COLORADO STATE UNIVERSITY

CURC 2022 Celebrate Undergraduate Research and Creativity

CURC 2022- Hybrid
ELECTRONIC ABSTRACT BOOKLET

Online
Starting on April 18
CSU-CURC-2022

In person
April 21, 2022
Lory Student Center

ORAL PRESENTATIONS - 1 -

RESEARCH POSTERS - 15 -

SERVICE LEARNING POSTERS - 124 -

VISUAL ART - 130 -

WRITTEN WORK - 133 -

Oral Presentations

An Investigation in Forensic Entomology: The Dissonance Between Educational Literature and Police Procedure

Riley Hoffman
College of Natural Sciences

Presenter(s): **Riley Hoffman**
Advisor/Mentor: Dr. Crystal Cooke
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42927

Forensic Entomology is the study of insects present on carrion and is used to create timelines for death investigations and to identify toxins present at the time of death. Forensic Entomology typically focuses on Diptera larvae (fly maggots) and Silphidae (carrion beetles) present on or near the body during decomposition. Different species may become present at different phases of decomposition, creating a timeline that may be variable in geographical location and exposure to the elements. While there are some educational texts instructing on the collection methods for this field of study, it became apparent these followed an investigation for an educational space that was not consistent with law enforcement procedure or availability. This leads one to question the plausibility of the procedural expectations of law enforcement agencies. While gaining hands-on experience, reading the available literature, and interviewing crime scene investigators; particular aspects of collection methods were identified to be an issue. These aspects included: a lack of standardized collection methods, the long-term chain of custody, evidence storage limitations, and curation personal limitations. The use of forensic entomology is limited within criminal investigations due to a lack of research and lack of accessible and comprehensive identification resources. As a result, police procedures and legal statutes have yet to catch up to this field of investigation. If the body of knowledge were to grow, this form of evidence could become more standardized and informative to the criminal justice system as a whole.

Borderland Indigeneity; Unmapping Topographies of Place, Body, and Time in Jeanette Winterson's The Passion

Alex Kinnaman
College of Liberal Arts

Presenter(s): **Alex Kinnaman**
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42824

Much has been said of the postmodern subject, but little remains said of the postmodern place. In the era of the primacy of the self-image–or more precisely the trouble of whether there is

indeed a self beneath the image at all--little remains said of how to live with it. Amidst calls to return to indigenous ways of knowing, to ecologize cultural narratives, and to restore human relationships to land–by remembering our ancestral pasts–it is critical that we put the postmodern topography (in which we live) in conversation with current conceptions of indigeneity. Venice, as it is depicted in Jeanette Winterson's *The Passion* (1987)--as a fragmented and dynamic, yet oddly unitary and statuary place–provides a particularly useful setting to examine a post-modern conception of place and indigeneity. In the post-modern landscape, to be native is to be-coming native. Place (anyplace, anywhere) is always already engaged in the ongoing process of producing itself. To learn the language of place is to attend to the silent yet intelligible and pervading undercurrents which animate the places, systems, and networks of beings in which we are situated. In this presentation, I will show how Venice as the 'invented city' holds a kind of unmappable borderland topography; a topography which the native (the Venetian) inscribes upon their own bodies and which is inscribed upon Winterson's sense of passion, as an emotion and a destiny. In so doing, I bring to bear a more complete sense of how our sense of indigeneity is cast in the postmodern era.

Brain and cerebrospinal fluid biomarkers as a diagnostic tool for canine cognitive dysfunction

Amelia Hines, McKenzie Richards, Breonna Kusick, Stephanie McGrath, Julie Moreno
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Amelia Hines**
Advisor/Mentor: Dr. Julie Moreno
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43043

Canines, like humans, develop many features of human aging, including cognitive decline and neuropathologies including neuroinflammation and accumulation of misfolded proteins, making them an excellent translational model for diseases like Alzheimer's and other human dementias. Currently, the only antemortem diagnostic available for canine cognitive dysfunction (CCD) is the use of magnetic resonance imaging (MRI) which primarily identifies other causes of cognitive decline including brain infections and cancer. Development of antemortem diagnostics using both blood and cerebrospinal fluid (CSF) samples is vital to the early diagnosis of aged canines. The challenges posed by this however is low concentrations of known biomarkers, such as misfolded amyloid-beta (Aβ), hyperphosphorylation of tau (P-tau), inflammatory marker glial fibrillary acidic protein (GFAP) and neurofilament light chain (NfL) in aged canines. By extracting extracellular vesicles to detect Aβ, P-tau, GFAP and NfL, we have been able to correlate changes in these markers to pathological changes in the brain tissue of the same canines. Use of these sensitive diagnostic tools by veterinarians would provide an enormously beneficial tool for the early and accurate diagnosis of CCD. The translational ability of the canine model for human dementia and Alzheimer's disease allows for exciting research opportunities to move forward diagnostic testing in humans.

Bridging the Divide: Assessing Racism-related Stress and Counseling Services.

Luna Li, Mihika Sodani, Maliek Swain, Treasure Morgan, Rayne Veazey

College of Natural Sciences

Presenter(s): **Jacob Leavitt, Nichole Sinaloa Acosta, Grace Kirk, Anh Bui, Shaza Mohamed**
Advisor/Mentor: Stephanie Moreira
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43027

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

Characterizing Differences in Soil Characteristics Between Intact, Restored, and Degraded Ecosystems Across the Southwestern United States: Support for Restoration Target-Setting

Jessica Fagan, Dr. Caroline Havrilla
Warner College of Natural Resources

Presenter(s): **Jessica Fagan**
Advisor/Mentor: Dr. Caroline Havrilla
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42943

Dryland ecosystems support about 1/3rd of the Earth's population. These ecosystems are characterized by low moisture availability. Given moisture constraints, these areas are prone to land degradation. This degradation has large economic impacts and can impact the livelihoods of many. To combat these changes, ecological restoration has been used to reverse some of this damage. Presently, most restoration techniques have focused on plant-based restoration, such as seeding or transplanting seedlings. Plant-based restoration has variable success within drylands. The focus solely on plants may not give an accurate picture as to what is happening in the system. Soil health is an equally important aspect of an ecosystem that should be considered during dryland restoration. Soil health plays a role in nutrient cycling and plant success; however, there is limited knowledge as to how plant-based restoration can impact soil.This study attempts

to bridge this knowledge gap by comparing physical soil characteristics between intact, restored, and degraded drylands across the western United States. Soils were collected from a pre-existing restoration study called RestoreNet. RestoreNet is a networked study that looks at how restoration techniques vary in success across climatic gradients in the western United States. For the purposes of this study, restored areas were sites where plant-based restoration has occurred. With these results, a better understanding of how plant-based restoration impacts the soil can be obtained. This will also help inform whether plant-based

Construct, Build, Assemble Diversity

Joel Ibarra
College of Health and Human Sciences

Presenter(s): **Joel Ibarra**
Advisor/Mentor: India Luxton
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42833

Post-secondary institutions and the professional world lack a diverse representation of individuals who are institutionally minoritized. Amongst first-generation students and students who are people of color, pursuing post-secondary education is a journey with many obstacles. This is true for students of color pursuing a degree in the Construction Management (CM) program. From my personal experience, I'm striving to obtain a degree in the CM program, a very competitive career, and encounter a playing field that presents students like myself with disparities. ,ÄúConstruct, Build, Assemble Diversity,Äù is a project intended to hone down on the opportunities already offered in the industry and the CM program here at CSU to further promote a diverse and inclusive environment. My ultimate goal is to create a scholarship program, but my first steps will consist of fostering a mentorship program for institutionally minority students pursuing a career in the construction industry and studying in the CM program. To help me with my project, I've reached out to Alumni students who studied in the CM program to learn from their lived experiences and challenges as people of color and as first-generation students. From our conversations, there is an imbalance that's deprived first-gen and minority students of skills and resources that cater to their academic and professional success. It's important to me and for my community that this issue is addressed and dismantled. Establishing a mentorship program between alumni students and undergraduate students for the CM program will pave a durable stepping stone for first-generation and minoritized students.

Differential stress experiences in niche-tracking and niche-switching yellow warblers

Noelle Mason
Warner College of Natural Resources

Presenter(s): **Noelle Mason**
Advisor/Mentor: Marina Rodriguez, Kristen Ruegg
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43083

Conservation of biological diversity is increasingly challenging as the global climate rapidly changes. Recent work supports the idea that avian populations, which have declined by 2.9 billion birds since the 1970s, are able to persist in the face of changing climate conditions based on the extent of climate specialization across the annual cycle. Climate specialists track their climate niche across the annual cycle, whereas generalists switch their climate niche between seasons. However, ornithologists'understanding of what happens on North American birds'wintering grounds is often limited. Here we take advantage of a rare opportunity to study the potential implications of climate tracking and climate switching on individuals in the yellow warbler (Setophaga petechia), where the extent of climate tracking across the annual cycle has been extensively quantified. Because niche-trackers and switchers likely experience differential stress, this study aims to understand whether niche-switching and niche-tracking populations differ in telomere length. Telomeres reflect stress throughout an organism's life history and are strongly correlated to an individual's relative lifespan and fitness. Environmental stressors, such as those experienced as a result of niche-tracking or switching, accelerate this attrition. Understanding stress impacts associated with migration to wintering ground niches may help to reveal the selective pressures exerted on yellow warblers outside of their breeding grounds. This knowledge could even illuminate the adaptive capacity of climate specialists compared to generalists. Implications from this study will support conservation efforts of birds and other migratory taxa in the face of rapid climate change.

Discovering connection: Dance as an instrument for growth for children on the autism spectrum

Caitlynn Doyle
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Caitlynn Doyle**
Advisor/Mentor: Lisa Morgan and Dr. Blythe LaGasse
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43036

Autism spectrum disorder (ASD) is a common, neurodevelopmental condition that involves challenges with aspects of daily living in areas such as motor skill learning, communication, and social interaction. The prevalence of ASD continues to rise, urging the creation of opportunities that recognize the underlying causes of symptoms and support growth in three key areas of skill: motor, interpersonal synchrony, and social/emotional. Dance classes, and dance/movement therapy, promote growth in these aspects and may be crucial in supporting individuals with ASD. This interdisciplinary project will compile recent data from neuroimaging, mirror neuron, dance, and music therapy research to investigate the efficacy of dance opportunities for the healthy development of motor, interpersonal synchrony, and social and emotional skills. This literature will inform the development of lesson plans for a 6-week dance class series for students ages 6-10 with ASD that, pending approval from Colorado State University's Institutional Review Board, will be piloted in the fall of 2022. This literature review, and the subsequent development of a dance class protocol, seeks to (a) understand how young students with ASD may use movement

as a tool to impact motor operations that will bolster social growth and (b) assert artistic therapies, like dance/movement therapy, as necessary and viable choices for supporting the full potential of children on the spectrum.

Engineering a new herbicide resistance trait in wheat

Liliana Fendler, Jake Montgomery, Dr. Todd Gaines
College of Agricultural Sciences

Presenter(s): **Liliana Fendler**
Advisor/Mentor: Dr. Todd Gaines
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42903

Wheat is a major crop across the world, accounting for 15% of calories consumed by humans. In wheat production weedy plants compete for essential resources. Across the world, herbicides are the main method of weed control used by wheat producers. Recently the overdependence on a few herbicides has rendered them ineffective against some weedy species due to herbicide resistance evolution. Wheat that is resistant to new herbicides would give producers new tools to control resistant weedy species. In this project we utilize technology brought by CRISPR-Cas to make targeted edits to a gene of interest in wheat. A knockout of this gene in rice is known to cause resistance to herbicide that is not currently used by wheat producers. We started by designing guides for our CRISPR-Cas system that target all copies our gene of interest and integrated them into a CRISPR transgene cassette. We inserted our transgene cassette into the genome of undifferentiated wheat cells and regenerated plants from cells with insertions. Sanger sequencing was used to identify edits made to our gene of interest. As expected, our engineered CRISPR-Cas system induced mutations including small insertions and deletions. Edited plants were allowed to self-pollinate, and progeny will be screened to identify individuals with all copies of the gene knocked out. Once identified we will test for herbicide resistance in these knock out individuals and create a molecular marker for rapid detection of this trait. Resistance to this new herbicide will allow producers to better control weeds in wheat.

Examining Inclusive Science Communication Training as a Tool to Support Historically Disadvantaged STEM Students

Sydney Alderfer, Amanda Otamendi, Alycia Pisano, Jasmine Donkoh, Delaney Worthington, Nicole Kelp
Walter Scott, Jr. College of Engineering,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Sydney Alderfer**
Advisor/Mentor: Dr. Nicole Kelp
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42891

Diverse participation in STEM is critical to scientific and societal progress, yet students of low socioeconomic status (SES), first generation college (FGC) students, and students of color (SOC) are underrepresented in STEM fields. There is a strong need to explore alternative mechanisms of engaging students in STEM to promote the retention and career success of students from historically excluded groups. The interdisciplinary topic of science communication presents a unique avenue to engage students, emphasize the connections between scientific topics and social justice issues, and encourage the value of diverse perspectives in STEM. To examine the impact of inclusive science communication training on students'values and attitudes toward STEM and science communication, a 1-hour inclusive science communication workshop was developed and piloted in three first-year seminar courses for biomedical science, chemical engineering, and neuroscience majors at Colorado State University in Fall 2021 and Spring 2022. Pre- and post-workshop surveys indicated that the workshop led to a significant improvement in students'self-efficacy and belonging/identity in science, as well as their self-efficacy and belonging/identity in science communication. Because students'confidence, motivations, and attitudes towards STEM have significant implications for their persistence in STEM majors, these promising results provide rationale for adopting an inclusive approach to science communication training across STEM curricula and beyond an introductory 1-hour workshop. The development of scaffolded workshops for upper-level courses began in Spring 2022 to integrate inclusive science communication content with technical science communication skills, such as science writing, giving scientific presentations, and reading scientific articles.

Examining Seasonal Bird Migration in Relation to Weather, Air Quality, and Radar Data

Madison Chudzik, Jacob Job, Kurt Fristrup, Kyle Horton
Warner College of Natural Resources

Presenter(s): **Madison Chudzik**
Advisor/Mentor: Dr. Jacob Job
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42804

Billions of migratory birds make their way across the continent each fall and spring season as they move to and from their breeding grounds. The increasing number and severity of wildfires pose a threat to this phenomenon, yet the effects of poor air quality resulting from smoke on migratory behavior are severely understudied. Understanding this phenomenon is critical if we are to help protect migratory species and the ecosystems they rely upon. Weather surveillance radar (WSR) is a somewhat recently developed tool used to predict patterns and magnitude of movements on a nightly basis. However, this tool uses historical meteorological data to produce forecasts that do not include air quality, which could limit its effectiveness of it for future conservation work. We conducted a descriptive study of migration during the fall and spring seasons from a single site along the Front Range of Colorado. Using nocturnal flight calls (NFCs) of migratory birds, we examined the taxonomic composition, timing, and density of birds in relationship to meteorological variables, including air quality. NFCs were collected using acoustical recording units and identified by a trained observer. Our results reveal patterns and prevalence of migratory bird species at our study site, and that certain meteorological variables

had an influence on migration. Air quality was found to have a positive influence on this relationship, but we are currently still investigating as to why. The impact of air quality is a largely unaccounted for variable that might have negative consequences on migratory ability and thus impact the accuracy of migratory forecasts.

Examining the role of human fecal microbiome transplantation and diet with neuroinflammation in a murine model

Dev Aldaz, Casey McDermott, Tiffany Weir, Chris Gentile, and Katriana A. Popichak
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Dev Aldaz**
Advisor/Mentor: Dr. Katriana Popichak
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43019

Changes in gut microbial diversity and composition (dysbiosis) are associated with disease states ranging from obesity and arthritis to neurodegenerative diseases such as Parkinson's.These disease states are often accompanied by systematic chronic inflammation shown to be influenced heavily by inflammagens including certain bacterial strains, their metabolites, and bacterial products all which may target the brain, causing neuroinflammatory response (mediated by activation of transcription factor, Nuclear Factor-kappaB (NF-kB) in astrocytes and microglia) directly via vagal nerve stimulation or indirectly through immune-neuroendocrine mechanisms leading to neuronal death. Thus, we postulate presence of obesity-related microbiota in the gut causes neuroinflammation in a mouse model and diet alterations alongside fecal transplantation from healthy, non-obese human donors mitigate neuroinflammatory NF-kB signaling of glial cells leading to neuroprotection. To test this hypothesis, we measured key inflammatory gene expression with qPCR and neuronal and glial numbers with immunofluorescent staining of the brain tissue acquired from a study of three cohorts receiving different combinations of fecal/microbiota transplantations from lean or obese donors alongside normal or high fat diets. With this study, we aim to characterize and identify mechanisms by which fecal transplantation from obese individuals augments inflammatory signaling pathways in glial cells that promote neurological injury compared to fecal transplantation from lean individuals. Thus, these data present a novel opportunity for elucidating the intricate gut-microbiota-brain relationship and potential gut-microbiota targeted strategies, such as dietary interventions and fecal microbiota transplantation, as promising therapies to help patients maintain a healthy weight and diminish chronic inflammatory repose through life.

Haplomylus (Macroscelidea): TBM Responses to Early Eocene (56-52 Ma) Thermal Temperature Change & Implications for Primates

Margo Schumann
College of Liberal Arts

Presenter(s): **Margo Schumann**
Advisor/Mentor: Kim Nichols

Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42967

Haplomylus is an early Eocene (56-52 million years ago) mammal recovered from the Willwood Formation of the Bighorn Basin, Wyoming. Comparable to a modern elephant shrew, Haplomylus likely occupied a ground-dwelling insectivorous niche. It is well-represented in the fossil record across all paleosol maturity stages and meter levels in the lower part of the Willwood Formation. It survived the major thermal events associated with global climate change related to the Paleocene-Eocene Thermal Maximum (PETM). I report the results from my research on the strength of correlation between lower first molar size (a proxy for total body mass, TBM) and time (measured by meter level) with particular attention to Biohorizons A and B (established faunal turnover zones). My results demonstrate that Haplomylus TBM increases with decreasing global temperatures during the early Eocene. This appears to support Bergmann's adaptive rule stating there is an inverse relationship between mammalian TBM and thermal temperature. Importantly, Haplomylus was sympatric with the earliest-known true primates (Euprimates). If thermal temperature stress impacted this small mammal, then it is reasonable to assume that early primates were also susceptible. Thus, Haplomylus variation paints a clearer picture of life on Earth 56 million years ago, and expresses mammalian adaptations potentially present in modern taxa. Understanding how Eocene fauna reacted to climate change over millions of years provides context for how modern mammals, including primates, might respond to present-day global thermal temperature stress. The results of this study are of interest to biological anthropology, vertebrate paleontology, primatology, and conservation biology.

