved across vertebrate species, including humans, mice, and zebrafish, making animal models an important tool to understand craniofacial development and variation in humans. Previous research using morpholino (MO) knockout technology in zebrafish identified an important role for the gene metastasis associated in colon cancer 1 (*macc1*) in craniofacial development. In zebrafish, *macc1* is expressed at 48 hours post fertilization (hpf) in a small region of the developing embryonic face and knockdown of the *macc1* gene caused loss of facial

cartilages, including those of the lower jaw and base of the skull. In humans, upregulation of MACC1 is a known marker for metastasis in various cancers and is thought to drive metastasis through transcriptional control of other cancer-related target genes. Though the role of MACC1 in cancer is well studied, the normal function of this gene is not well understood. To better understand the role of *macc1* during embryonic development, we will examine *macc1* expression in zebrafish embryos using in situ hybridization. We will include the two developmental timepoints previously examined (24hpf and 48hpf) and expand that to include additional timepoints that are relevant to craniofacial development, including 12 hpf, 36 hpf, 60 hpf, and 72 hpf. This study will expand and refine previous studies that mapped *macc1* gene expression in the developing zebrafish and provide insight into the normal function of *macc1* in development.

How did the rise in economy lead to larceny?

Wendy Villegas – Criminal Justice & Criminology
Faculty Mentor: Hyon Namgung

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

Ever since the pandemic started, we started to notice a variety of different changes in our economy. Some changes that would sooner, rather than later increase our crime rate. In this society and in today, our economy has gone up way too high, in a short span of time, due to the government lowering our supply chain. During the time of the pandemic in 2020 when it was first in act, more than half a million people lost their jobs here in Colorado. That alone is 10% of the overall population in Colorado, and larceny crimes rose up to 17% since 2019. That's why I would ask the question of How did the rise in the economy lead to larceny? Larceny is a crime meaning; taking someone else's property or belongings without any force. Some examples of larceny can include shoplifting, car theft, Since there was a huge increase in our economy and unemployment rates since 2018 up to today, many people in Colorado began to turn to shoplifting, mainly because their job pay wasn't livable, and because people couldn't afford the new prices. These topics of connecting two different, yet similar topics with each other is interesting to me mainly because of how fast the economy rose, and how our crime increased along with it. It's clear that when something or anything happens, it happens because of something or someone that drove the person. In this case, larceny. Using secondary research, and crime data to view the outcomes of the low unemployment rates, and the effect the rise of this economy had on us will help me figure out the why and the how it's affecting people up to this date.

Creative Performance and State Anxiety

Sage Vinson and Chayse Enriquez – Psychology
Faculty Mentor: Pamela Ansburg

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

Creativity is a complex cognitive process allowing for innovation, but is it possible for factors such as anxiety to inhibit the process? Studies have reported conflicting findings; particularly questioning if state anxiety, a transitory emotional state consisting of nervousness, has any relation to creativity. The

dominant idea is that anxiety may interfere with cognition. Thus those suffering from state anxiety may find it more difficult to generate spontaneous, original ideas which assist in the creative process. Alternatively, stress may promote creative thinking in problem-based situations. The present study investigated what relationship state anxiety has on creative performance and whether higher or lower amounts of state anxiety would inhibit the ability to generate alternative uses for an item. The aim of this study was to understand the transitory emotional states involved with state anxiety and their impact on divergent thinking (DT). Metropolitan State University of Denver psychology students completed an alternative use task (AUT) in which they had to think of creative uses for a tire. Participants also filled out the State Anxiety scale, a shortened version of the Spielberger State-Trait Anxiety Inventory (STAI). DT was measured by the originality, fluency, and flexibility of respondents' answers to the AUTs. Two raters took the responsibility of rating responses with a reliability score of 90% or above. Contrary to our predictions, the findings did not support the concept that higher amounts of state anxiety would lead to mental fixation inhibiting the production of spontaneous ideas. For the STAI measure, we had a restricted range resulting in a floor effect. Future research should explore whether inducing stress prior to the AUT would provide a stronger test of the relationship between state anxiety and DT.