Heavy metals sensitize microglia to the neuroinflammatory effects of bacterial endotoxin through activation of nuclear factor kappa B

Shelby A. Smith, Katriana A. Popichak, Ronald B. Tjalkens
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Shelby Smith**
Advisor/Mentor: Dr. Katriana Popichak
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42809

Parkinson's Disease (PD) is characterized activation of neuronal immune cells, glia, and dopaminergic neuronal cell death. While the exact mechanism through which neurodegeneration occurs is unknown, it often coincides with activation of the transcription factor, Nuclear Factor-KappaB (NF-kB), from exposures ranging from heavy metals (such as Manganese (Mn)), pesticides, viral infections (such as COVID) and bacterial products, such as lipopolysaccharide (LPS). Thus, we postulate that exposure to Mn increases susceptibility to LPS-induced neuroinflammation, leading to increased neuronal cell death due to activation of NF-kB in the primary immune cell of the brain, microglia. To test this hypothesis, we isolated primary glia (both astrocytes and microglia) from wild-type (WT) mice, microglial-specific NF-kB knock-out (KO) mice and NF-kB-luciferase reporter mice to examine the role microglia may play in regulating neuroinflammatory response between glia. Mixed glia (WT astrocytes with WT or NF-

kB KO microglia, and NF-kB-luciferase glia) were treated with low levels of Mn and LPS demonstrating increased inflammatory response in WT glia and decreased inflammatory response in mixed glia containing NF-kB KO microglia, suggesting microglia, specifically NF-kB, mediate neuroinflammatory response. Neurons treated with glia-conditioned media (GCM) from astrocytes + WT microglia exhibited increased cell death compared to a decreased cell death after treatment with GCM from astrocytes+ NF-kB KO microglia, further suggesting that NF-kB activation in microglia mediates neuroinflammatory response. Thus, microglia are key mediators in neuronal cell death and present as a novel therapeutic target for neurodegenerative diseases such as PD.

Identifying Historical Patterns of Migratory Connectivity in the Wilson'sWarbler

Alexandria Polich
College of Natural Sciences

Presenter(s): **Alexandria Polich**
Advisor/Mentor: Dr. Kristen Ruegg, Dr. Sheela Turbek
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42913

With growing stressors on environmental conditions there is a greater need for conservation scientists to understand how a warming climate impacts animal populations. This study focuses on climate effects on the migratory patterns of the Wilson'swarbler (Cardellina pusilla). Previous research on modern Wilson's warbler individuals has found correlations between species vulnerability and similarity between wintering and breeding grounds in relation to climate. The understanding of this correlation would be improved by analysis of historical samples; therefore, this study consists of the genomic sequencing of 92 individuals at predetermined geographic loci using skin punches that were sampled across the wintering range from 1930-1955. The genomic data collected will help to identify the breeding locations of these individuals and examine historical patterns of migratory connectivity, allowing us to make better predictions for future migratory patterns.

Impacts of winter severity on mule deer in Middle Park, Colorado

Ryan Snell
Warner College of Natural Resources

Presenter(s): **Ryan Snell**
Advisor/Mentor: Dr. David Koons
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42987

Mule deer (Odocoileus hemionus) are of ecological and economic importance in the western United States, and concerns about declines of their populations across the west warrant a strong understanding of factors that influence their demographic parameters. Understanding recruitment and survival are foci for managers because of their influence on population

dynamics. I researched the role of previous and current winter severity, summer precipitation, and density-dependence on fawn ratios and fawn survival in Middle Park, Colorado. Based on Akaike's Information Criterion adjusted for sample size (AICc), the most supported model for inter-annual variation in fawn ratios was that with additive effects of density-dependence (population abundance), the previous January/February Winter Severity Index (WSI), and summer precipitation. The most supported model for inter-annual variation in fawn survival included additive effects of previous All Month WSI, summer precipitation, and the current January/February WSI. My research indicates that previous winter severity likely plays a role in recruitment and survival of a current winter's deer population, though its role at the population level (i.e., in affecting population growth rates) remains to be seen. As such, carry-over effects may play an important role in population dynamics that should be further considered by biologists.

Microbiome of Culicoides sonorensis

Abigail Fennell, Christie Mayo, Grace Borlee, Brad Borlee
Walter Scott, Jr. College of Engineering,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Abigail Fennell**
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42798

Culicoides sonorensis is a small biting fly (midge) that is a vector for viral pathogens such as vesicular stomatitis and bluetongue virus. These viruses can cause high mortality in livestock populations and incur significant economic losses. Thus there is a critical need to develop approaches to alter vector competency of the midge. The aim of this investigation was to culture bacteria that have evolved symbiotic relationships with midges. The bacterial isolates were also characterized for antibacterial or antifungal activities and the ability to induce or inhibit quorum sensing. Bacterial isolates were identified using MALDI-TOF and 16S genetic sequencing. Acinetobacter spp., Aeromonas spp., Bacillus spp., Elizabethkingia spp., Enterobacter spp., Microbacterium spp., Morganella spp., Pseudomonas spp., Serratia spp., and E. coli. were identified as culturable members of the midge microbiome. This investigation marks a significant contribution to understanding the microbial diversity of the C. sonorensis microbiome. This thorough characterization of the midge microbiome will provide the foundation to develop a paratransgenic strategy to use a symbiont of the vector to reduce or eliminate transmission of viruses.

Outcomes of hands-on, PowerPoint and eLearning interventions in MIP300 General Microbiology

Amelia Hines, Delaney Worthington, Katriana Popichak, Jennifer McLean
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Amelia Hines**
Advisor/Mentor: Dr. Jennifer McLean, Dr. Katriana Popichak
Category: Oral Presentation

Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43046

Designing course components in a thoughtful way to maximize student engagement and outcomes becomes especially crucial when courses are delivered via an online format necessitated due to the COVID-19 pandemic. Students face a variety of barriers such as isolation, disengagement, accessibility issues and technology problems. These barriers created a unique challenge to educators everywhere to adapt coursework to an online format. In our (MIP300) General Microbiology course, we had six active hands on activities, which had to be quickly revamped for virtual delivery. Initial adaptation of these activities to interactive PowerPoint activities revealed to be, anecdotally, cumbersome and frustrating for students, although preliminary data from the asynchronous online MIP300 course did suggest that virtual activities were beneficial to student performance. We hypothesize that high-quality, easy-to-use, active learning interventions covering historically difficult topics will increase student performance, confidence, and engagement among students in an asynchronous online course. To test this hypothesis, we converted six PowerPoint activities into new digital learning content utilizing Articulate360 and delivered both options to multiple MIP300 sections (fall 2021), asynchronously, online. Analysis of these data suggest that students'overall performance did not change due to these interventions, however, the students utilizing eLearning reported higher levels of satisfaction and engagement than those who completed the PowerPoint activities. Now, in Spring 2022 semester, we are delivering three different interventions ,Äì original hands-on activities, PowerPoint activities and eLearning activities to further ascertain the most beneficial modality of active learning.

Regional scale patterns of bark beetle and wildfire interactions in the southern Rockies.

Amanda Kowalski
College of Liberal Arts

Presenter(s): **Amanda Kowalski**
Advisor/Mentor: Dr. Jason S. Sibold
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43018

Natural ecological disturbances are keystone processes that shape forest structure and composition, alter resource availability, and open gaps for regeneration. High elevation subalpine forests in the Southern Rockies are maintained by a variety of disturbance agents including stand-replacing wildfires and outbreaks of dendroctonus (tree-killing) bark beetles. Over the past two decades, the drastic increase of wildfire and bark beetle activity within the region drew national attention and fueled debate regarding their interactions: Do bark beetle-killed forests influence the extent of wildfire? Publications addressing this question have investigated patterns across the entire western U.S. or in single wildfires. Additionally, previous work has mostly focused on forests impacted only by mountain pine beetle in extreme fire years. There is a significant gap in the current literature regarding regional-scale beetle-fire interactions in high elevation spruce-fir and lodgepole pine forests that experience outbreaks of both mountain pine and spruce beetle. To address this gap, this analysis uses GIS to understand wildfire and bark beetle disturbance

patterns in the Southern Rockies Ecoregion from 2010 to 2020. Results suggest that during our study period, beetle-killed forests in the subalpine burned 150% more than expected based on their distribution across the ecoregion. Regional-scale results do not coincide with those of previous studies conducted at both coarse and finer scales. Here, we demonstrate the need for ecological analyses that consider a range of spatial and temporal scales when studying complex processes like disturbance. This analysis also adds to the growing body of research on the increasing likelihood of disturbance interactions due to climate change. Such interactions have the capacity to decrease forest regeneration and resilience, which may have indirect impacts on carbon storage, nutrient cycling, soil stabilization, and watershed health.

The role of litter chemistry on soil organic matter formation.

Laura Moore, Samantha Mosier, Francesca Cotrufo
College of Agricultural Sciences

Presenter(s): **Laura Moore**
Advisor/Mentor: Dr. Francesca Cotrufo
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42782

Soil organic matter (SOM) is the largest store of carbon (C) in terrestrial ecosystems. Therefore, SOM formation dynamics and persistence must be understood to manage soils more effectively for C storage and climate change mitigation. Plant litter chemistry is recognized as a critical control for SOM formation into mineral-associated organic matter (MAOM) and particulate organic matter (POM); however, comprehensive testing of these mechanisms is needed. Isotopically labeled plant litter was tracked into soils over a 3-year incubation. This analysis represents the final 3-year harvest of the experiment, building off previous 1-year incubation results, which show that more labile litters contributed more to MAOM. After 3 years of incubation, I hypothesize that we will see more POM formation from recalcitrant plant litters, which will ultimately contribute to more soil C. Additionally, I hypothesize that grass litter will decompose faster and result in relatively higher MAOM formation earlier in the decomposition process. This experiment will help to better understand the mechanisms of SOM formation and persistence.

Trauma and the Pathway to Healing

Melanin Armendariz
College of Health and Human Sciences

Presenter(s): **Melanin Armendariz**
Category: Oral Presentation
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43024

Human development occurs throughout the whole lifespan but there are certain periods that are crucial for development, especially in childhood. If something occurs during these formative years it can prevent the child from developing in the way they're supposed to. Adverse childhood experiences can steer the development in a different way. These can be things like living in poverty, experiencing abuse/neglect, parental separation, substance use, etc. These are the things that lead to insecure attachment, higher levels of stress and anxiety, mental illness and even problems with substance use. If these adverse childhood experiences continue repeating for many years, this then turns into transgenerational trauma, which is something that affects many people, especially people of color. The generational trauma is embedded in your way before you even get to experience life. When you are in your mother's womb you are not only exposed to all the emotions and experiences she felt, but also those that your grandmother experienced. Many times this trauma is unresolved which is why it continues through so many generations. This is why it is important to heal and break them. By learning about your attachment style and identifying those traumas, people can begin to understand themselves and heal in order to move forward. Healing and breaking generational patterns is extremely important and it can change the lives of generations to come.

Research Posters

A Comparative Life Cycle Assessment of Conventional and Local Outdoor Lettuce Production Systems

Jenna L. Stubbers, Matthew Reid Maynard, Jesse Burkhardt, Jason C. Quinn
Walter Scott, Jr. College of Engineering

Presenter(s): **Jenna Stubbers**
Advisor/Mentor: Dr. Jason Quinn
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42986

Due to increasing food demand, food insecurity, and environmental concerns, there has been growing interest in local food production. These systems, such as greenhouses and local farmers markets, often claim to be more sustainable than conventional centralized agriculture. There is a common preconception that conventional agriculture has a high environmental impact from transportation emissions. However, other factors throughout the life cycle may outweigh transportation impacts depending on location. Through life cycle assessment methodology, the global warming potential (GWP) of conventional lettuce production in the Central Coast of California was calculated along with added transportation emissions to market, ranging from 0.37 to 1.22 kg CO2-eq-kg lettuce-1 across the contiguous US. Local growth model results in a range of GWP between 0.36 to 1.60 kg CO2-eq-kg lettuce-1 across the contiguous US. Location specific results show some tradeoffs between choosing local or conventional lettuce. In Fort Collins, CO, the GWP of local lettuce production is 0.43 kg CO2-eq-kg lettuce-1 versus 0.68 kg CO2-eq -kg lettuce-1 for conventional production. Alternatively, in Washington, DC, the GWP of local lettuce production is 0.41 kg CO2-eq -kg lettuce-1 compared to 1.05 kg CO2-eq -kg lettuce-1 for conventional lettuce production. However, water impacts show contrasting results. In Fort Collins, the water footprint is larger for local production versus conventional production, at 0.30 m3-kg lettuce-1 and 0.07 m3-kg lettuce-1, respectively. In Washington, DC, the water footprint is smaller for local production compared to conventional production, resulting in values of 0.03 m3-kg lettuce-1 and 0.10 m3-kg lettuce-1, respectively. The results suggest that GWP is heavily influenced by transportation emissions, whereas water impacts are affected predominantly by soil and rainfall variation.¬†This research gives a regionalized understanding to comparative GWP and water impacts between local and conventional lettuce production systems.

A Deep Dive Into Microphones for Recording Collaborative Group Work

Mariah Bradford, Paige Hansen, Ross Beveridge, Nikhil Krishnaswamy, Nathaniel Blanchard
College of Natural Sciences

Presenter(s): **Mariah Bradford, Paige Hansen**
Advisor/Mentor: Dr Nikhil Krishnaswamy
Category: Research Poster

Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43057

Classroom environments are challenging for artificially intelligent agents primarily because classroom noise dilutes the interpretability and usefulness of gathered data. This problem is exacerbated when groups of students participate in collaborative problem solving (CPS) --- sound from other students makes it difficult to isolate the group the agent is interacting with, or individuals within the group. Here, we examine how well six popular microphones can capture audio from individual groups. A primary usage of audio data is in automatic speech recognition (ASR), therefore we evaluate our recordings by examining the accuracy of downstream ASR using the Google Cloud Platform. We simultaneously captured the audio of all microphones for 11 unique groups of three participants first reading a prepared script, and then participating in a collaborative problem solving exercise. We vary participants, noise conditions, and speech contexts. Transcribed speech was evaluated using word error rate (WER) and match error rate (MER). We find that scripted speech is transcribed with a surprisingly high degree of accuracy across groups (average WER = 0.114, SD = 0.044). However, the CPS task was much more difficult (average WER = 0.570, SD = 0.143). We found most microphones were robust to background noise below a certain threshold, but the AT-Cardioid and ProCon microphones were more robust to higher noise levels. Finally, an analysis of errors revealed that most errors were due to the ASR missing words/phrases, rather than mistranscribing them. We conclude with recommendations based on our observations.

A Hairy tale of molting regulation: Wnt signaling and transcriptional effects on ecdysteroid synthesis

Halie Stockett, Vanessa Bently
College of Natural Sciences,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Halie Stockett**
Advisor/Mentor: Dr. Donald Mykles
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42926

Crustacean molting is regulated through the increase of 20-hydroxyecdysone (20-E), the active form of ecdysteroid produced by the Y-organs (YO). It is hypothesized that crustaceans utilize methyl farnesoate (MF) which acts through Methoprene tolerant (Met) to induce Krüppel homolog 1 (Kr-h1) thereby repressing transcription of ecdysone response genes. It was previously shown in *Aedes aeypti* that Hairy (Hry) and Groucho (Gro), also act through Met leading to the inhibition of downstream target genes potentially including the ecdysone response genes. Additionally, methylation of Hry in *Drosophila* and *Bombyx* was shown to inhibit ecdysone production in prothoracic gland (PG), the insect molting gland. Hry and Gro are transcriptional repressors characterized by their Orange; basic helix-loop-helix domain (bHLH_Orange) responsible for regulation of protein interactions. These components are commonly found in the Notch signaling pathway which in turn is antagonistic to Wnt signaling. Wnts are a family of conserved glycoprotein ligands that are known for the diverse roles in development and cell proliferation. Nonetheless, little is known about crustacean Wnt genes

and their diverse physiological roles including their role in ecdysteroidogenesis. Therefore, to gain insight on the function of Wnt/Notch genes and cofactors function in ecdysteroid synthesis several components, including Armadillo (Arm), Axin (Axn), Groucho (Gro), Glycogen synthase kinase-3 (GSK-3)/Shaggy (Sgg), Hairy (Hry), and different Wnts, were identified and characterized using the blackback land crab (*Gecarcinus lateralis*) YO *de novo* assembled transcriptomes. Supported by NSF (IOS-1922701).

A Human Cell Model for Studying Efficacy of Therapeutics for Reversal of a Dementia-Associated Neuropathology

Sydney Alderfer, Thomas Kuhn, Laurie Minamide, Tom Cast, Michael Ruff, James Bamburg, Lubna Tahtamouni
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Sydney Alderfer**
Advisor/Mentor: Dr. Lubna Tahtamouni
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42890

Many rodent models of human dementias are characterized by intraneurite inclusions consisting of rod-shaped bundles of cofilin-saturated actin filaments (rods), which have been shown to cause loss of synapses. Rods are induced in about 20% of rodent hippocampal neurons by factors associated with neuronal dysfunction such as amyloid-β in Alzheimer's disease (AD), αSynuclein in Parkinson's dementia (PD), and HIV envelope protein gp120 in AIDS dementia. Rods have been found postmortem in human hippocampus of AD and PD subjects. The signaling pathway for rod induction requires the chemokine/cytokine receptors CXCR4 (X4) and/or CCR5 (R5), the cellular prion protein (PrP^C), NADPH oxidase (NOX), and reactive oxygen species (ROS). Inhibition of rod formation and rod reversal have been achieved in rodent neurons by X4/R5 antagonists. However, there is a critical need to test the efficacy of X4/R5 antagonists in human neurons. Here we utilized a human iPSC line, WTC-11, in which the Ngn2 neuronal differentiation factor has been inserted behind a doxycycline-inducible promoter, allowing for rapid differentiation into glutamatergic neurons. Although these neurons express cofilin, actin, all NOX subunits, and X4/R5 receptors, they are deficient in PrP^C expression and do not form rods when treated with the rod inducers described above. Utilizing viral-mediated expression of PrP^C before challenging with rod-inducers, we demonstrated that rods, now induced to form in these human neurons, are inhibited by subnanomolar levels of X4/R5 inhibitory peptides. Current work is looking at the protection of synapses in WTC-11 neuronal cultures by rod inhibitors during long-term exposure to rod-inducers.

A Mixed Method Examination of Existential Anxiety and Trait Mindfulness in College Students.

Megan Brown, Marissa Alliegro
College of Natural Sciences

Presenter(s): **Megan Brown**

Advisor/Mentor: Dr. Mark Prince
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43058

The college years are a time when individuals report heightened anxiety. Students are navigating newfound independence, forging their identity, and making decisions that will affect their life. Yet, existential anxiety (EA) is rarely assessed among this population. EA is a psychological reaction to existential threats (e.g., freedom, death, isolation, meaninglessness). EA is positively correlated with externalizing behaviors in college students and EA significantly increased after the emergence of COVID-19. This study is a multi-method examination of how EA affected college students during the pandemic. A sample of college students participated in focus groups discussing EA and completed pre- and post-focus group surveys regarding existential concerns and mindfulness traits. Key themes that emerged from the discussions included: feeling uncertain, desiring connection, craving structure, creating meaning, fearing loss, and protective factors against EA. Quantitative analyses of survey data revealed that existential concerns increased after the focus group, suggesting that the focus groups acted as an induction of EA. The association between existential concerns and the Five Facets of Mindfulness ranged from small to large both pre- and post-discussion with 3 out of the 5 Facets being positively associated with pre- and post-focus group existential concerns (describing, nonjudging, nonreacting, awareness) and 1 Facets being negatively associated with existential concerns (observing). Thus, certain Facets of mindfulness may be helpful in attenuating existential concerns. Results from this study deepens our understanding of EA among college students, highlights the relevance of EA in this population, and emphasizes the important role that mindfulness plays in lessening anxiety

A Study of RNA Modifying Methyltransferase Enzymes in Thermococcus kodakarensis

Liam Elkins, Kristin Scott
College of Natural Sciences

Presenter(s): **Liam Elkins**
Advisor/Mentor: Thomas Santangelo
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43017

Thermococcus Kodakarensis is an extremophile archaeal species that live at high temperatures. The RNA transcriptome on T. Kodakarensis has many post-translational RNA modifications, specifically 5-methyl cytosine modifications (m5c). It is possible these modifications help the cell to live in extreme conditions. T. Kodakarensis contains 17 enzymes that make m5c modifications. Five of these MTase enzymes are essential to the genome of T. Kodakarensis and little research has been done to determine the importance of these modifications on the cell, therefore it is our goal to determine the function of the 5-methyl cytosines and target specificity of these MTases.

A Tale of Three Insecticides: The Future of Chemical Controls for Beet Curly Top Virus in Sugar Beets

Max Schmidtbauer, Jordan Withycombe, Punya Nachappa
College of Agricultural Sciences

Presenter(s): **Max Schmidtbauer**
Advisor/Mentor: Dr. Punya Nachappa
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42932

Sugar beets are grown across the western United States for their lucrative taproot and are considered an economically important crop generating 1.16 billion dollars in 2021. However, production is threatened by the Beet Curly Top Virus (BCTV), a virus that severely reduces yield. The virus is exclusively transmitted by the beet leafhopper, Circulifer tenellus, therefore; current management strategies focus on elimination of the insect. Many growers use neonicotinoid seed treatments to protect crops from insects, but recently laws have been introduced to ban this treatment due to their devastating environmental effects. With the proposed ban, farmers are turning to a variety of pyrethroid based insecticidal sprays. This study looks to compare two commercially available sprays, Mustang and Asana, at three different application rates (2x, 1x, 0.1x) for controlling beet leafhoppers and lowering overall virus transmission as compared to the neonicotinoid seed treatment, Poncho Beta. We hypothesize that insecticidal sprays applied at a higher label rate will result in an increased mortality of beet leafhoppers, and therefore reduced virus transmission rates. Although trials are ongoing, current data suggests that beet leafhoppers may be able to evolve resistance to both Mustang and Asana. Armed with this knowledge, farmers would be able to adjust their management strategies to achieve more sustainable and profitable sugar beet production practices.

AdMSC anti-inflammatory response as a treatment against prion induced glial inflammation

Sean Boland, Arielle Hay, Tanner Murphy, Mark Zabel, Julie Moreno
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Sean Boland**
Advisor/Mentor: Dr. Julie Moreno
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43000

Prion disease is characterized by neuroinflammation and neurodegeneration, resulting from the misfolding of cellular prion protein (PrPC) into its pathogenetic form PrP scrapie (PrPSc). The etiology of the disease is a combination of genetic, sporadic, and infectious disease states Formation of PrPSc aggregates leads to oxidative stress, abnormal neuronal signaling, and gliosis, which ultimately leads to neuroinflammation. Neuroinflammation is the first sign of the disease, resulting from activation of pro-inflammatory astrocytes and microglia. Progression results in severe abnormal neuronal functioning, synaptic degeneration, and finally neuronal death. Although these diseases are rare, the severity of the disease makes treatment absolutely vital.

Since neuroinflammation is the first sign of prion disease, our lab focused on therapies to decrease neuroinflammation. Adipose-derived mesenchymal cells (AdMSCs) have been shown to secrete anti-inflammatory cytokines and chemokines, neurotropic factors, and growth factors that have been shown to combat inflammatory phenotypes. To test this in prion disease we co-cultured prion infected glia with AdMSCs, to investigate the AdMSCs ability to decrease prion induced neuroinflammation and PrPSc levels. We found that the prion infected glial cells co-cultured with AdMSCs show significant decrease in secretion of pro-inflammatory mediators, compared to non-AdMSC treated glia. Along with a decrease in pro-inflammatory mediator secretion, we also found a significant decrease in the presence of pro-inflammatory astrocytes and microglia. However, the results shown are independent of PrPSc concentration. Our research shows the anti-inflammatory effects of AdMSCs have the ability to resolve prion-induced neuroinflammation, independent of PrPSc changes.

Adverse Childhood Experiences: More Than a Score

Dulce Olmedo
College of Health and Human Sciences

Presenter(s): **Dulce Olmedo**
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43039

Adverse childhood experiences (ACEs) have impacted various individuals from multiple backgrounds and can affect any child. An ACE score is determined by a quiz that consists of ten yes or no questions focused on childhood (under the age of 18) maltreatment and household dysfunction. The higher one's ACE score, the more likely they are to develop both mental and physical health problems. ACEs impact individuals differently as they may have different social locations which include but are not limited to race, class, gender, geographic location, ability, and age. It has recently been found that ACEs can increase physical health problems later on in life. The most prevalent health problems were lung cancer, cardiovascular disease, obesity, and stroke. Unfortunately, populations that are especially susceptible to health disparities due to ACEs are those who are economically vulnerable racial and ethnic minorities. There are very few studies that examine the impacts of ACEs on racial and ethnic minorities and those who are economically vulnerable. This is quite alarming as many of these marginalized individuals experiencing ACEs are more inclined to develop a physical health problem due to potential mutations caused by intergenerational trauma. To truly understand the impacts ACEs have on a child's mental and physical health, one needs to take a look at all possible risk and protective factors from genetic to systemic. Once we are able to have a better understanding of the impacts of ACEs then we will be able to formulate more effective preventive measures for all children.

Alcohol, Cannabis, and the Gut Brain Axis

Wyatt Taylor, Lindsay McCarron, Jesse Ruehrmund, Vanessa Stallsmith, Hollis Karoly
College of Natural Sciences

Presenter(s): **Wyatt Taylor, Lindsay McCarron, Jesse Ruehrmund**

Advisor/Mentor: Dr. Hollis Karoly
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43032

Cannabis is frequently co-used among individuals who drink alcohol. Preliminary studies on co-use of alcohol and cannabis demonstrated possible behavioral and social consequences, and increased impairment. However, most research on co-administration has not included legal-market cannabis products, which tend to contain much higher levels of THC than cannabis provided for research studies in the past. Interestingly, alcohol and cannabis may have contradictory effects on the brain and body. For example, alcohol is shown to have a negative impact on the microbiota-gut-brain-axis (MGBA), whereas cannabis may have some positive effects, though research in this area is limited. Therefore, the present study aims to better understand the biological, cognitive, and behavioral effects of alcohol and cannabis use through a quasi-observational laboratory study. We aim to characterize craving, impulsivity, impairment, and alcohol consumption through the use of two sessions, two weeks apart, where researchers will collect blood and micro biome bio markers, behavioral and cognitive data, both with (Session A) and without (Session B) the co-use of these substances. A mobile-laboratory will be utilized to allow participants to use cannabis in their home to be in compliance with all local federal regulations and restrictions on cannabis research. Participants will use legal-market cannabis and self-administer alcohol to capture naturalistic effects and patterns of co-use. Longitudinal, and within-day patterns will be assessed with daily diary questionnaires between sessions. Taken together, we aspire to gain more insight and knowledge about the effects of alcohol and cannabis co-use to be used in clinical treatments and interventions of AUD.

An Asylum of Broken Bones: Trauma Analysis across 19th Century Mental Health Facilities

Brooke Toothaker
College of Liberal Arts

Presenter(s): **Brooke Toothaker**
Advisor/Mentor: Dr. Connie Fellmann
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43040

The skeletal remains of patients found in 19th century asylum cemeteries exhibit numerous and abundant signs of skeletal trauma which, while often unproven, are frequently attributed to the mistreatment of patients at the hands of asylum staff. In particular, the Colorado State Insane Asylum (CSIA) Skeletal Collection (1879-1899) from Pueblo, Colorado shows an abundance of evidently ante- and peri- mortem trauma. However, the trauma in this collection appears to exceed the average acute and chronic trauma of asylum collections of the time, in both quantity and severity. Because of limited literature of the CSIA trauma in context with other 19th century asylum collections, it is important to execute a comparative analysis of the trauma of the CSIA collection with other collections to truly understand the context of the CSIA in 19th century America. This research is a formal comparative analysis of the CSIA with the Oneida Asylum collection from New York (1880-1900) and the California State Asylum collection (1851-1854) to

address and compare the quantity and severity of ante- and peri- mortem skeletal trauma. The results of this study indicate that the patients of the CSIA skeletal collection are over twice as likely to experience ante- and peri- mortem trauma than the other collections of similar backgrounds. While we are unable to discern the exact reasoning for the trauma experienced by these individuals, the time period suggests that some likely causes could include patient abuse at the hands of asylum staff, alcohol abuse and accompanied interpersonal conflict, and/or the increase in the popularity of boxing during this time.

An Inducible Repressor System for the Thermophilic Archaeon Thermococcus kodakarensis

Stavros Trimmer, Kathryn Long
Warner College of Natural Resources

Presenter(s): **Stavros Trimmer, Kathryn Long**
Advisor/Mentor: Thomas Santangelo
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42970

Transcription is essential for gene expression and regulation in all life forms. Transcription is globally controlled by genetic switches which can either promote (activators) or inhibit (repressors) transcription. Within each system transcription is tightly controlled according to the state of the environment. A variety of switches exist to control substrate utilization, amino acid synthesis, and immune responses. One of the most interesting of these regulative systems are inducible repressor systems. Known for the ability to serve as an genetic off switch, inducible repressor systems will inhibit transcription activity by binding to a unique sequence up stream of a promoter. This protein prevents transcription from occurring unless a specific signal molecule known as an effector binds to the repressor. Many inducible repressor systems have been characterized from the TetR family and have even been genetically engineered to work in mesophilic eukaryotes and bacteria. There are innate repressor systems are encoded in hyperthermophiles genomes. But a robust non-endogenous inducible repressor system has yet to be found in the model organism Thermococcus kodakarensis. Yet many repressor systems are extensively characterized in bacteria. Particularly the TetR tetracycline inducible repressor system has had its protein and nucleotide sequence defined and has also been replicated in higher organisms. Therefore, using the thermophilic genetic model system T. kodakarensis, we aim to manipulate the TetR protein through site directed mutagenesis to make the repressor system thermostable.

Analysis of an Orally Delivered rLA rotavirus Vaccine using a Meta-Omics and Immunological Approach

Brianna Ramirez, Darby Gilfillan, Kayl Ecton, Allison Vilander, Zaid Abdo, Gregg Dean
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Brianna Ramirez Rubio**
Advisor/Mentor: Dr. Gregg Dean
Category: Research Poster

Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42911

Rotavirus is a highly contagious diarrheal illness that is spread through mucosal surfaces and is one of the leading causes of death among children in developing countries. Despite the availability of two vaccines, the lack of resources and reduced efficacy in low and middle-income countries makes these vaccines a less viable option for protection. Oral vaccines using probiotic organisms are now being recognized as potential platforms due to their ability to effectively engage the host mucosal immune response. In the present work, we have developed a recombinant vaccine using the commensal bacterium Lactobacillus acidophilus (LA) as a vector. This orally delivered vaccine utilizes the VP8 rotavirus capsid protein alongside the adjuvants FliC or FimH in order to produce a specific anti-rotavirus response. In this pilot study, we investigated the effect of this engineered probiotic vaccine on the immune responses of mice by dosing 4 groups, either receiving a buffer, wild-type LA, 5 doses of the rLA vaccine. Groups received treatment every two weeks for eight weeks prior to being infected with rotavirus. Data from immunological assays indicate that the mice receiving the rLA vaccine produced an overall higher level of Antigen-Specific B cells per 100,000 cells compared to the other groups. A meta-omics approach was also utilized in order to reveal that LA, along with FliC or FimH, were present and being expressed within the murine host. These results suggest that our rLA vaccine antigens are reliably expressed within the host and inducing a protective immune response.

Analysis of Inclusivity of Published Science Communication Cirricula for Scientists and STEM Students

Rachel McMillan, Randy Vickery, Kaitlin Murphy, Sydney Alderfer, Jasmine Donkoh, Dr. Nicole Kelp
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Rachel McMillan**
Advisor/Mentor: Dr. Nicole Kelp
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43030

There is an increased push for STEM students and scientists to be trained in science communication. Science communication researchers have outlined various models of how scientists interact with non-scientists, including deficit, dialogue, and inclusive approaches. Ideally, science communication should embrace the inclusive end of the spectrum, with an interdisciplinary model incorporating cultural funds of knowledge, multiple ways of knowing, social and political contexts, and encourages scientists to learn as well as teach. However, science and science communication tend to be inequitably distributed, with only certain voices and perspectives owning the narrative. We wanted to analyze whether published science communication curricula for STEM students and scientists are promoting an inclusive approach to science communication. We analyzed n=83 published science communication trainings. We found an increase in such publications over the past two decades. We coded the trainings according to their science communication model, finding 37.3% deficit, 44.6% dialogue, and 18.1% inclusive. Trainings for STEM undergraduates were least likely to be inclusive. Finally, only

26% of publications included evaluation of efficacy of curriculum using an externally validated scale or framework. These findings present opportunities: while it is positive there are more published science communication curricula, science education and communication researchers should develop and publish more inclusive science communication trainings for STEM students. Additionally, undergraduate students can and should begin their training in science communication with a focus on inclusivity rather than deficits. Finally, science education researchers should develop more standards for evaluating efficacy of inclusive science communication training.

Analyzing Groundwater Storage Trends in the United States from 1951-2020

Cavin Alderfer, Dr. Ryan Bailey
Walter Scott, Jr. College of Engineering

Presenter(s): **Cavin Alderfer**
Advisor/Mentor: Dr. Ryan T. Bailey
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42763

Groundwater is an important source of water for municipalities and irrigation in the United States. However, the change in groundwater storage through time is difficult to quantify. Groundwater level measurements have been taken at monitoring wells across the United States for over a century, and a significant amount of data from the last seven decades is available through the United States Geological Survey (USGS). This study couples data retrieved from the USGS groundwater database with ArcGIS geoprocessing routines to display groundwater storage trends in unconfined aquifers over the last seventy years. Filtering data for unconfined aquifers is performed using reported well depths and national raster maps of land surface elevation and thickness of unconsolidated sediment, resulting in a total of 356,785 wells with measurement data in the past 100 years.
Groundwater head data from these wells are averaged temporally, by decade, and spatially, by watershed boundary, to quantify trends in groundwater storage during the period 1951-2020. Watershed boundaries are designated by the 2,139 8-digit hydrologic unit code (HUC) subbasins of the conterminous United States. To provide key temporal trends in various regions of the country, subbasins are filtered according to the number of wells that have been sampled within their boundaries and the availability of measurements across the years 1951-2020. The results of the groundwater trend analysis depict the overall shifts in regional groundwater storage. These trends provide an overall status of near-surface groundwater availability in the United States, which can be used to guide groundwater management in the future.

Analyzing the effect of primary lung fibroblasts on chemosensitivity in triple-negative and luminal breast cancer cell lines

Gwyneth Knott, Kathryn Cronise, and Daniel Regan
College of Natural Sciences

Presenter(s): **Gwyneth Knott**

Advisor/Mentor: Dr. Dan Regan
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43073

Metastasis, which is the spreading of cancer from a primary tumor to secondary sites, is responsible for the majority of cancer-related deaths. Breast cancer is the most common cancer in women in the United States and presents as three major subtypes: triple-negative, luminal, and HER2+. Triple-negative breast cancer has the worst prognosis out of these subtypes due the development of drug resistance and its high incidence of metastasis, specifically to the lung. In this study, we focus on fibroblasts which are the most prevalent cell type within lung interstitium. This project aims to evaluate the influence that primary lung fibroblasts from healthy donors (NHLF) have on breast cancer cell proliferation and sensitivity to drugs commonly used to treat triple-negative (doxorubicin) and luminal (tamoxifen) breast cancer. MDA-MB-231 and T47D cell lines were each cultured alone (monoculture) and in the presence of NHLF (coculture) and were treated with serial dilutions of doxorubicin (MDA-MB-231) or tamoxifen (T47D). These experiments were performed in both traditional 2D culture as well as the more biologically-relevant 3D culture. We hypothesized that coculture with NHLF will induce chemoresistance in both 2D and 3D conditions. MDA-MB-231 exhibited decreased proliferation when grown in the presence of NHLF in both 2D and 3D culture. MDA-MB-231 sensitivity to doxorubicin decreased in 2D coculture with NHLF relative to 2D monoculture; whereas, no difference in sensitivity was observed between 3D coculture and monoculture conditions. Overall, these data demonstrate that primary normal lung fibroblasts influence triple-negative breast cancer cell growth and response to doxorubicin.

Analyzing the Impact of Mangrove Leaf Litter on Snail Movement at Magdalena Bay, BCS, Mexico

Alison Dyck, Ashley Palmer Contributors: Dr. Graham Peers, Dr. Shane Kanatous
College of Natural Sciences

Presenter(s): **Alison Dyck, Ashley Palmer**
Advisor/Mentor: Dr. Graham Peers and Dr. Shane Kanatous
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43042

The intertidal zone is a very important habitat and feeding area for many organisms. When temperatures rise after the tide drops, organisms that are prone to desiccation, such as snails, need to be able to find shelter and sustenance. We sought to analyze the impact of mangrove leaf litter on snail density, on mudflats in Magdalena Bay, BCS, Mexico. We hypothesized that leaf cover provided refuge from desiccation at low tide. Three one-meter squares were set up and these were split into quarters. In two of these quarters, leaves were removed. The density of snails in each quadrant was checked every ten minutes. Results show that there was a much higher density of snails where there was still leaf cover (With a standard T-test with P= 0.00017). This indicates that leaf cover provides shelter from the heat and desiccation and is an important part of the intertidal zone.

Antibody Screening to Develop an Immunoassay for LAM in Urine of CF Patients with NTM Co-infection

Brooke Jensen, Andrea Russell, Delphi Chatterjee, and Anita G Amin
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Brooke Jensen**
Advisor/Mentor: Anita G Amin
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42999

The purpose of our research is to develop an immunoassay to detect Nontuberculous Mycobacteria (NTM) in cystic fibrosis (CF) clinical urine samples. Currently, there are immunoassays to detect Mycobacterium tuberculosis Lipoarabinomannan (LAM) in urine. However, the immunoassays to detect LAM in NTM must be studied further. There is a great need for NTM LAM immunoassays that can be performed quickly and diagnose NTM disease. The method used in our research is the development of a capture dot blot assay, where the LAM in urine is sandwiched between a primary capture antibody and detection antibody. We will use four monoclonal antibodies (mAb) that are available to our laboratory. These are CHCS9, CS35, P1AM25, and T1AM09. They should detect the presence of Mycobacterium abscessus LAM. For a positive control, we will use Mycobacterium tuberculosis LAM strain CDC1551 spiked in urine. Antibody A194 will be used for detection of LAM. 3,3'5,5'-Tetramethylbenzidine (TMB) and Streptavidin Horseradish peroxidase (HRP) are the substrates of choice, which will produce color.To determine the outcome of the capture dot blot, we will look for high color intensity. High color intensity will indicate antigen-antibody complexes and help us to determine each antibody's affinity for M. abscessus LAM. The results will then be incorporated to a plate-based immunoassay.