Sex ratio effects on pair-bond formation in convict cichlids (*Amatitlania nigrofasciata*)

Leah Vitale – Biology
Co-Authors: Bree Belardinelli, Jordan Cashman, Chris Wicker
Faculty Mentor: Jennifer Gagliardi Seeley

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

Operational sex ratio (OSR), the ratio of reproductively available sexually mature males and females, can affect pair-bond formation, mating success, and overall fitness. Convict cichlid fish (*Amatitlania nigrofasciata*) are biparental, serially monogamous, and exhibit OSR variation in their natural habitat. The objective of our study was to determine how varying OSRs affect pair-bond formation in the convict cichlid. We hypothesize that if OSR affects pair-bond formation, then there will be a difference in number of pair-bonds formed as well as a difference in duration until pair-bond formation between treatment groups. Moreover, we predict that if OSR affects pair-bond formation, then the mutual mate choice treatment group (two males and two females) will form the most pair-bonds in the least amount of time, and that the control group (one male and one female) will form the fewest number of pair-bonds the slowest. Our study consists of one control group and three experimental groups with varying ratios of sexually mature males and females. Each tank was observed five times a day until pair-bond formation occurred. For all four treatment groups, we recorded the number of days until pair-bond formation and the total number of pair-bonds formed within a 3-week period. Preliminary data does not show a significant difference in number of pair-bonds formed nor duration until pair-bond formation between the four treatment groups. Due to our small sample size, we cannot confidently support nor reject our predictions at this time. We will continue collecting data until a sufficient sample size has been reached.

Effects of Wind Speed on Vigilance and Foraging Behavior of Black-Tailed Prairie Dog (*Cynomys ludovicianus*)

Courtney Ward – Biology
Faculty Mentor: Jennifer Gagliardi Seeley

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

Wind is an ever-changing abiotic factor that continues to influence species in many ways. Cherry and Barton (2017) highlighted 18 papers that found that wind reduced the prey's ability to detect the predator nearby; this was due to disturbances in sight, smell, or hearing. In forests, small mammal daily activity was reduced due to higher wind speeds when temperatures were colder, and vigilance was positively correlated with wind speed (Studd et al. 2022). For this study, our objective is to determine how wind speed variations affect vigilance and foraging behavior in black-tailed prairie dogs (*Cynomys ludovicianus*). If wind speed effects prairie dog behavior, then we will observe a difference in the amount of time spent foraging and standing vigilant due to variations in wind speed. If wind speeds are positively correlated to decibel readings, then higher wind speeds could increase vigilance and decrease foraging behavior compared to lower wind speed in black-tailed prairie dogs. To test this hypothesis, a sample size of 20 active prairie dog burrows would be marked, notated, and observed over several days with low (0-5), medium (10-15), and high (20+) windspeeds in km/h. The prairie dogs' activity will be recorded with a camcorder from a 50 m distance to the burrows for five minutes. Wind speeds and decibel readings will be taken at the end and beginning of each observation and averaged together to get the overall readings. Video recordings will be analyzed to determine how much time they spend engaging in vigilance or foraging behavior. Wind speeds and decibel readings will be analyzed to determine if they are correlated. Foraging and vigilance behavior will be compared between the low, medium, and high wind speeds.

Saintly Protestations: Margery Kempe and the Embodiment of Public Piety

Robert Welch – History
Faculty Mentor: Kimberly Klimek

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

This paper examines Margery Kempe's actions in relation to the expected behaviour of female mystics and visionaries, and how that behaviour may have been influenced by period drama. Utilizing Kempe's own accounts of her visions, and the accounts of other contemporary female visionaries and mystics, including the Anchoress Julian of Norwich (to whom Kempe actually paid a visit around 1413), the writings of previous female visionaires and mystics, like Hildegard of Bingen, and Catherine of Siena, as well as the texts of contemporaneous plays that Kempe is likely to have seen, including the York cycle, the Exeter Cycle, and other mystery plays, we shall investigate to what extent Margery Kempe's actions may have been dictated by expectations of how a visionary should behave when in the throes of divine rapture.

Active Listening: Experimental Processes for a Post-Anthropocentric Ecology

Dev Wiggers – Art
Faculty Mentor: Marin Abell

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

Active Listening, at heart, seeks to engage with life and habitat, and, in the process, to question and redefine existing anthropocentric relationships with them. It is intended to create space for the acceptance of the agency of lifeforms much older than ourselves, our shared habitat, and the all-encompassing degree of our interdependence; the propagation of a post-anthropocentric ecology. Current materialist philosophies guiding anthropocentric attitudes and actions towards life and habitat, ascribe an inadequate or non-existent agency to non-human entities and environments. Their boundaries of moral concern are firmly planted within the realm of an anthropocentric ecology. By working with experimental processes, plants and soils are actively engaged and collaborated with. Scientific or technical processes in the forms of soil and leaf chromatography, and biodata and soil sonification, are appropriated and intentionally subverted. Alternative ideologies are offered and philosophies and meanings are explored. Active Listening culminated in the creation of collaborative, experimental audio-visual works, with an emphasis placed on the importance and effectiveness of sound-based work in the form of lo-fi ambient music. Photographic processes then, played a supporting role, allowing greater accessibility to the above ideas for laypersons, as well as helping to expand the scope of photography within the popular consciousness.