Archaeal Transcription and NET-Seq

Amelia Stocking
College of Natural Sciences

Presenter(s): **Amelia Stocking**
Advisor/Mentor: Bree Wenck
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42929

Genomes are organized into chromatin, and chromatin architecture impacts transcription regulation, gene expression, development, disease progression, and cancer. Many archaeal genomes are organized with histone proteins that resemble the core eukaryotic histone fold, specifically the tertiary structure of the eukaryotic (H3/H4)2 tetramer. Comparable to eukaryotic histones, archaeal histones organize the genome and regulate the progression of the transcription apparatus, although archaeal histones are devoid of eukaryotic-like N and C terminal extensions. Additionally, archaeal histones do not form discrete, octameric

nucleosomes but an extended, superhelical structure. This extended structure is permitted, in part, by the lack of N and C terminal extensions but mostly due to a conserved AGA motif at the L1-L1(loop 1 of dimer 1 & 4) interface between the four main helical bundles. Differential analysis on strains designed to disrupt the L1-L1 interface resulted in significant up and down regulation of steady-state RNAs. However, this data does not explain why we observe such a change in the transcriptome. Therefore, we are utilizing nascent elongating transcript sequencing (NET-seq) to observe the impacts archaeal histone-based chromatin has on global RNA polymerase (RNAP) positioning patterns. Through the use of NET-Seq, we will be able to use ternary elongation complexes (TECs) to elucidate the rate-limiting step of archaeal transcription, and to find positions where RNAP could be regulated by histones or other unknown factors.

Assessing the Human Pathogenic Potential of SIVmac251 and SIVmac239

Annie Price, Kimberly Schmitt, James Curlin, Jared Morrison, Leila Remling-Mulder, Ramesh Akkina
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Annie Price**
Advisor/Mentor: Dr. Ramesh Akkina
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42878

The ongoing acquired immunodeficiency syndrome (AIDS) pandemic originated from Simian Immunodeficiency Viruses (SIVs) that evolved to infect humans and become human immunodeficiency virus (HIV). SIVs derived from rhesus macaques are commonly used model strains because of their ability to recapitulate HIV pathogenicity. While SIVmac239 is a molecular clone, SIVmac251 exists as a viral swarm, which suggests that the growth kinetics of these viruses may differ. Despite the usefulness of nonhuman primate models, a less expensive, more readily accessible animal model is the humanized mouse. These mice have been transplanted with human hematopoietic stem cells to produce a robust human immune system that is readily infected by HIV. This study aims to characterize human pathogenicity of both SIVmac239 and SIVmac251 using human peripheral blood mononuclear cells (PBMC) and humanized mice. First, we will infect PBMC from two different human immune donors and assess their replication kinetics using qRT-PCR. Then, we will inoculate humanized mice with either SIVmac239 or SIVmac251 to assess their viral replication through plasma viral loads and CD4+ T cell decline. We predict that the heterogenous nature of SIVmac251 will display increased viral replication both in PBMC and humanized mice relative to the homogenous SIVmac239. These results will provide valuable information regarding human pathogenic potential of these viruses in human immune cells and provide a model for possible human exposure. This information will allow us to better characterize the cross-species transmission potential of both SIVmac strains into humans.

Assessing yoga-induced balance improvements in adults with acquired brain injuries

Denny Press, Brian Jones, Dr. Jaclyn Stephens
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Denny Press**
Advisor/Mentor: Dr. Jaclyn Stephens
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43008

Each year, approximately 2.5 million Americans sustain acquired brain injuries (ABI). Although there are many rehabilitation services available in the weeks and months post-injury, many individuals with chronic ABI live with residual impairments, such as poor balance, which is associated with increased fall risk and decreased quality of life. In previous studies, community-based yoga has improved balance in adults with ABI. However, the neural underpinnings of balance improvements are unknown, as standardized measures of balance (i.e. those used in previous studies) do not permit simultaneous neuroimaging. The purpose of my thesis is to determine if yoga-induced balance improvements can be detected when balance is assessed with simultaneous neuroimaging. Seven participants (3 female, mean age=49.86) with chronic ABI were assessed before and after an 8-week community-based yoga intervention. Six balance tasks were adapted from the Berg Balance Scale (BBS) and repeated four times in a randomized block design to permit simultaneous evaluation of balance and neuroimaging via functional near-infrared spectroscopy (fNIRS). Due to adaptations, standardized BBS scores could not be calculated; thus balance was evaluated using Functional Independence Measure (FIM) scoring criteria, using scores from Dependent (1), Independent (7) to indicate the amount of assistance participants needed. Grand averages of balance performance were calculated, and a Wilcoxon signed-rank test was used to compare pre-yoga and post-yoga performance. Significant improvements in balance from pre-yoga (Median=4.67, SE=1.20) to post-yoga (Median=5.33, SE= 0.91) were observed, p=0.043. This suggests that yoga-induced balance improvements can be detected even when balance is assessed with simultaneous neuroimaging.

Association Between Anticholinergic Medication Burden and Resting Cerebral Blood Flow in Schizophrenia

Colton Castro, Emily Sturm, Samantha Weed, Yash Joshi, Michael Thomas
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Colton Castro, Samantha Weed**
Advisor/Mentor: Dr. Michael Thomas
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42865

Psychotropic medications used in the treatment of schizophrenia (SZ) are helpful for attenuating SZ symptoms but have complex effects on cognition. Recently, large cross-sectional studies have demonstrated that anticholinergic medication burden (ACB) stemming from psychotropics is associated with impairment across multiple cognitive domains in SZ outpatients. Despite these important observations, the mechanisms by which ACB produces SZ-cognitive dysfunction remain unclear. In this exploratory analysis, we aimed to determine whether resting cerebral blood flow (CBF) in multiple regions of interest (ROIs) are impacted by ACB. Perfusion was measured using functional magnetic resonance imaging and an arterial spin labeling protocol in

14 individuals with SZ. Average CBF was quantified for bilateral ROIs representing cortical and subcortical structures based on the talairach atlas. Average CBF in each ROI was correlated with ACB scores. Results were interpreted in terms of effect size defined as medium (r = 0.3-0.49), or large (r = 0.5-1.0). A large positive correlation was found between ACB and CBF in the nucleus accumbens (r = .57). Medium sized negative correlations were found in the right amygdala (r = -.48) and left temporal gyrus (r = -.44). Medium sized positive correlations were found between the right superior temporal gyrus (r = .48) and left caudate (r = .43). This suggests that ACB is correlated with resting CBF in brain structures relevant not only to cognitive functioning, but previously reported illness-specific associations and plausible medication-specific targets. Interpretations are limited by small sample size, but future studies will aim to replicate these findings.

Associations Between Diabetes and Psychomotor/Balance Performance

Ariana Crary, Krystyna Kolodziej, Brett Fling
College of Health and Human Sciences,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Ariana Crary**
Advisor/Mentor: Dr. Brett Fling
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42831

37.3 million US adults have diabetes and it has become the seventh leading cause of death in the US (Center for Disease Control and Prevention). It is known that diabetes can cause hyperglycemia, nerve damage, cognitive impairments, and many other symptoms, but how these relate to balance and psychomotor performance is not thoroughly understood. Since balance and psychomotor skills are pertinent to a normal lifestyle, including proper gait and proprioception function, we want to further explore how these are affected in individuals with diabetes. To do so, we collected data from individuals with diabetes using the NeuroCom Balance Master to obtain balance data and combined this with psychomotor tests (Purdue Pegboard, Grooved Pegboard, and Digit Signal Switching Test) to also understand how cognitive psychomotor tasks are affected. We are early in our data collection stage, but preliminary results indicate that younger individuals with diabetes perform relatively similar to age-matched controls, while older individuals with diabetes perform worse compared to age-matched controls. This could be related to increased cognitive decline and nerve damage as the disease progresses, but further data will be needed in order to support this.

Bacillus Subtilis DE111 Improves Endothelial Function in Male Mice Fed a Western Diet

Gabriele D. Brown, Briana D. Risk, Elliot L. Graham, Mingyue Zhang, Grace Stark, Kayla Hinkle, Christopher L. Gentile PhD, Tiffany L. Weir PhD
College of Health and Human Sciences,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Gabriele Brown**
Advisor/Mentor: Dr. Christopher Gentile and Dr. Tiffany Weir
Category: Research Poster

Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42991

The gut microbiota has emerged as a critical regulator of human physiology. Disturbances to the microbiota, broadly termed dysbiosis, are linked to various chronic diseases, including cardiovascular disease (CVD). Notably, there is evidence linking dysbiosis to vascular dysfunction, an early predictor of CVD. In a pilot study of healthy humans, we observed that the spore-based probiotic, Bacillus Subtilis DE111 (DE111), improved vascular dilation. The current study further examined the efficacy of DE111 in a mouse model of diet-induced obesity. Male C57/BJ mice were fed a standard diet (SD; n=24) or western diet (WD; n=24) for 8 weeks and were then further divided such that half of the animals (n=12) on each diet received 1 billion colony forming units per day (CFU/d) of DE111. DE111 improved western diet-induced endothelial dysfunction independent of body weight or glucose homeostasis. These initial data suggest that the novel probiotic, DE111, may be beneficial for improving cardiovascular health. Current and future analyses will determine how DE111 mediates these beneficial effects, and whether they are relevant to human disease.

Bimanual force coordination deficits after stroke are influenced by task constraints

Paxton Zettl, Prakruti Patel, Neha Lodha
College of Health and Human Sciences

Presenter(s): **Paxton Zettl**
Advisor/Mentor: Dr. Prakruti Patel, Dr. Neha Lodha
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42917

Background: Deficits in force output are key in motor impairment after stroke. Our study looked at coordinating forces in bimanual tasks using a pinch grasp and determining whether bimanual force coordination is influenced by tasks constraints both post stroke.
Methods: Ten chronic stroke survivors (67.04¬± 12.00 years) and eleven healthy adults (67.84¬± 10.07 years) completed a visually guided force-tracking task involving pinch grasp. Participants performed tasks bimanually in symmetric and asymmetric conditions. Participants increased and decreased forces (0-10N) either simultaneously or alternating to follow a sinusoidal force trajectory. Correlation coefficient and time lag quantified temporal coordination between two forces. Amplitude of coherence in 0-0.5Hz quantified coordination of forces in frequency domain.
Results: Cross-correlation coefficient did not differ between groups in the symmetric condition ($p>0.05$); in asymmetric condition stroke group showed less correlation compared with the control group ($p=0.01$). A significant main effect of group ($p=0.04$) suggested the stroke group had a higher time lag between two forces relative to controls. Significant main effect of group ($p=0.00$) indicated the stroke group showed reduced amplitude of coherence in 0-0.5Hz relative to controls. There was a significant main effect of condition where amplitude of coherence was higher for symmetric condition relative to the asymmetric condition ($p=0.03$).
Conclusion: This study shows impairment to coordinate forces bimanually in pinch grasp after stroke for temporal and frequency synchronization. Diminished ability to synchronize forces

bimanually may limit functional tasks of daily life and therefore have implications for rehabilitation interventions post stroke.

Biology and Molecular Tools for Management of Hemp Russet Mite- The Most Important Pest of Hemp

Olivia Carter, Jacob MacWilliams, and Chris Hayes,
College of Agricultural Sciences

Presenter(s): **Olivia Carter**
Advisor/Mentor: Dr. Punya Nachappa
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42908

Cannabis sativa, or hemp, is becoming an increasingly important agricultural crop worldwide. Pest species affecting hemp in the United States have been documented, however there is little understanding on proper management. One species of particular importance, the Hemp Russet Mite (Aculops cannabicola, HRM) is a microscopic arthropod which feeds on the leaves, stems, and petioles of hemp. Due to its minute size, HRM can go unrecognized until population numbers are so large that they have already damaged crops, and their economic impact is likely underestimated. Fundamental information of HRM is almost completely lacking and prevents proper management. This study intends to report the life history of HRM on both fiber and CBD varieties of hemp, and to develop molecular markers from related species to identify infestations before reaching damaging levels. We evaluated the life cycle of HRM by transferring adult mites to clean hemp leaves placed on a nutritionally supplemented medium, these plates are checked daily to determine basic life history traits and timeline of HRM development. A second study is conducted using PCR primers from a closely related eriophyid mite species to specify gene sequences and develop HRM-specific primers for use in further analysis. Our results show a basic timeline of life history traits on two varieties of hemp. Additionally, molecular markers for HRM have been developed and used in qPCR analysis. This research will hopefully provide hemp producers and stakeholders with a better understanding of this pest and a way to detect populations at an early stage.

Body Condition Explains Exploratory Behavior of Creek Chub in Experimental Streams

Megan Locklear, Yoichiro Kanno
Warner College of Natural Resources

Presenter(s): **Megan Locklear**
Advisor/Mentor: Yoichiro Kanno
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42841

We conducted laboratory experiments to evaluate whether metrics of body condition affected exploratory movement of Creek Chub (*Semotilus atromaculatus*) at 16 and 22 °C. Each of two experimental streams was composed of two circular tanks (4 feet diameter) connected by a

straight corridor (18 inches wide, 5 feet long), which was equipped with a pair of PIT antennas to monitor fish movement between the circular tanks. Creek chub (74-97 mm TL) were collected from the Spring Creek, Fort Collins, in October 2021 and were transported to the experimental streams on the Colorado State University main campus (N = 52 fish at 16 °C and N = 50 fish at 22 °C). After a 24-hour acclimation period, we monitored inter-pool movement of fish tagged with 12-mm PIT tags for 72 hours with a photoperiod controlled at 9 hours of daytime and 15 hours of night. Results showed that, at both temperatures, larger fish or fish in better body conditions moved more frequently than smaller fish or those in poorer body conditions. Percent weight loss and dry matter content (ratio of wet versus dry weight) were better predictors of movement than weight-at-length, which is mostly typically used as a surrogate of body condition in the field movement research. The vast majority of movement occurred in the dark, and mobile individuals were consistently mobile across three nights. This study indicated that individual variation in movement could be linked to various metrics of body condition.

Canine Exoskeleton for Rehabilitation

Nicole Mitchell, Matt Ahern, Ryan Gloekler, Kendra Ott, Katie Evans, Elizabeth Stienike, Drew Rackow
Walter Scott, Jr. College of Engineering

Presenter(s): **Nicole Mitchell, Matt Ahern, Ryan Gloekler, Kendra Ott**
Advisor/Mentor: Dr. Anura Jayasumana
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42959

The Canine Exoskeleton for Rehabilitation is an electro-mechanical orthopedic brace system designed to assist with the recovery and rehabilitation of injured and partially paralyzed canine hind legs. A multi-disciplinary team of biomedical, mechanical, electrical, and computer engineers aims to design, manufacture, and test a canine exoskeleton prototype fit for use in clinical settings. The current project builds upon the work and experience gained by six previous generations of senior design canine exoskeleton teams. Every generation since has worked to modify and improve this prototype to meet all design constraints including adding a stepper motor driven hip joint, brace variability, and an overall studier cart design. This year's team worked with last year's prototype to develop a new prototype better able to meet all design constraints and requirements and improve the stability, organization, and ease of use of the device. The goal was to create a fully functional device by the end of the academic year that is fit to be variably tested on a medium to large sized canine subject. In collaboration with our academic and industry partners, we improved the speed of the device and the ease of adjustability to meet the needs of the VTH. Using mechanical and electrical principles and control systems, our team designed, developed, and manufactured a device that will improve the lives of these dogs. This device will be very useful for initial clinical testing at the VTH, and a successful demonstrable prototype has the potential for future venture opportunities.

Capillary Driven Immunoassay for E. coli Detection

Rae Bellows, Zachary Call, Jeremy Link, Jason Boes, Elijah Barstis, Charles Henry
College of Natural Sciences

Presenter(s): **Rae Bellows**
Advisor/Mentor: Dr. Charles Henry
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43016

Escherichia coli (*E. coli*) is a widespread source of illness for humans, causing stomach cramps, diarrhea, vomiting, and Hemolytic Uremic Syndrome (HUS). In order to reduce the transmission rates of *E. coli,* sensitive, cost efficient, and fast diagnostic tools are essential. While current detection methods for *E. coli* such as polymerase chain reactions (PCR) and the enzyme-linked immunosorbent assay (ELISA) are very sensitive, they require trained personnel, expensive machinery, and long run-times. An alternative detection method, the lateral flow assay, addresses these issues with an inexpensive, one-step device design and fast run-times, but also results in reduced sensitivity compared to other methods. This work seeks to introduce the Capillary Driven Immunoassay (CaDI) as a detection method for *E. coli* that could provide both high sensitivity and practical operating parameters. The CaDI operates by sequentially delivering the reagents of a sandwich ELISA across a test and control line and is driven by capillary flow. By utilizing the sensitivity of an ELISA combined with the efficiency of a lateral flow assay, the CaDI is an optimal device to detect *E. coli*. At this stage in the research, a complete procedure for a DH5-α *E. coli*ELISA has been developed as a baseline for the conditions in the device. The CaDI was also used to detect the *E. coli* fluorescently, using Alexa Fluor 488 conjugated secondary antibodies. Currently, the conditions in the device are being optimized to detect *E. coli* colorimetrically, using the traditional steps of a sandwich ELISA.

CDK8/19 Inhibition in Canine Histiocytic Sarcoma Cells

Kambrie Smith, Lisa Schlein
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Kambrie Smith**
Advisor/Mentor: Dr. Douglas H. Thamm
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43034

Histiocytic sarcoma is a disease that affects both humans and dogs, and is highly prevalent in particular dog breeds, including Burmese Mountain dogs and flat-coated Retrievers. This provides an obvious study population for this rare and deadly disease. Senexin B is a CDK8/19 inhibitor and is a promising compound for histiocytic sarcoma. CDK8/19 is an oncogene that has been implicated in several cancers as well as being required for tumor growth. CDK8/19 inhibition has been shown to increase the efficacy of chemotherapy and radiation therapy, thus making it a promising anticancer drug. To study the antiproliferative effects of Senexin B growth inhibition

assays were done. Senexin B strongly inhibited growth of 3 canine histiocytic sarcoma cell lines. When Senexin B was combined with the drug CCNU, there were no additional effects seen. To study the anti-inflammatory effects of Senexin B, cytokine assays were done as well as RNA sequencing via NanoString. Treatment of cells with Senexin B induces gene expression for multiple pathways, including the inflammatory response, apoptosis, and IL-6 via STAT3/JAK. In conclusion, Senexin B has anti-proliferative effects on canine histiocytic sarcoma cell lines and modulates components of the immune response.

Characterization of Biogenic Amine Receptors in the Y-Organ of Gecarcinus lateralis

Julia Newcomb, Talia Head, Don Mykles
College of Natural Sciences

Presenter(s): **Julia Newcomb**
Advisor/Mentor: Dr. Donald Mykles
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42788

Ecdysis is the shedding of the exoskeleton, a vital process in crustaceans controlled through a complex signaling pathway. Molting is managed by two main organs: the Y-organ (YO) and X-organ/sinus gland complex (XO/SG). The YO is responsible for producing and secreting ecdysteroid molting hormones, which travel peripherally to tissues to ready them for molting. The production of these ecdysteroid hormones in the YO is negatively regulated by molt-inhibiting hormone (MIH) produced and secreted by the XO/SG. Stimulation of ecdysteroid synthesis in the YO can be induced by a number of ligands. Biogenic amine receptors have been identified in the YO transcriptome and downstream pathways of serotonin (5-HT) have been linked to the protein kinase C (PKC) pathway leading to ecdysteroidogenesis. Six putative biogenic amine receptors have been identified in the YO of Gecarcinus lateralis: 3 serotonin, 2 dopamine, and 1 octopamine. This study aims to characterize the expression of biogenic amine receptors in the YO over the course of the molt cycle, as well as quantify the effects of serotonin on ecdysteroid synthesis and secretion. Funding is provided by NSF (IOS-1922701).

Characterization of Leucine-Rich Repeat-ContainingG Protein-Coupled Receptors (LGR) in Gecarcinus lateralis

Ayaka Paul
College of Natural Sciences

Presenter(s): **Ayaka Paul**
Advisor/Mentor: Dr. Mihika Kozma
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42887

Molting is a cyclic process driving growth and regeneration in crustaceans. Y-Organs (YO) are a pair of glands that synthesize ecdysteroids, stimulating progression through the four stages of the crustacean molt. YO transcriptomes of *Gecarcinus lateralis* (blackback land crab) have gene

expression of five putative leucine-rich repeat-containing G protein-coupled receptors (LGRs). LGRs belong to class A rhodopsin-like GPCRs containing multiple regions of leucine rich repeats (LRR), low density lipoprotein motif (LDL), and a 7-transmembrane domain. LGRs are classified into three types (A, B, C) based on the number of LRRs, structure of the hinge region, and presence of LDL motifs. Gene expression of LGRs, especially LGR2 and LGR3, in *G. lateralis* YO is important due to their role in other arthropods. LGR2 and its associated ligand, bursicon, are involved in cuticle tanning/hardening, and wing expansion in insects. In green shore crabs, a surge of bursicon release coincides with ecdysis, suggesting LGR2 involvement in the crustacean molt cycle. In *Drosophila*, LGR3 is activated by the insulin-like peptide, Dilp8, secreted by damaged imaginal discs. LGR3 activation increases nitric oxide synthase, reducing ecdysteroid synthesis and halting metamorphosis until damaged imaginal discs are regenerated. Similarly, in decapod crustaceans damage to regenerating limbs in early premolt delays molting to allow synchronous limb regeneration. The LGR superfamily in decapods was characterized phylogenetically, and gene expression analyses of LGRs in YO of *G. lateralis* across molt stages when appendages are damaged will improve our understanding of their role in molting. Support: NSF (IOS-1922701) and CSU Honors Program.

Characterization of Protein Kinase C in the Molting Gland of Gecarcinus lateralis

Laura Antizzo, Talia Head, Donald Mykles
College of Natural Sciences

Presenter(s): **Laura Antizzo**
Advisor/Mentor: Dr. Donald Mykles
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42976

Ecdysis, the act of shedding the exoskeleton, is an important growth event of decapod crustaceans. The molt cycle is a unidirectional process consisting of the stages: intermolt, premolt, ecdysis, and postmolt. The neuropeptide, molt inhibiting hormone, is synthesized within the X-organ of the eyestalk ganglia and inhibits the Y-organ (YO). The YO synthesizes and secretes molting hormones (ecdysteroids), which are necessary for transitioning through the molt cycle. The activation of protein kinase C (PKC) is hypothesized to stimulate ecdysteroid synthesis through activation of the mechanistic target of rapamycin (mTOR). However, the extracellular ligand and downstream events of PKC activation are not fully understood. Currently, we have identified five candidate sequences of PKC isoforms in the YO transcriptome of Gecarcinus lateralis. PKC isoforms are classified based upon their second messenger requirements. Of the three PKC subfamilies, conventional, novel, and atypical, we believe one sequence is conventional, two are novel, and two are atypical. The isoforms appear to have differential expression across the molt stages. Expression of the conventional and novel PKC isoforms increase during premolt stages. The atypical isoforms appear to have comparatively low expression across all molt stages. Future work will include further sequence analysis and qPCR to quantify transcript expression in various tissues, followed by assays using pharmacological inhibitors or activators of PKC to determine the role of specific isoforms in mTOR activation by examining ecdysteroid secretion. Funding is provided by NSF (IOS-1922701).

Characterization of the Neuropeptide Corazonin, its Receptor and its Role in the Crustacean Molt Cycle

Ashlynn Madril, Jorge Pérez-Moreno, Donald L. Mykles
Warner College of Natural Resources,College of Natural Sciences

Presenter(s): **Ashlynn Madril**
Advisor/Mentor: Dr. Donald L. Mykles
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43001

Molting in crustaceans is a complex cyclical process necessary for growth, reproduction, and the regeneration of lost appendages. Given its involvement in a wide array of biological processes, it's unsurprising that the molecular mechanisms underpinning the regulation of molting have been subject of attention for carcinologists and endocrinologists alike. Numerous neuropeptides, secreted by the X-Organ (XO) in the eyestalk ganglia and acting upon the Y-Organ (YO) within the crustacean cephalothorax, have been hypothesized to be involved in regulating the molt cycle. Most notably, previous studies have emphasized the significant role played by the Molt-Inhibiting Hormone in such regulation by inhibiting the activation of the YO and maintaining it in its basal state. Nevertheless, the XO has also been found to express numerous neuropeptides whose functions in crustaceans are not fully understood. For example, corazonin is a neuropeptide that is found across many arthropod lineages, whose putative receptor is reportedly highly expressed in the YO suggesting a role in molting. The proposed study uses the blackback land crab, *Gecarcinus lateralis*, as a model to fully characterize corazonin, putative receptors, and corresponding gene expression across multiple organs and tissues (eyestalk ganglia, YO, hepatopancreas, etc.). Well-characterized homologous sequences from related arthropods will be used to search a custom transcriptomic database of >190 crustacean species for candidate peptide sequences, which will be subsequently employed for phylogenetic reconstruction and functional annotation. In combination with gene expression analyses across tissues, the results of said inference will illuminate the role of corazonin in the crustacean molt cycle.

Characterizing Vanadium (V) Schiff Base Catecholates With Cyclic Voltammetry

Drew Walters, John Hagan, Alison Haase, Debbie Crans
College of Natural Sciences

Presenter(s): **Drew Walters**
Advisor/Mentor: Kate Kostenkova
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42941

Vanadium (V) Schiff base catechol complexes have been shown to have high cytotoxic properties that may be useful in the treatment of cancer. Its multidentate back bone (SALMINH) is a none-innocent ligand that creates interesting effects when examined with cyclic voltammetry. Using

cyclic voltammetry this experiment will examine the half-way potentials of both [VO(Cl-SALIMH)X] and [VO(SALIMH)X] complexes. Additionally, the reversibility of the redox properties of the complexes will be examined using the amperage peaks.

Childhood Cancer Survivors and Psychological Outcomes: A literature review

Hannah Gilliard
College of Natural Sciences

Presenter(s): **Hannah Gilliard**
Advisor/Mentor: Dr. Neomi Vin-Raviv
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43026

The purpose of this review is to explore and focus on psychological outcomes among survivors of childhood cancer survivors. The diagnosis, treatment, and medical late effects of childhood cancer may alter the psychosocial trajectory of survivors across their life course. This young age may place them at increased risk for psychological impairment due to the disruption of normal psychosocial development by intensive cancer treatment. The diagnosis and treatment of childhood cancer may impair the psychosocial development as some childhood cancer survivors (CCS) have been shown to be hindered in their development. This literature review focuses on mental health symptoms, achievement of social milestones, socioeconomic attainment, and risky health behaviors in survivors of childhood cancer. Long-term psychological impairment in CCS is not well characterized because, until recently, many succumbed to their disease. Studies used in this review were retrieved from PubMed database and included electronic content of professional journals. The following search terms were used: 'childhood cancer survivor' AND 'anxiety' OR 'risky health behaviors' OR 'posttraumatic stress'. Search held on Colorado State University database. Overall, four studies were reviewed addressing psychological outcomes among CCS. One study served as background review on the subject. While one study examined the risk of post-traumatic stress symptoms, and two studies examined the risk of suicides among childhood cancer survivors. Childhood cancer survivors appear to have an increased risk for behavior-related causes of death. Health care providers who work with CCS should be aware and provide opportunities for preventive interventions among survivors of childhood cancer.

Chimeric Antimicrobial Enzyme: Jel-Endo

Gracie Eaton, Dr. Claudia Gentry-Weeks
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Gracie Eaton**
Advisor/Mentor: Dr. Claudia Gentry-Weeks
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42994

Antibiotic resistance is a common, but concerning worldwide issue. The emergence of antibiotic resistant bacterial pathogens, often known as "superbugs", are making infections potentially very

difficult to treat. With current antibiotics being effective against fewer and fewer pathogens, the need for new antimicrobials is great. In order to combat this rising threat, different types of antimicrobials are being explored as opposed to relying on the current types of antibiotics. Two new methods of combating bacterial infections include the use of bacteriophages, which are viruses that only infect and kill certain bacteria. The second, is the many naturally produced antimicrobial peptides that various animals and plants have as a means of innate immunity against pathogens. By combining bacteriophage endolysin, a protein synthesized to lyse bacterial cells, with an antimicrobial peptide, a chimeric antimicrobial can be made and tested as a viable new antibiotic option. We test a chimeric antimicrobic made from endolysin from a bacteriophage that is known to infect Pseudomonas spp. called KZ144, and an antimicrobial peptide found in honey bee royal jelly, called Jelleine-1. Together, this antimicrobial peptide is called Jel-Endo. With Jel-Endo we hope to inhibit bacterial growth by attacking multiple different targets. We tested Jel-Endo's effect against S. aureus ATCC in different buffers to see which enhances the activity best. We will be transforming a yeast, Pichia pastoris, to see if it will be more efficient in synthesizing Jel-Endo.

Chromatin impacts on global RNAP positioning in Thermococcus kodakarensis

Robert L. Vickerman, Breanna Wenck
College of Natural Sciences

Presenter(s): **Robert Vickerman**
Advisor/Mentor: Dr. Thomas Santangelo
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43063

Transcription is an essential process in all three domains of life. There is great interest and insight into studying the nascent RNA population in a cell rather than at steady state, where many RNAs have already been degraded. Native elongating transcript sequencing (NET-seq) is a technique that has been developed and put to use in various bacterial and eukaryotic species; however, it has not been used in an archaeal organism, much less an extremophile. I will discuss and show the current progress made on developing a fully functioning NET-seq protocol in the anaerobic, hyperthermophile Thermococcus kodakarensis. Additionally, I have generated six different mutant strains of T. kodakarensis for use once NET-seq has been successfully performed with the control strains TS559 and TS413. These strains are a combination of a few important mutations that are known to impact transcription in archaea, including a deletion of archaeal histone B, a single nucleotide polymorphism in archaeal histone A, and a deletion of transcription factor S. The L subunit of T. kodakarensis' only DNA directed RNA polymerase was necessarily tagged in every strain to allow for purification in the NET-seq protocol.

Chronic Immune Stimulation to Suppress Tumor Metastasis in a Mouse Model of Osteosarcoma

Kayla Fairweather, Laura Chubb, Dr. Ruth Rose, Lauren Monroe, Dr. Nicole Ehrhart
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Kayla Fairweather**
Advisor/Mentor: Dr. Nicole Ehrhart
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42975

Osteosarcoma is the most common bone cancer in canines and humans. It is understood that the body's immune system has the potential to fight some forms of cancer, and several studies have found a correlation between infection following limb-sparing surgery in canine osteosarcoma patients and increased survival times. This study investigates a novel immunotherapy designed to induce an innate immune response to indirectly impact osteosarcoma progression and metastasis. Specifically, membrane pouches containing Staphylococcus aureus are placed into sites of tumor removal in mice and time to metastasis and local progression are evaluated. It is hypothesized that the presence of bacteria contained within the pouches will stimulate the immune system to fight residual tumor without causing systemic infection. Nylon membranes with 0.2 ¬µm pores and PVDF Durapore membranes with 0.1 ¬µm pores have been examined as potential pouch materials. Different loading techniques were tested including injecting bacteria in LB broth directly into the pouches as well as seeding bacteria on silk suture strands before placement in the pouches. PVDF membrane better retained the bacteria. During in vivo testing, PVDF pouches were implanted subcutaneously or at the site of hind limb amputation in C3H mice. IVIS imaging was used to monitor bacteria migration. Mice that received pouches loaded with bacteria in broth suffered compromised healing. For future studies, an orthotopic osteosarcoma will be established in the left hind tibia of mice followed by hind limb amputation and pouch placement in the distant dorsal mid-scapular region.

Climate Change Impacts on Seasonal Survival of Golden-mantled Ground Squirrels

Bodie Spinner, Mo Chen, Dr. Caitlin Wells
Warner College of Natural Resources

Presenter(s): **Bodie Spinner, Mo Chen**
Advisor/Mentor: Dr. Caitlin Wells
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43044

Climate change is transforming high elevation ecosystems, forcing organisms to cope with new conditions. It is important for the conservation of high elevation ecosystems to understand how climate change will affect hibernators such as the golden-mantled ground squirrel (Callospermophilus lateralis). Golden-mantled ground squirrels are an important prey species for many high elevation ecosystems across western Canada and America. Golden-mantled ground squirrels cope with harsh winters by building up fat reserves in the summer and hibernating in burrows through the winter. However, there is a lack of research looking into how climate change is impacting seasonal mortality for hibernating mammals at high elevations. Our study examines the seasonal mortality of Golden Mantled ground squirrels at a high-elevation site in the southern Rocky Mountains, Colorado. We determined if there was a significant change in mortality rates between active and hibernation seasons across time, and how these trends correspond to

changes in climate. Our analysis indicates that though total snowfall had no impact on seasonal mortality, earlier springs are significantly decreasing active season survival. This means that the insulating effects of snowpack are not critical for survival over the hibernation season and this population is likely facing increased predation pressure.

Clonable Nanoparticle Protein Tagging in Yeast for Electron Microscopy

Audrey Alspach, the Ack Lab
College of Natural Sciences

Presenter(s): **Audrey Alspach**
Advisor/Mentor: Grad. Alex Hendricks
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42901

Current methods of subcellular imaging are fundamentally challenged by the physical properties of biological matter. In order to observe and understand cellular behavior, electron microscopy is often used due to its unparalleled atomic-level imaging resolution and raw data acquisition. However, a big problem with biological electron microscopy is the notoriously low contrast when comparing structural elements, notably proteins; the end result is that most of a cell appears invisible without special treatment. This “contrast problem” is a result of the relatively homogeneous composition of “electron-light” proteins and other biomolecules, which do not interact strongly with incident electron beams used in imaging. To provide a more accurate depiction of where a specific protein would lie in a cell, a clonable heavy metal nanoparticle (“clonable nanoparticles”) can be attached to the protein of interest in order to increase electron scattering and thus increase imaging contrast. My work is directed towards adapting the clonable nanoparticle system to yeast cells. As part of a proof-of-concept experiment, the protein actin will be 'tagged' with a clonable metal nanoparticle and inserted into yeast cells through genetic engineering. Eventually, genetically engineered yeast will be imaged through electron microscopy to evaluate how imaging contrast is improved by clonable metal nanoparticle tags. Provided this goes well, introducing tagging into more complex eukaryotic cells or experimenting with multiple tags in one cell to differentiate multiple proteins could be explored.

Colorado State University Fiscal Year ’21 Nitrogen Footprint

Laura Lenhart, Xiaowen Sun, Jill Baron, Allison Leach, Stacey Baumgarn
Warner College of Natural Resources

Presenter(s): **Xiaowen Sun, Laura Lenhart**
Advisor/Mentor: Dr. Jill Baron
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43014

The rise in nitrogen pollution is causing devastating impacts on the air and water quality, eutrophication of bodies of water and coastal regions, stratospheric ozone depletion, and climate change. As a part of CSU’s sustainability effort, the Nitrogen Footprint team has calculated and

analyzed the nitrogen footprint for the 2021 fiscal year. A nitrogen footprint calculates the reactive nitrogen from food production and consumption, utilities, transportation, fertilizer, research animals, and agriculture. We contacted CSU Housing and Dining staff to collect information on food purchases. To address our research question, we processed the data by formatting the raw data and uploading it to SIMAP in accordance with the instructions provided by the Nitrogen Footprint team to calculate the Nitrogen Footprint data for the entire fiscal 2021 year for making future reduction recommendations. We expect to compare the differences in nitrogen footprints between this year and previous years, and create pie and bar charts to compare the entire emissions and categories in food, utilities, fertilizer, etc. Food Purchase is CSU's largest source of nitrogen waste and is one of the easiest ways the research can be applied for recommendations for nitrogen reduction.

Comparative Dental Analysis of Early Eocene Mammals Diacodexis, Cantius & Microsyops (Willwood Fm, Bighorn Basin, WY)

Natalie Freeman
College of Liberal Arts

Presenter(s): **Natalie Freeman**
Advisor/Mentor: Professor Kimberly Nichols & Dr. Thomas Bown
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42767

Fossils are rare, formed under unique circumstances: enduring, despite very high odds against preservation. Oftentimes, vertebrate fossils of the highest quality and quantity are teeth, due to the hydroxyapatite that forms enamel. Teeth convey a great deal of taxonomic and adaptive information. Taxa are characterized by size, shape, dental formula, cusping patterns, and additional dental traits. Many of these reflect dietary adaptations. This project compares the dental characteristics of three early Eocene mammals: Diacodexis, Cantius, and Microsyops. The fauna are united by dietary generalization. Such similarities, as well as overlapping body mass ranges and shared environments, can result in the misidentification of the taxa. My primary focus is to illustrate representative dental specimens of each genus within a single image. This visual comparison elucidates distinctive traits. The accurate identification of taxa facilitates reconstruction of the Willwood paleobiome during the earliest Eocene (~56-52 Ma).

Comparison of the Influence of Five Cannabidiol Formulations on Kidney and Liver Function

Matthew Bomar, Taylor Ewell, Kieran Abbotts, Hannah Butterklee
College of Health and Human Sciences

Presenter(s): **Matthew Bomar**
Advisor/Mentor: Dr. Christopher Bell
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42814

With the increased usage of Cannabidiol (CBD) in the American public, research and clinical trials have gone underway to determine the potential physiological effects of CBD. While some research and clinical trials have found that regular CBD usage has negative effects on the liver and kidney, other research has determined that CBD might relieve symptoms of people with chronic liver and kidney disease. The purpose of this study was to investigate the properties of CBD, and its influence on kidney and liver health. Adult men (n=14) with overweight or obesity (determined by Body Mass Index, >25kg/m^2) imbibed 5 different CBD formulations (725, 126, 625, 088, and 213) in a randomized crossover design. Each CBD formulation possessed 30 mg of CBD powder or oil dissolved or mixed into water. Circulating factors to determine kidney and liver health were analyzed with comprehensive metabolic panels via chemical analysis. Some CBD formulations were found to significantly increase albumin (088 and 725) and total bilirubin (625, 213, 126, and 725). However, the increase for these circulating factors were still within a physiologically safe range, indicating that CBD caused no harm or benefit to liver and kidney function.

COVID-19 Impacts on the Yellowstone National Park Soundscape

Katerina Elizabeth Lee, Kurt Fristrup, Jacob Job
College of Natural Sciences

Presenter(s): **Katerina Elizabeth Lee**
Advisor/Mentor: Dr. Jacob Job
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42845

COVID-19 shutdowns are thought to have had wide-ranging effects as the world collectively attempted to mitigate public health risks by enacting shutdowns and closures. Impacts were felt across the United States, including at National Park units, which were closed to visitation from March-May/June 2020. The effects of park closures are thought to be extensive, yet still relatively unknown. We explore the degree to which human activity impacted the soundscape along a heavily trafficked road at one of the busiest National Parks, Yellowstone. Using continuous acoustical data gathered by automated recording units deployed during the 2020 shutdown and during the same period in 2018, we examined changes in the patterns and presence of noise, as well as vehicle and aircraft counts. Our findings indicate distinct reductions and changes in the patterns of overall loudness as well as vehicle and aircraft presence during the 2020 shutdown period as compared to 2018. These observations reflect changes in human behavior during the shutdown. Understanding the impacts of COVID-19 shutdowns can help guide future park management decisions regarding visitation and use policies that minimize negative impacts on visitor enjoyment and wildlife wellbeing.