Investigating the testing effect in undergraduate psychology students

Annalee Wilson – Psychology
Co-Authors: Charles A. Ciociola, Brennan Cowing, Megan E. Dragani, Cath A. Martin, Brandon D. Martinez, Annalee S. Wilson, Tierra M. Zuniga
Faculty Mentor: Cynthia Erickson

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #15

Psychologists refer to the testing effect as an effective tool for retrieving information to solidify learning. This proposes the idea that recalling information from memory strengthens one's ability to remember it long term. This concept has been noted by many scholars throughout history, including Aristotle, Francis Bacon, and William James. Empirical research has continuously confirmed that practicing retrieval is far more effective in solidifying learning than simply rereading and reviewing the original material. This phenomenon is also known as the retrieval-practice effect (Brown et al., 2014). The effectiveness of this approach was first documented in 1909 (Abott, 1909), yet few professors employ this strategy. The underutilization of this approach is likely because it has been traditionally difficult to implement. With current learning management systems (LMS, such as Canvas) implementing repeated quizzes and spaced practice to learn the material, the testing effect is more practical. This presentation will focus on the research supporting the testing effect. Additionally, we will describe how we use Canvas to teach statistics, a course many psychology students dread. The quizzes in this class allow students to practice difficult concepts with low-stakes assignments. Students were given unlimited attempts to complete the quizzes before each due date. Each quiz draws questions from a question bank that corresponds to the learning objectives. Overall, the class is engaged and performing well on the exams. This presentation

will open a greater discussion on the benefits of unlimited quiz attempts and encourage other professors to implement the testing effect in their classes.

"Annual Variability of the Surface Heat Flux generated by Offshore Wind Farm Clusters in the Mid-Atlantic"

Sarah Womantree – Meteorology
Faculty Mentor: Scott Landolt

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #16

Massive deployments of offshore wind farms are being installed in the Mid-Atlantic to generate clean, renewable power on a scale never seen in the United States before. Offshore wind power has the potential to provide more than two times the current nationwide demand for electricity, and nearly 80% of electricity demand within the United States is found amongst the coastal states ("National Offshore Wind Strategy:…"). Harnessing this renewable energy source is already underway, with 27 areas already leased and under construction across the mid-Atlantic Outer Continental Shelf (OCS).

Wind turbines create electricity by extracting kinetic energy from the laminar flow of the wind, leaving wakes of reduced wind speed and increased turbulence downwind (Akhtar et al., 2022). This production of Turbulent Kinetic Energy (TKE) results in reduced wind speeds in the wake zone, as the laminar flow of the wind is perturbed downwind. There is a lack of in-situ meteorological observations off the Atlantic coast; therefore, modeling studies must be utilized in order to determine the effects of large wind farms on the environment. Each wind turbine modifies the surface heat flux, the turbulent flux and the latent heat flux of the boundary layer surrounding it. A year-long WRF-LES microscale modeling dataset, provided by CU Boulder, is utilized to study the Mid-Atlantic Offshore wind farms and their effect on the surface heat flux, latent heat flux, and cloud cover downstream. The effects of 1,418 12 MW turbines are studied in the leasing area, and each turbine has a 138-meter hub height and a 215m rotor dimeter (Rosencrans and Lundquist). By investigating the impact of large clusters of offshore wind farms on boundary layer atmospheric conditions and air-sea fluxes, the author hopes to learn if these wind farm clusters will have any impact on climate conditions in the long term.

Community Volunteer Project - Wish for Wheels Bike Build

Melissa Zinanti – Public Health
Faculty Mentor Garvita Thareja

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

I worked as part of a volunteer group from Townsend Retirement & Legacy Planning who sponsored a Wish for Wheels bike build and gifting at two Title I elementary schools in Arvada, Colorado on September 16, 2022. During this volunteer opportunity while helping the other volunteers from Townsend, I was able to observe Wish for Wheels' standard organization for how the bikes were assembled and given to second graders at the two schools. First, I worked with two other volunteers to assemble a bike. After the bikes were assembled, 40 bikes were taken to each of the schools and the

volunteers were split into two groups. There were approximately 40 bikes and 20 volunteers at each school. Second graders who were pre-registered by their parents picked their bike and helmet and were given time to ride the bikes. If they did not know how to ride a bike, volunteers, including myself, taught them how to ride. The model of having a corporate sponsor and volunteers from that sponsor promotes participation of the corporate sponsor within the community where they operate. Bikes provide children with several health and practical benefits including encouraging physical activity, promoting mental health and social wellbeing, having positive impacts on brain development and learning and serving as a mode of transportation. Some of the best practices established by Wish for Wheels are providing bikes to second graders who have a level of independence to ride alone and have reached a stage of growth where the bike will last for a few years. Recommendations for improvement include an increased emphasis on safety and more guidance for volunteers on how to teach kids to ride bikes. This opportunity allowed me to volunteer in my community and will provide good insight as I progress in my public health career.

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