Crab Density in Intertidal Mud Flats Located in Magdalena Bay, BCS, Mexico

Inga Erickson
College of Natural Sciences

Presenter(s): **Inga Erickson**

Advisor/Mentor: Dr. Graham Peers
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43013

The intertidal mud flats in Magdalena Bay are marked with thousands of small holes, dug by crabs as a method of getting oxygen while buried. The presence of invertebrates can be a reliable indicator of the health of the intertidal environment. The purpose of this study is to determine if a relationship exists between the number of air holes in the sand and the number of crabs present in the area. Three randomly selected testing sites measuring 1m2 were used for observations. The area was disturbed by one person moving nearby, and crab emergence was counted for 1 minute following disturbance. The data was too varied for there to be any correlation between air holes and crabs. We conclude that there is no correlation between the number of air holes and number of crabs present. This was a short term study with few sample sites, so a more extensive study will be necessary in the future to support these conclusions.

Defining the protein metabolic interactome of the hyperthermophilic archaeon Thermococcus kodakarensis

Danielle Riley, Teagan Rockwood, David Crosby
College of Natural Sciences

Presenter(s): **Danielle Riley**
Advisor/Mentor: Sere Willams, Dr. Thomas Santangelo
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42990

Through the process of evolution, earth's diverse lifeforms have developed very efficient metabolisms which enable them to obtain the energy needed to survive, thrive, and reproduce. Extremophiles, which are organisms that thrive in environments characterized by extreme pH, salinity, temperature, or pressure, possess incredibly unique and efficient metabolisms that allow them to survive in such extreme conditions. Thermococcus kodakarensis is an anaerobic, hyperthermophilic, archaeal species commonly found in the sediment of hydrothermal sea vents surrounding shallow water volcanos, making it a model organism for studying life in the extremes. Despite living in extremely hot, nutrient-poor conditions, T. kodakarensis rapidly grows and reproduces, suggesting a unique, efficient, and responsive metabolism. The overarching goal of my undergraduate research is to define the routes of energetic gain which make up the metabolic network of T. kodakarensis, also known as the metabolic interactome. Understanding the unique metabolic adaptations and protein interactions of T. kodakarensis will allow us to discover how extremophiles maximize energetic gains. As extremophiles such as T. kodakarensis are believed to share many of the properties and metabolic routes used by the first forms of life, my research has the potential to broaden our knowledge of the origins of life and the evolution of metabolic processes. Finally, as the metabolism of T. kodakarensis generates hydrogen in large quantities, efforts to re-route energetics also has important implications in the fields of alternative energy and sustainability.

Demonstration of the Nucleotide Excision Repair pathway using RADAR-seq

Ianna Debrunner, Andy Gardner, Tom Santangelo, Paul Caffery, Kelly Zatopek, Gentry Cork, Chippy Marx, Clayton Speed, Craig Marshall
College of Natural Sciences

Presenter(s): **Ianna Debrunner**
Advisor/Mentor: Dr. Tom Santangelo
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42972

Organisms constantly experience DNA damage that must be repaired to maintain viability and ensure passage of genetic material to the next generation. The diversity of DNA damage coupled with the importance of DNA repair demands the evolutionary retention of diverse and redundant DNA repair pathways. In Eukarya and Bacteria, the Nucleotide Excision Repair (NER) pathway is used to repair damage resulting in distortions of the DNA backbone. Many Archaea are known for their ability to thrive in environments where rates of DNA damage are greatly accelerated, suggesting robust DNA repair pathways beyond what other species demonstrate. Surprisingly, however, there is no experimental evidence of NER or new DNA repair pathways in Archaea. Given the importance of NER pathways for DNA repair in Bacteria and Eukarya, it is critical to define whether NER is active in archaeal clades. Advances in sequencing techniques offer new opportunities and routes to investigate whether NER is active in archaeal species. Rare Damage and Repair sequencing (RADAR-seq) is a sequencing method that can be used to quantify and map different types of DNA damage (Zatopek, 2019). My work first aims to demonstrate that RADAR-seq coupled to RNA-seq can quantify DNA repair rates in NER-proficient species (e.g. E. coli). Given our positive preliminary results in E. coli we are now turning experimental attention to the model hyperthermophilic archaeon Thermococcus kodakarensis, which encodes several homologs of enzymes that are components of eukaryotic NER, but for which NER has not been definitely established.

Determining The Mechanism of Action of A New Herbicide Class Using A Novel Artificial Intelligence Platform

Alyssa Twitty, Dr. Franck Dayan
College of Agricultural Sciences,College of Natural Sciences

Presenter(s): **Alyssa Twitty**
Advisor/Mentor: Dr. Franck Dayan
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42843

Startup company, Agrematch, has created a new artificial intelligence platform, Agresense™, that can predict target interactions. For the realm of weed research, this means the potential ability to predict target sites of compounds that are currently unknown. Discovering new modes of action (MOA) of herbicides is crucial to the agricultural industry due to the evolution of resistance to current herbicide classes. The Agresense™ platform has

potentially identified a new herbicidal class that acts on fatty acid biosynthesis as a target site. Currently not much is known about this MOA, and no commercial herbicides act on this target site. My project will be carried out in four stages to evaluate the predictions made by Agresense™. The goal of the first stage of this project is to confirm herbicidal activity of the compounds in the greenhouse. To do this, dose response curves will be performed on Palmer amaranth (*Amaranthus palmeri*) and green foxtail (*Setaria viridis*) plants. As part of this stage the data collected will consist of fresh and dry weights, chlorophyll content, carotenoid content, and photosynthetic electron transport. The second stage of this project will focus on the effects of fatty acid synthesis in the subject plants. Here, samples will be treated with a single discriminating dose determined from previous sets of experiments, and samples will be collected at varying time points. These samples will then be outsourced to the CSU-ARC Bio center to be analyzed for targeted metabolomics analysis of the fatty acid profile. The third stage of this project will focus on assaying de novo fatty acid biosynthesis using radiolabeled ^{14}C acetate. Data will be obtained in this stage using chromatography and scintillation counting. Lastly, the fatty acid synthase will be measured using an enzyme assay. Based on the results from these four project stages, conclusions will be able to be drawn about the predictions made by the Agresense™ artificial intelligence platform.

Developing a Confidence Score for Finding Natural Gas Leaks from Methane Surveys

Joshua Rogers, Zachary Weller, Joseph von Fischer
College of Natural Sciences

Presenter(s): **Joshua Rogers**
Advisor/Mentor: Dr. Zach Weller
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42902

In the last ten years (2010-2020), there were a total of 351 significant NG distribution pipeline incidents that were attributable to corrosion or equipment failure, incorrect operation, material failure, or natural force damage. These incidents resulted in 30 fatalities, 225 injuries requiring inpatient hospitalization, and an estimated total cost (including property damage, emergency response, and gas released) of $1.75 billion. Due to the many negative impacts, it's important to find and repair these leaks. For this research, we processed and analyzed data from an advanced leak detection (ALD) survey in Fort Collins. The ALD survey generated hundreds of natural gas leak indications. Following the survey, we developed a confidence score metric to score the leak indications based on their potential correspondence to natural gas. We used this metric to identify 14 locations to conduct follow-up on-the-ground investigations to verify the presence or absence of a natural gas emitting source during two different field visits. During our searches, we used handheld, highly sensitive methane analyzers to locate locations with elevated methane readings. We ultimately found a natural gas emitting source at 5 of these locations. The results of our study can be used to inform methods that discriminate between ALD leak indications arising from natural gas and those that do not, improving the efficiency of on-the-ground investigations.

Digitally Reconstructing the Past

Louis Inghilterra
College of Health and Human Sciences

Presenter(s): **Louis Inghilterra**
Advisor/Mentor: Dr. Maria Delgado
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43045

In the interior architecture industry, the primary focus of digital software modeling is to display a new design for a proposed construction project. In recent years, this modeling software such as Revit has been used to recreate historic buildings. This project focuses on exploring the ways in which Revit can be used to reconstruct a recently demolished Mid Century Modern Indoor Pool building by just referencing a scaled floor plan and photographs. The building selected for the project was an underrecognized architectural masterpiece that was built in 1958 as an addition to the Grossinger Resort in the Catskill Mountains of New York State. The Catskill Mountain and Grossinger's Resort were a part of a booming resort area in the 20th century that catered to Jewish Americans. Known as the Borscht Belt, this cultural heritage region was home to over 500 resorts between 1920 and 1990 and today they are all abandoned or demolished. The Indoor Pool Building at the Grossinger Resort was razed in 2018 after decaying for almost thirty years. This project aims to celebrate the architectural integrity to this lost historic building by digitally reconstructing it using Autodesk Revit software. The author discussed the project on an episode of the history podcast, the Borscht Belt Tattler.
https://borschtbeltpod.buzzsprout.com/1788603/9342766-reimagining-the-borscht-belt-with-louis-inghilterra

DNA Replicative Mechanisms in Thermococcus kodakarensis

Sarah Davidson, Geraldy Liman, Tom Santangelo
College of Natural Sciences

Presenter(s): **Sarah Davidson**
Advisor/Mentor: Geraldy Liman, Tom Santangelo
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43067

DNA replication is typically carried out be an ensemble of proteins that collectively synthesize both the leading and lagging strands simultaneously. Central to DNA replication is the enzyme that is actually responsible for DNA synthesis, a DNA polymerase (DNAP). Despite the retention of conserved mechanisms of DNA replication in most forms of life, the DNAPs responsible for DNA synthesis are not conserved and instead stem from evolutionarily diverse lineages or families. In Bacteria, the bulk of DNA synthesis is done by DNAP III, a polymerase -C family enzyme (Pol-C), whereas all eukaryotes use two Pol-B family enzymes for DNA replication. It was previously assumed that the retention of Pol-B family enzymes and the homology of DNA

replication components in eukaryotes and archaea would result in archaeal DNA replication being similarly dependent on Pol B. However, it has now been demonstrated that an archaeal specific form of DNAP, Pol D can function to replicate both leading and lagging strands independently upon deletion of Pol B without phenotypic consequences. The demonstration of three unique DNAP families responsible for replication in each of the three Domains (Pol C, Bacteria; Pol B; Eukarya; Pol D, Archaea) begs the question of the biological roles of Pol B in archaeal lineages, given the near universal conservation of Pol B in archaeal clades. This thesis is directed at determining the role of Pol B in the model archaeon Thermococcus kodakarensis, and specifically addresses whether Pol B activates could be responsible for repair of replication of the genome under stress conditions, as T. kodakarensis is known to use alternative strategies of DNA replication upon radical environmental shifts.

Do you Smell That?: Modifying The Behavior of Rats to Identify Introduced Scents

Michael Burns, Kyle Curtis, Caroline Loewecke, Kileigh Palmer, Rachel Hernandez, Makele Reed, Marcus Garcia, Josie Reinhardt, and Katey Fix
Walter Scott, Jr. College of Engineering

Presenter(s): **Michael Burns, Kyle Curtis, Caroline Loeecke**
Advisor/Mentor: Dr. Christopher Snow
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42854

In the teams' research they have been examining the behavioral sciences of rodents in the laboratory. After extensive research the team concluded that baby rats, trained from the beginning, were a suitable choice for the project. Then the team experimented with the best way to train rats to correctly identify "Wintergreen Scent" consistently. There were multiple different stages of getting the rodents ready for training. The team associated the rats with being handled and taking treats. The next step was to familiarize the rodents with the training/testing apparatus, along with showing the rats the levers to indicate whether they have detected the scent wintergreen. The final stage was a constant training and testing cycle, the protocol of testing and training the rats was to minimize confusion as to what they are supposed to be doing or detecting. The team placed the rodents on one side of the cage with a plexiglass divider keeping them away from the levers. Then the team administered a randomly chosen scent, either blank or Wintergreen Scent. The rats were food motivated as the team restricted their diet to 80% of original. When tested, a correct lever press received a treat and an incorrect lever press received no treat. If the rats did not press a lever for 1 minute, the test was considered inconclusive. The previously mentioned data that the team collected was to model the growth of knowledge in each individual rat.

Drosophila Melanogaster: A Genetic Model for Studying the Role of Synaptotagmin at the Neuromuscular Junction

Kaitlin Reed, Dr. Matthew Bowers, Morgan Litchford, Hannah Kramer, and Dr. Noreen Reist
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Kaitlin Reed**
Advisor/Mentor: Dr. Noreen Reist
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42952

One of the most practical and common model organisms for studying biological systems and human diseases are fruit flies, specifically Drosophila melanogaster. The Drosophila melanogaster genome has been studied extensively for years and is well understood and mapped out, and the flies require little maintenance compared to other organisms such as mice. Additionally, the human and Drosophila melanogaster genomes are 60 percent homologous (Ugur et al., 2016). One notable conserved biological process between humans and Drosophila melanogaster is the means by which synaptic transmission takes place through Ca2+ (calcium) dependent synchronous neurotransmitter release. Ca2+ dependent synchronous neurotransmitter release is essential for effective communication between neurons and between neurons and muscle cells in the neuromuscular junction. A key component in this communication is a presynaptic vesicular protein known as synaptotagmin (syt). Synaptotagmin serves as the Ca2+ sensor for fast, synchronous neurotransmitter release, meaning that it is by Ca2+ binding to synaptotagmin that multiple vesicles containing neurotransmitters fuse simultaneously to the plasma membrane and release neurotransmitters. There is still much to learn about the interactions between Ca2+ and synaptotagmin. In this study I perform a series of genetic crosses to propagate flies containing mutations in one of the Ca2+ binding domains on synaptotagmin to investigate the impact these mutations have on the functionality of synaptotagmin and neurotransmitter release from vesicles at the neuromuscular junction. Synaptotagmin has two binding Ca2+ domains, C2A and C2B. This study deals with mutations in the C2A binding domain.

Education Support for Low-Socioeconomic School

Anh Bui
Warner College of Natural Resources

Presenter(s): **Anh Bui**
Advisor/Mentor: Sam Desta
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42753

For many across the nation, inner-city urban schools are failing. The economic inequity is hard-wired into our school-funding systems, and many of these systems have relied largely on local property tax bases. This in turn has caused a noticeable funding gap, highlights the socioeconomic divide found in the flawed process of distributing these funds, and creates a gap for students' access to higher education. My community specifically is in low socioeconomic neighborhoods which lack funding to create extra programs to support their students for college. Being a first-generation college student, minority, and woman has made me uniquely qualified to tackle and help alleviate some of the problems of our community's most disadvantaged and underfunded students. Several times during my journey of applying and learning about college, I had a

challenging time finding answers to my questions and I even thought about giving up my dream of college because there was minimal support for me. My goal for this project is to be able to provide mentoring services to students coming from my local high school in Denver. Through this mentoring service, I educated high school students on resources like pre-collegiate programs, internship opportunities, and answered any further questions. Most students are first-generation students like me, so they had little to no guidance on college. I hope to further expand this project to provide students all over the Denver Metro area with resources.

Effects of Experimental and Environmental Conditions on Mobile Methane Surveys

Alaina Cross, Zach Weller, Joseph von Fischer
College of Natural Sciences

Presenter(s): **Alaina Cross**
Advisor/Mentor: Dr. Zach Weller
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42829

NTMs are an environmental bacterium that can cause certain pulmonary diseases in humans. The UN recently released a climate report that concluded our planet's temperature has reached an all-time high and is continuing to climb. NTMs grow the best at elevated temperatures, and it has led to some studies documenting elevated presence of NTMs in soil. In this project I attempted to characterize the bacteria present in water and soil samples taken from Nelson Reservoir and Wilson Lake, both man-made lakes in Fort Collins CO during two different seasons. Specifically, I looked for NTMs present in the soil and water samples by conducting DNA extractions and eventually PCR of bacteria cultured on agar plates selecting for NTMs. As well as comparing the ability to culture NTMs from soil and water on two different types of plates that select for NTMs.We expect to see positive PCR results for NTMs in both lakes due to the increasing climate in this area and the proximity to suburban neighborhoods. As well as more positive PCR results from Wilson Lake compared to Nelson reservoir due to Wilson Lake's proximity to two major roads as well as a suburban neighborhood.

Effects of Hail Damage on Cannabinoid Production

Tyler Richards, Janina Bowen, Beth Mitchell, Jacqueline Chaparro, Jessica Prenni
College of Agricultural Sciences

Presenter(s): **Tyler Richards**
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42876

Hemp is from the plant species Cannabis sativa and is differentiated from marijuana by the requirement that it must contain less than 0.3% delta-9 tetrahydrocannabinol (THC). The 2018 Farm Bill removed hemp from the Controlled Substances Act (CSA), opening the door to commercial cultivation of hemp in the U.S. Much of the commercial demand for hemp is due to bioactive non-psychoactive cannabinoids like cannabidiol (CBD). This fast-growing industry is

driving a significant increase in hemp cultivation nationwide. However, the historical regulatory limitations have minimized the amount of research that has been done to help growers make proper management decisions. As a result, thousands of hemp acreage are lost each year due to mandatory destruction mandates when crops test greater than 0.3% THC. We were interested in understanding how hemp responds to abiotic stress such a defoliation due to hail, a major concern for Colorado growers. We hypothesized that hemp would respond to the abiotic stress of simulated hail damage with an increase in cannabinoid production. To test this hypothesis, we conducted an experiment where hemp plants were exposed to simulated hail damage at different time points throughout development. Plants were harvested at multiple different points of the flowering stage over two field seasons. Cannabinoids were extracted from the flower material and quantified using liquid chromatography mass spectrometry. The results of this study provide valuable information for growers to adjust their cultivation practices using scientific data, enabling production of high-quality hemp while protecting the crop by maintaining compliance with federal guidelines.

Effects of SARS-CoV-2 ORF8 Protein on Human Lung Epithelial Cells

Kristin Rugh, Logan Ridenbaugh, Sam Sornsen, Dr. Alan Schenkel
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Kristin Rugh, Logan Ridenbaugh, Sam Sorensen**
Advisor/Mentor: Dr. Alan Schenkel
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42958

Severe acute respiratory syndrome Coronavirus 2019 (SARS-CoV-2) is a viral disease that caused a global pandemic in 2020. The genome of SARS-CoV-2 is 30kbs long and contains 23 opening reading frames (ORFs) that code for different proteins. We focused on ORF8 which codes for a protein that is hypothesized to be essential in the pathogenicity of the virus. The ORF8 protein is used by the virus to change the cell's ability to express MHC-I molecules and produce interferon, which are two important molecules in the body's immune response. We chose to investigate how the ORF8 protein interacts with human cells to confirm what other researchers have found by linking the protein to the regulation of MHC-I expression and interferon production. We transfected A549 human epithelial cells with DNA containing the ORF8 gene to be able to look at how the protein changes the expression of these two immunological molecules. These cells will be analyzed using fluorescent microscopy and western blotting to quantify the amount of each molecule inside of the cells. In addition, we transfected the epithelial cells with pGreenFire, a plasmid that is used to show Interferon signaling. While looking into the SARS-CoV-2 ORF8 genome, we became interested in the ORF8 genomes of other viruses and did more research looking into their structure. We plan to transfect cells with multiple different ORF8 genomes to see how they each affect the MHC-I expression.

Efficacy of Ivermectin and Conventional Insecticides against Wild-Type West Nile Virus Vectors from Urban and Rural Larimer County.

Molly Ring, Anna Sophia Leon, Ashley Janich, Paula Lado, Chilin Nguyen, Greg Pugh, Michelle Savran, Brian Foy
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Molly Ring**
Advisor/Mentor: Dr. Brian Foy
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42879

Colorado has some of the highest West Nile Virus (WNV) case numbers among the United States each year, and perennially has counties with some of the highest WNV disease incidence. Current WNV control is limited to applying mosquito larvicides to water sources and insecticide spraying to control adult mosquito vectors in residential areas when risk of WNV transmission is high. The latter has limited proof of efficacy, can be poorly targeted, has environmental toxicity concerns, and may be ineffective against mosquito populations if they are already resistant to similar insecticides applied to residential and agricultural areas. Wild birds are WNV reservoirs because they infect local mosquito vectors that feed upon them, and these vectors subsequently transmit WNV to humans. We are developing an alternative WNV control strategy that treats birds with the drug ivermectin (IVM) to kill mosquitoes that blood feed upon them to reduce WNV transmission risk to humans. We investigated the susceptibility of local rural and urban wild-type *Culex tarsalis* to the adulticide permethrin using insecticide bioassays and to IVM by blood feeding them on IVM-treated chickens and observing their survivorship in semi-field mesocosms we constructed. Bioassays determined the lab strain was susceptible to permethrin, and the rural strain was deemed possibly resistant, but future testing is needed to confirm this. There was significantly lower survivorship in mosquitoes that fed on IVM-treated birds compared to the control group. This preliminary data suggests that we can potentially implement this control method into the field to help reduce WNV transmission.

Elucidating episome-based transgene expression variation in Phaeodactylum tricornutum

Sarai Ramnani, Tessema Kassaw, Graham Peers
College of Natural Sciences

Presenter(s): **Sarai Ramnani**
Advisor/Mentor: Tessema Kassaw
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43066

An episome is an extra-chromosomal circular DNA that can replicate autonomously in the host cell. Episome-based transcriptional control system has been reported in the model diatom, Phaeodactylum tricornutum, using a reporter protein (eYFP) as a readout. Ideally, episome based expression systems should produce strains with uniform and predictable protein expression. Attaining uniform transgene expression in different independent transgenic lines is attractive to quantitatively characterize genetic components and standardize them for synthetic biological

applications. However, our earlier work showed variation in eYFP accumulation 24hrs post induction. Our goal is to elucidate what causes the variation in eYFP accumulation among the independent transgenic strains. We hypothesize that the variation could be caused by either of two factors: copy number variation or mutation on the episome. We are employing episome rescue and whole plasmid sequencing to assess mutation and droplet digital PCR (ddPCR) to evaluate copy number variation. We systematically selected twenty transgenic strains encompassing 6 non-responsive strains, 7 intermediate and 7 high eYFP expressing strains.

Employing Former Offenders: Criminal Record Disclosure During the Hiring Process

Tammy Li, Dr. Chris Henle
College of Business

Presenter(s): **Tammy Li**
Advisor/Mentor: Dr. Chris Henle
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42992

Incarceration rates continue to rise in the United States, resulting in hundreds of thousands of released offenders entering back into society every year. Stable employment is crucial to reintegration into society following release from prison. Unfortunately, a criminal record proves to be a significant barrier to employment for former offenders. Employers can easily access an applicant's criminal record and often allow this information overshadow all other characteristics and qualifications when making hiring decisions, even if the conviction is not job-related. The criminal justice system also disproportionately affects racial and ethnic minorities, especially Black men, and funnels them into a system that makes it harder for them to build a better life following release, often leading to reincarceration. Thus, this research project focuses on how to decrease discrimination towards former offenders during the hiring process. By conducting a review of the current literature, we drew conclusions as to what approaches have not been studied to improve future hiring practices. We generated study designs that could be used in future research including manipulating the nature of disclosure of a criminal record and training hiring managers. Through this research, we aim to increase the inclusion of former offenders in the labor market and identify ways to mitigate the impacts of a broken justice system by improving employment outcomes and the lives of former offenders.

Energy Transfer Fluorescence Spectroscopy in the Field of Nanoscience

Jimena Firo
College of Business

Presenter(s): **Jimena Firo**
Advisor/Mentor: Dr. Justin Sambur
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43049

Fluorescence Resonance Energy Transfer (FRET) measurements are often used in biological systems to measure nanometer distances between donor and acceptor molecules. FRET is a powerful "spectroscopic ruler" because it can reveal how and why cells survive just by measuring the distance between proteins. For example, FRET is used in coronavirus research to understand how the main protease replicates the virus. While many FRET applications are biologically focused, our research leverages the powerful FRET technique for potential energy and materials applications. We apply FRET spectroscopy to study defects in nanocrystals. Defects are imperfections in a crystal lattice and play a crucial role in the functional properties of a material, such as its ability to convert solar energy into useful chemical products. Our experiments explore energy transfer between ZnO nanocrystals (NCs) donors and AlexaFluor 555 (A555) dye molecule acceptors. We discovered that ZnO NC emission decreases as the A555 concentration increases, which signifies that a highly efficient energy transfer process occurs between the NC donor and molecular acceptors. This work will provide valuable information to understand where the defect sites are in the NCs. This fundamental knowledge will ultimately enable us to leverage ZnO nanocrystals as the active material in environmentally friendly lighting applications.

Engaging Broader Audiences in Urban Biodiversity Conservation Action

Minna Munson, Natalie Fitzpatrick, Lauren Myli
Warner College of Natural Resources

Presenter(s): **Minna Munson, Natalie Fitzpatrick**
Advisor/Mentor: Veronica Champine
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42916

Understanding the motivators and barriers to urban conservation actions is important in addressing biodiversity loss. Building on ongoing research that finds a relatively homogenous group of people who engage in native plant gardening, this research study provides additional context to engage broader audiences in urban biodiversity conservation actions. We aim to further understand the motivators and barriers that organizations face in engaging underrepresented communities in biodiversity conservation actions. The research team conducted semi-structured interviews with four organizations in the Colorado Front Range and used thematic analysis to find patterns in the data. Findings show that motivators were education, social interactions, and access to nature. Barriers were time, outreach, and lack of resources. These organizations define success through active participation, building strong networks, and providing an inclusive environment. From this, organizations can engage broader audiences by emphasizing specific motivators found in our analyses, work to reduce the barriers highlighted, and increase success in their programs. This study can help to further the progress in actions taken towards the urban biodiversity crisis across Colorado.

Engineered DNA Crystals For Hosting DNA-Binding Proteins

Sage Phuepwint, Nabila Ahmad, Sebastian Bronk
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Sage Phuepwint, Nabila Ahmad, Sebastian Bronk**
Advisor/Mentor: Dr. Christopher Snow
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42997

Our goal is to create large porous crystals made out of designed DNA tiles that can be used to make programmable molecular scaffolds. These scaffolds could organize other guest molecules by allowing them to bind to specifically designed sequences of the tile. We can use these crystal lattices for imaging and detection of various biomolecules. These crystals also could be used as vehicles to transport proteins. Other labs have created DNA crystals, utilizing the principle of tensegrity in their designs to ensure the internal strength and rigidity of a single DNA tile. Two different DNA tiles were designed for our experiment; one with edge lengths composed of three full twists of DNA, three nick strands, three staple strands, and a central strand (T.3). The other design had four full twists and two central strands(T.4), which should ensure the resulting crystals will have larger solvent channels than the T.3 tile. Solutions consisting of our salt stock, nuclease-free water, and the DNA strands encoding our tiles were left to anneal in an oven for the DNA to crystallize. Our trials resulted in the creation of DNA crystals that appeared in many sizes, but the best crystals were large and geometric, versus the smaller and less uniform ones. The search for optimal parameters for crystal growth is ongoing. Once large crystals are engineered for stability, we will attempt to diffuse proteins into the crystals and also determine if we can attach the guest proteins to the scaffold crystal.

Evaluating Dual Task Costs with Neuroimaging Compatible Dual Task Screen

Maude Pointet, Dr. Brian Tracy, Dr. Jaclyn Stephens
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Maude Pointet**
Advisor/Mentor: Dr. Jaclyn Stephens
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43006

Our lab developed the Dual Task Screen (DTS) to quickly evaluate lower extremity (LE) and upper extremity (UE) dual-task performance in athletes with concussion. LE and UE subtasks include one repetition of a single motor trial, a single cognitive trial, and a dual-task trial, and the full DTS can administered in ≤ 10 minutes. However, with such quick administration, our lab has failed to detect a dual-task cost (i.e. poorer performance during dual compared to single trials) in some athletes. To address this and to permit simultaneous neuroimaging, we developed a neuroimaging-compatible DTS. This version includes five repetitions of single motor, single cognitive, and dual-task trials. My thesis work is designed to determine how many repetitions are necessary to elicit a dual-task motor or cognitive costs in ≤ 90% athletes. Thirty-three athletes (mean age=20.00; 21 female) completed the neuroimaging-compatible DTS. I calculated dual-task costs by comparing single trial to dual-task trial performance. Next, I averaged dual-task costs for one through five repetitions to determine how many repetitions were needed to elicit dual-task costs in ≥ 90% of participants. For the LE subtask, one repetition

elicited a dual-task motor cost in 100% of participants, but five repetitions failed to elicit a dual-task cognitive cost in ≥ 90% of participants. Likewise, in the UE subtask, three repetitions elicited a dual-task motor cost in 94% of participants, but five repetitions failed to elicit a dual-task cognitive cost in ≥ 90% of participants. Thus, the DTS is best suited for evaluating dual-task motor performance.

Evaluation of Hemp Volatile Contamination of Wine-Type Grapes

Brandon Sandoval, Dr. Jacquline Chaparro, Professor Horst Caspari, Professor Jessica Prenni, Stacey Williams
College of Agricultural Sciences

Presenter(s): **Brandon Sandoval**
Advisor/Mentor: Professor Jessica Prenni
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42248

Studies have shown that the quality of wine-type grapes are impacted by volatile organic compounds (VOCs) released by wildfires. With industrial hemp gaining popularity among farmers, there is concern that volatile compounds released from nearby hemp plants will impact grapes in a similar fashion. While limited preliminary research has reported no evidence of hemp VOC contamination, more studies are needed. Here, we utilized sensitive analytical tools to evaluate red and white wine-type grapes grown near an industrial hemp plot. Berries were sampled from five different "treatment" locations (within their respective experimental vineyard) which varied in proximity to the hemp plot, with "control" vineyards located several miles from any known hemp operation. Red and white wine was made from three of these treatment locations. Grape and wine samples were analyzed using solid-phase microextraction (SPME) headspace GC-MS. Our results revealed very low levels of terpenes indicative of hemp VOCs, with most below the limit of detection. Linalool was the lone exception, but levels of this compound did not show any pattern of variation that correlated with proximity to hemp fields. Taken together, the results from this study demonstrate that hemp-derived VOC contamination was not detected in grapes and wine. These results serve both grape and hemp growers by providing strong evidence that the quality of wine-type grapes is not impacted by the proximity of industrial hemp.

Expanding the Toolbox for In-Vivo Single Molecule Tracking

Hunter Ogg, Dr. Ning Zhao, Dr. Timothy Stasevich
College of Natural Sciences

Presenter(s): **Hunter Ogg**
Advisor/Mentor: Dr. Timothy Stasevich
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43060

The development of genetically encodable probes paired with epitope tags has been ubiquitously used across the life sciences, from protein purification to studying in-vivo dynamics in real time. More recently, intrabodies (fluorophores linked to probes) have allowed for the observation of behavior such as protein folding or translation which occur too quickly to be observed by traditional methods. Although numerous probes exist, few (e.g. SunTag and HA-frankenbody) have been proven for studying intracellular dynamics (including translation dynamics) and there is little literature comparing these. A fraction of this already small group are suitable for visualizing single molecules. We are seeking to characterize the options that exist and aid in the development of new optogenetic tools and imaging systems. Kinetics of the tags were determined using histone H2B-epitope fusion constructs in concert with the intradbodies of interest and performing Fluorescence Recovery After Photobleaching (FRAP) assays. These were analyzed with the creation/usage of custom programs to find . Potential for single-molecule imaging was examined with a construct consisting of fused twelve ALFA tag repeats to the N-terminus of a standard translation reporter KDM5B protein using a HILO microscope. Ongoing work involves the characterization of the aggregation common among highly expressed epitopes, photostability of as well as the interactions between different fluorophore-nanobody pairs. Potential impacts on translational dynamics will be quantified using heringtonin run-off assays as well as colocalization lifetime of the mRNA and nascent protein.

Exploring the feeding ecology within the gastrointestinal tracts of red fox (Vulpes vulpes) from Alaska

Paige Fortunati, Karisa Sommermeyer, Emily Bradford, Gabriell Papp, Ellery Sherman, Dr. Traci Kinkel, Dr. Ashley McGrew
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Paige Fortunati**
Advisor/Mentor: Dr. Ashley McGrew and Dr. Traci Kinkel
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42950

The microbiome of parasites and their hosts is poorly understood and requires further exploration. It is well known that certain helminths exist in mutualistic relationships with the endosymbionts, or internal microorganisms, that they possess. Based on recent findings, some helminths have been found to contain a diverse group of endosymbionts, including the bacterial genus, *Pseudomonas* sp. The objective of this study was to identify and characterize the core microbiomes of whole helminths and host-derived samples from red fox (Vulpes vulpes) from Alaska; specifically, aiming to elucidate the feeding ecology of the host GI tract and whether the host microbiome differs from that of the helminths present. This characterization is based on both the parasitic group as well as their position in the GI tract. We used C and N stable isotope analysis, as well as microbiome analysis, to analyze samples opportunistically collected from 16 red fox hosts. Representative helminths, including cestodes and nematodes, were analyzed, as well as host lumen contents, colon contents, and GI wall. Prior to processing the helminth samples for microbiome characterization, a surface sterilization was carried out to decrease the likelihood of contamination from the host lumen contents. Assessment of similarities and

differences between the microbiome of the parasite and its host, as well as determination of C and N isotopic signatures, will lead to a better understanding of host-parasite evolutionary ecology and will provide a foundation for exploring whether antibacterial targeting can be used to target the bacteria within the helminth.

Expression of Host Cell Signaling Transcripts in Rift Valley Fever Virus Infected Aedes Aegypti

Christian Smith, Dr. Corey Rosenberg
College of Natural Sciences

Presenter(s): **Christian Smith**
Advisor/Mentor: Dr. Corey Rosenberg
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42855

Rift Valley fever virus (RVFV) is a zoonotic mosquito-borne virus that infects livestock and humans. In humans RVFV causes fever-like symptoms, birth defects, and sometimes death. To better understand the virus' replication in mosquito carriers, we investigated gene expression changes in infected and uninfected mosquitoes, specifically related to immune system signaling pathways. Alterations to these signaling pathways could result in changes to a virus' ability to infect and reproduce within a host. Known mosquito vector of the disease, Aedes aegpyti (Aae) was studied, and the pathways studied are the Wingless (Wg), Janus Kinase/signal transducers and activators of transcription (JAK-STAT), and c-Jun N-terminal Kinase (JNK) pathways. To study these, we analyzed expression levels of five transcripts: Armadillo (Arm), Frizzled2 (Fz2), and Disheveled (Dsh), of the Wingless pathway, Puckered (Pck), of the JNK pathway, and Domeless (Dome), of the JAK/STAT pathway. To do so, we used quantitative PCR from RVFV MP-12 infected mosquito bodies (at 14 days post oral infection), and compared the expression levels to that of uninfected, blood-fed mosquitoes. This was done for three replicates of 20 samples for each mosquito species and the data was analyzed via the comparative Ct method. Lower expression levels were found for all target transcripts in infected mosquitoes relative to controls. These results suggest that RVFV infection results in prolonged changes to cell signaling pathways. These changes could potentially lead to a weakened immune system in the mosquitoes.

Extracellular Vesicles Modulate Drivers of Aging in Astrocytes

Susanna McIntyre, Qian Zhang, Cali McEntee, Tom LaRocca, Karyn Hamilton
College of Health and Human Sciences

Presenter(s): **Susanna McIntyre**
Advisor/Mentor: Dr. Karyn Hamilton
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42647

Drivers of cellular aging contribute to the onset and progression of multi-morbidities of aging including neurodegenerative diseases. However, how these drivers of cellular aging are communicated — particularly between the brain and periphery — remains poorly understood,

and the gap in translating basic research findings from laboratory organisms to humans has made progress in this area slow. We created a "Translational Research Pipeline," leveraging comparative studies in companion dogs as a bridge between basic laboratory discoveries and relevant clinical human populations. Using this pipeline, we are testing the hypothesis that the activation of astrocytes, specialized glial cells implicated in neuroinflammation, leads to mitochondrial dysfunction that can be communicated via release of extracellular vesicles (EVs) containing functional cargo. We treated primary human astrocytes with vehicle or inflammatory cytokines to promote activation to an "A1" pro-inflammatory phenotype that has been implicated in neurodegenerative disease. Then, we measured mitochondrial function (oxygen consumption), and we isolated EVs for co-culture with naïve astrocytes followed by respirometry to measure mitochondrial function in the recipient (naïve) cells. Compared to vehicle, rates of oxygen consumption were greater in both A1 astrocytes and in astrocytes treated with EVs from A1 astrocytes. These results support our hypothesis. To follow up on these experiments using our Translational Research Pipeline, we plan to co-culture cells with circulating EVs from older humans and dogs with/without cognitive impairment to identify if functional cargo in EVs from relevant clinical populations that may drive cellular aging.

Finding Our Way Home: A History of Environmental Injustice in Denver, CO

Corrina Farho, Marcela Velasco, Madeline Gottlieb
College of Liberal Arts

Presenter(s): **Corrina Farho**
Advisor/Mentor: Dr. Jared Orsi
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42940

As the human species confronts the implications of climate change, the vision for the future is ripe with new technologies and solutions to make adaptation and mitigation feasible. This expedient transition needs to consider the implications that it might have on both the quality of life of people and the environment. The Environmental History of Globeville and Elyria-Swansea communities since the late 19th century will be explored with a specific focus on manufactured injustices, reflective of the industrial revolution and aspirations for economic growth. Denver's historical smelting plants, development of I-25 and I-70, and the presence of Suncor's Commerce City Refinery and Xcel's Cherokee Generating Station are moments in time that document the history of environmental justices of Globeville and Elyria-Swansea communities. Recognizing the natural environment's intersection with human progress in this case-study is integral for a regenerative future and encourages humanity to think about the implications of extractive ways of life.

When the last tree has been cut down, the last fish caught, the last river poisoned, only then will we realize that one cannot eat money.

- Native American Proverb

Freshwater Algal Blooms: From Detrimental to Marketable Goods

Kataryna Gingrass, Ed Hall
Warner College of Natural Resources

Presenter(s): **Kataryna Gingrass**
Advisor/Mentor: Dr. Ed Hall
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42998

Freshwater aquaculture is an exponentially growing industry. Honduras has had great involvement in net-pen aquaculture with three locations across the country: one of them being Lake Yojoa (Rodriguez 2001). Being the largest natural lake in Honduras, Lake Yojoa is known for its farm fresh tilapia. Due to high amounts of tilapia production, Lake Yojoa is eutrophying. Having too many algae in a lake can cause anoxic conditions, meaning an uninhabitable place for all organisms that require oxygen (Carpenter 2005). My research asks if harvesting algae for Lake Yojoa is a viable pathway to reduce eutrophication. By measuring the biomass composition of mixed algal assemblages (e.g., carbon, nitrogen, phosphorus) and comparing it to animal feeds, or fertilizer, we can assess if algal biomass may have a beneficial use to watershed residents. We evaluated the membership and biomass composition of a mixed algal assemblage harvested from Lake Yojoa in June of 2018. Creating a market for algal biomass could encourage watershed residents to harvest algal biomass and create a novel nutrient loss pathway for the lake.

Front Range Cattle Population Behavioral-Spatial Modeling

Gunnar Wagner, Anna Clare Monlezun
Warner College of Natural Resources

Presenter(s): **Gunnar Wagner**
Advisor/Mentor: Anna Clare Monlezun MS MA
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42974

Some sectors of the contemporary sustainability community are fast to point to domestic livestock as a primary cause of landscape degradation, yet large herbivores are essential to grassland ecosystem function. At this intersection of landscape degradation and maintenance, it is possible for cattle and the landscape to exist in a mutually beneficial relationship- but it is an open question as to under what circumstances this marriage is achieved. Our research seeks to investigate management strategies that may allow cattle to be conceptualized as allies in landscape conservation rather than opponents. This is achieved through an agent-based model built to represent the relationship between cattle management/behavior and the resulting impacts on the quantity and heterogeneity of local vegetation. Grazing seasons were simulated upon a pilot landscape in the context of two management approaches (conventional and intensive rotational grazing) which were compared against one another in terms of efficacy and goal-meeting.
We found that while the conventional management approach was more likely to exhibit a more

successful outcome in terms of cattle-related metrics, the intensive approach tended to result in greater benefits to the landscape. Overall, the results indicate that success in management is conditional and context-specific. With provisions to increase complexity and subjectivity, this model could come to serve as a useful management and decision-making tool which will allow ranchers to simulate how different management approaches may perform in the context of their own land and herds.

Fucoxanthin Decreases Cell Proliferation, Induces Cell Death in Mouse Myoblast Cells

Erin Citarella, Shane Kanatous, Yu Bai, and Graham Peers
College of Natural Sciences

Presenter(s): **Erin Citarella**
Advisor/Mentor: Graham Peers
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42922

Fucoxanthin is a carotenoid that has been shown to possess potent anticancer effects on a number of different cancer cell lines. An important aspect of cancer drug research is to look at the effects of the compound on non-cancerous cells. In this experiment, C2C12 murine myoblast cells were exposed to either 5 µM fucoxanthin, 10 µM fucoxanthin, or no fucoxanthin. The cells were observed over the course of several days, and the cell densities of each culture were tracked. The fucoxanthin test groups were found to have decreased cell proliferation, and the 10 µM fucoxanthin test group experienced mass cell death on day 3. Fucoxanthin therefore appears to have some level of toxicity for C2C12 myoblasts when applied directly to the undifferentiated cell cultures. This is an important topic for further research in order to investigate potentially detrimental effects of fucoxanthin on healthy cells when it is used for anti-cancer purposes.

Function of MSMEG_2328 and MSMEG_2333 in Biosynthesis of Methylglucose Lipopolysaccharides in Mycobacterium smegmatis.

Rhiannon Marina, Anna Grzegorzewicz, Bhanupriya Angala, Mary Jackson
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Rhiannon Marina**
Advisor/Mentor: Anna Grzegorzewicz
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43023

Mycobacteria produce two unusual polymethylated polysaccharides that have been postulated to regulate fatty acid metabolism. Studies initiated by the Jackson lab have begun to shed light on the nature of the enzymes involved in their biosynthesis. The *Rv3030 – Rv3039c* gene cluster in *M. tuberculosis*encompasses a number of conserved genes which are prime candidates for the biosynthesis of methylglucose lipopolysaccharides (MGLPs). Among

them, *Rv3035* and *Rv3039c* are two conserved genes of as yet unknown function. This project aims to characterize the function of these two conserved genes via genes *MSMEG_2328 (Rv3039c)* and *MSMEG_2333 (Rv3035)* in model organism *M. smegmatis*.

Generative Adversarial Approach to Melanoma Classification

Mikyla Bowen, Jesse Wilson
Walter Scott, Jr. College of Engineering,College of Natural Sciences

Presenter(s): **Mikyla Bowen**
Advisor/Mentor: Dr. Jesse Wilson
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42886

Convolutional neural networks (CNNs), trained as classifiers on dermoscopy images can achieve high accuracy, outperforming expert dermatologists in some situations. Unfortunately, CNNs are prone to misdiagnoses under different lighting conditions and orientations, and they cannot explain their decision-making process. This poster explores a new technique for classification using a Cycle-Consistent Generative Adversarial Network (CycleGAN). A CycleGAN can translate images between two different domains with paired images. A common example of CyleGANs has been translating images of horses to zebras. This image2image network was trained on benign and malignant skin lesions from the International Skin Imaging Collaboration (ISIC) archive. When presented with a lesion in question, this network generates two hypothetical images: (a) the closest unambiguous benign lesion it can 'imagine', and (b) the closest unambiguous malignant lesion it can 'imagine'. This reveals, on visual inspection, what needs to change about a photograph for a more confident classification, whether trivial changes like lighting or fundamental changes to morphology. Furthermore, the benign lesions tend to form two distinct clusters, one with no overlap with malignant lesions, and a second cluster overlapping malignant lesions. This clustering is consistent across multiple years and clinics from the ISIC archive, suggesting that only a subset of benign images is distinguishable from melanomas without a biopsy. This project aims to break the paradigm of AI as a black-box classifier. This may lead to new opportunities for understanding why a well-trained AI sees a lesion as benign or malignant, more informed decision making, and possibly better diagnostic criteria.

Genotype screening of the photosynthetic mutants generated by CRISPR/Cas9

Jesse Stahl, Yu Bai, Graham Peers
College of Natural Sciences

Presenter(s): **Jesse Stahl**
Advisor/Mentor: Dr. Graham Peers
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43005

Aquatic autotrophs make up at least half of the global primary production. Their importance to the base of the food chain warrants understanding how they will respond to a changing

environment. Increasing photosynthetic efficiency may also lead to more sustainable bioproducts. For this to happen, the vastly interconnected biochemical pathways involved must be better understood. Knockout experiments on specific genes (reverse genetics) can help identify their contribution to these pathways and can reveal previously unknown functions. Using a combination of CRISPR/Cas9 based homologous directed repair, we are targeting several genes believed to be involved in photosynthesis. This technique inserts an antibiotic resistance gene into a locus of predicted function. Viable, antibiotic resistant, strains are then assayed for the disruption of the native gene using PCR. This poster will explore the success associated with this technique.

Habitat suitability: relationship between Bumble Bees (Genus Bombus) and Lupine Family (Genus Lupinus) in Yosemite and Sequoia & Kings Canyon National Parks

Ziwen Sun Brianna Bruyere
Warner College of Natural Resources

Presenter(s): **Ziwen Sun, Brianna Bruyere**
Advisor/Mentor: Sarah Whipple
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43052

Bumble bees (genus Bombus) play a critical role in plant ecological functioning through pollination services, and climate change is said to impact all pollinator services. The project used citizen science datasets to provide population information for a well-documented plant-pollinator relationship (bumble bees and lupines) documented within Yosemite (YOSE) and Sequoia and Kings Canyon (SEKI). We overlaid these observations with climate data to determine peak pollinator emergence times in relation to climatic trends, which is needed to answer the research question of "How are changing climate conditions in YOSE and SEKI impacting the available habitat for bumble bees and lupines?" The results of this study showed that changes in species (lupine) resource availability, in correlation with climate warming, may have an effect on bumble bee populations. The increase of temperature and precipitation seen in the area could be a cause of bee species decline. An inventory of pollinator fauna in the YOSE and SEKI alpine will identify potential pollinators of the alpine plants targeted for climate adaptation strategies as well as pollinator species needing climate adaptation strategies in their own right. It will also provide baseline data to assess long term change in pollinator status as climate change progresses. The results of this study will also help park managers to better protect and manage bumble bees and more broadly pollinator species.

HIV and FIV glycoproteins increase cellular tau pathology via cGMP-dependent kinase II activation

Michael Doolittle, Matheus Sathler, James Cockrell, India Nadalin, Franz Hofmann, Sue VandeWoude, and Seonil Kim
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Michael Doolittle**

Advisor/Mentor: Kim Seonil
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42850

As the development of combination antiretroviral therapy (cART) against human immunodeficiency virus (HIV) drastically reduces the number of HIV deaths, more of individuals with HIV are now entering the prime age when Alzheimer's disease (AD)-like symptoms begin to manifest. Hyperphosphorylated tau, a known AD pathological characteristic, has been prematurely increased in the brains of HIV-infected patients as early as in their 30s and is increased with age. This thus suggests that HIV infection may lead to accelerated AD phenotypes. However, whether HIV causes AD to develop more quickly in the brain is not yet fully determined. Interestingly, we have revealed that viral glycoproteins, HIV gp120 and feline immunodeficiency virus (FIV) gp95, induce neuronal hyperexcitation via cGMP-dependent kinase II (cGKII) activation in cultured hippocampal neurons. Here, we use cultured mouse cortical neurons and demonstrate that HIV gp120 and FIV gp95 are sufficient to increase cellular tau pathology, including intracellular tau hyperphosphorylation and tau release to the extracellular space. We further reveal that viral glycoprotein-induced cellular tau pathology requires cGKII activation. Together, HIV infection likely accelerates AD-related tau pathology via cGKII activation.

Hostile Ship

Caspian Siebert, Turguy Caglar, Colleen Patton, Professors Ben Clegg, Nathaniel Blanchard
College of Natural Sciences

Presenter(s): **Caspian Siebert**
Advisor/Mentor: Dr. Nathaniel Blanchard
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43062

The Hostile Ship (aka Shadow Hunt) Research Project is a study focused on the interaction between artificial intelligence and human players. For this project a computer simulation has been constructed, in which ships navigate a two-dimensional grid. The player's ship navigates at the control of the user, while patrol ships move in a randomly chosen direction across the board. With each move the player makes, the hostile ship moves closer toward the direction of the player using either a hunting or shadowing strategy. Meanwhile, there exist distractor ships who choose, and move towards, a location near the starting position of the player. The player's goal is strategically moving their ship to determine which ship is hostile. The player and automated assistant's goal is to distinguish the performance of the hostile ships from the distractor ships. The purpose of this experiment is determining how to create a useful machine learning model that can interact with the user and eventually assist boats in the Navy with determining hostile ships.

How Collaborative Grazing Management Influences Soil Health

Spencer Varga, Anna Clare Monlezun
Warner College of Natural Resources

Presenter(s): **Spencer Varga**
Advisor/Mentor: Anna Clare Monlezun
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42973

Western grassland and rangeland ecosystems have long supported large herbivores that in return maintain ecosystem function. However, ineffective cattle management can degrade local ecosystems among other conservation concerns and highlight the need for more effective management strategies. Collaborative grazing management has the potential to meet conservation objectives by improving rangeland soil health while also promoting sustainable beef production. We investigated how three soil health metrics (soil organic carbon, total nitrogen, and water infiltration) varied between upper and lower soil horizons on actively grazed areas and ungrazed areas across four sites in northern Colorado over two years (2020 and 2021). Soil organic carbon, total nitrogen, and water infiltration measurements were derived from strategic research plots at each site to reduce biological variability. No difference in results between land treatments would be considered a positive outcome, indicating that while soil health did not improve, the areas under grazing management did not experience the degradation expected from poorly managed grazing. However, our results indicated a statistically significant increase in organic carbon and total nitrogen in grazed areas under collaborative grazing management compared to ungrazed sites. These results will help inform how cattle production can meet the dual objectives of natural resource managers and ranchers alike.

Identification of a Potentially Novel Planococcus Species & The Characterization of its Unique Properties for Biofilm Inhibition

Riley Anderson, Traci Kinkel
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Riley Anderson**
Advisor/Mentor: Traci Kinkel
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43092

Planococcus is a Gram-positive cocci, originally classified as *Staphylococcus*, but moved into its own genus in 1984. The genus has 22 confirmed species to date, all of which have been isolated from marine settings. Multiple species across the genus are characterized by their ability to produce biosurfactants which have distinct properties. We believe we have isolated a potentially novel species that produces a biosurfactant with unique abilities. We have demonstrated its ability to disrupt and inhibit biofilm formation of *Staphylococcus epidermidis* and we hypothesize this biosurfactant will have the same effect on biofilms produced by S. *aureus*, as well as biofilms produced by other genera such as *Pseudomonas*. Aside from it's biosurfactant production, we have also demonstrated quorum quenching (QQ) abilities from this species, which we hypothesize is due to the presence of a homoserine lactonase specific to Planococcus that has been shown to hydrolyze the homoserine lactones involved in quorum sensing (QS).

Identifying E78 and its role in the ecdysone cascade in Gecarcinus lateralis

Avery Hunter, Vanessa Bentley, Dr. Donald Mykles
College of Business

Presenter(s): **Avery Hunter**
Advisor/Mentor: Dr. Donald Mykles
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42835

Molting is an important process that allows crustaceans to grow, develop, and regenerate lost appendages by shedding their exoskeletons through ecdysis. Molting is driven by an increase the 20-hydroxyecdysone (20-E), a sterol hormone produced by the Y-organs (YO), but is inhibited by the presence of molt-inhibiting hormone (MIH), a neuropeptide produced in the eyestalk X-organ/sinus gland complex (XO). The binding of 20-E to the ecdysteroid receptor and ultraspiracle/retinoid X receptor (EcR and USP/RXR) heterodimer, members of the nuclear receptor (NR) superfamily, causes the transcriptional cascade of ecdysone response genes. The ecdysone response genes are classified as early, early-late, and late as they are mediated in a temporal fashion. Some ecdysone response genes were previously identified from the blackback land crab (*Gecarcinus lateralis*) de novo assembled YO transcriptomes including E74, E75, Broad Complex, HR3, HR4, and Fushi tarazu. However, reassembly of the RNA-seq reads will allow improved characterization of contigs and identify other response genes previously not identified such as E78, an early-late gene that has two isoforms. E78A has a conserved zinc finger DNA binding domain (DBD) and ligand binding domain (LBD) while E78B lacks the DBD but shares the LBD with E78A. This gene has been primarily studied for its importance in protein synthesis during metamorphosis in *Drosophila melanogaster*, but its role between the other ecdysone response genes remains unclear in insects and crustaceans. To better understand the role in the ecdysone cascade, E78 was identified and characterized using the *G. lateralis* YO assembled transcriptomes. Supported by NSF (IOS-1922701).

Impact of Environmental Factors on Antigen Test Accuracy

John O'Donnell-Sloan, Jeremy Link, Eli Barstis, Zachary Call, Charles Henry
Walter Scott, Jr. College of Engineering

Presenter(s): **John O'Donnell-Sloan**
Advisor/Mentor: Dr. Chuck Henry
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42795

Early diagnosis has been a valuable tool in combating the COVID-19 pandemic. While many diagnostic tools exist, many are inconvenient, expensive, and time-consuming. The most common diagnostic tools, RT-PCR or ELISA, are sensitive methods; however, they are expensive and time-consuming leading to long wait times before results are returned to a potentially contagious patient. Although home tests for Sars-CoV-2 exist, they often lack the sensitivity

required to accurately diagnose patients. To control this and any future pandemics, it is important to have an at-home test that is easy to use, rapid, and sensitive. With a rapid test, infected people could have immediate access to this information and take appropriate actions faster. Through the combination of microfluidics and ELISA-based techniques, we have developed a sensitive test for the detection of the Sars-CoV-2 nucleocapsid protein. However, the test has had some issues with inconsistent results, which often occurred when devices were exposed to environmental conditions for extended periods. In the lab, timing can be controlled, but in a point-of-care setting, this is much more difficult. It is therefore vital to understand how the conditions are affecting the accuracy of the device. To ensure the success of this device, it must produce consistent, trustworthy results.

Impact of environmental neurotoxins on glial mitochondrial function: potential links to Parkinson's Disease?

Aria Witt, Mary Stischer, Luke Whitcomb, Ronald Tjalkens, Adam Chicco
College of Natural Sciences

Presenter(s): **Aria Witt**
Advisor/Mentor: Dr. Adam Chicco
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42977

Mitochondria are responsible for the majority of adenosine triphosphate (ATP) production in the brain, but also generate reactive oxygen species (ROS) capable of damaging cellular proteins, lipids, and DNA. Both processes involve the transfer of electrons from oxidized fuel substrates through a series of protein complexes, which normally combine with protons and oxygen to form water. Environmental toxins or genetic defects that impair function of Complex I in this "respiratory chain" are associated with Parkinsonism, but the mechanisms responsible are incompletely understood. Prevailing hypotheses suggest that Complex I dysfunction causes a leak of electrons directly to oxygen, forming ROS that trigger dopaminergic neural cell death and an aggregation of misfolded proteins in the prefrontal cortex, basal ganglia, and substantia nigra that are central to Parkinson's Disease. The aim of this project is to evaluate the effects of neurotoxin exposures associated with Parkinsonism on glial cell mitochondrial function. Primary murine glial cell cultures are incubated with rotenone (a pesticide and known Complex I inhibitor), manganese (an environmental neurotoxin) or both for 24 hours, followed by detailed examination of mitochondrial respiratory function and ROS production by high-resolution fluorespirometry. We predict that these toxins contribute to Parkinsonism in part by impairing glial mitochondrial respiratory capacity and increases ROS production from Complex I, consistent with previous studies in neurons following similar toxicant exposures. Results to date support this hypothesis, providing the foundation for ongoing studies to model the effect of Parkinsonism on glial cell metabolism and mitochondrial function.

Impact of rainfall on insectivorous and nectivorous bats' emergence behavior and foraging timing

Garrett Peachey, Mallory Davies, Kathryn Stoner, Ben Walker

Warner College of Natural Resources

Presenter(s): **Garrett Peachey**
Advisor/Mentor: Dr. Kathryn Stoner & Mallory Davies
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43079

Bat populations in North America are currently in severe decline. Effective monitoring strategies to obtain accurate population counts are necessary to conserve these populations. However, the effects of rainfall on bat activity are relatively unknown, leaving room for potential bias in population estimates under current monitoring protocols. Using thermal camera videos at a natural roost site in New Mexico, we assessed bat emergence times for nights with and without rainfall. We observed the timing of emergence and foraging activity (whether they exited and began foraging or returned to the cave) in both nectivorous and insectivorous bats to determine temporal and behavioral differences in response to rainfall throughout the season and between the two different foraging guilds. Understanding the effects rainfall has on bat emergence and foraging activity in arid environments can aid managers by identifying the most advantageous times to conduct population count surveys and aid future conservation efforts with insight on how climate change can affect different foraging bat populations.

Improving the Utility of Wastewater-Based Surveillance for Viral Pathogens in Colorado

Tanya Jolly, Jim Huang, Luke Davis, Susan De Long, Carol Wilusz
Walter Scott, Jr. College of Engineering,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Tanya Jolly**
Advisor/Mentor: Dr. Carol Wilusz
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43029

The CSU wastewater laboratory has developed an assay to concentrate and detect SARS-CoV-2 in wastewater samples across campus and the Colorado Front Range. The protocol involves ultrafiltration, RNA extraction, and droplet digital PCR to detect the number of copies per liter of SARS-CoV-2.Two wastewater treatment plants (WWTPs) add ferric chloride to reduce odors prior to sample collection. Interestingly, samples from these two WWTPs show consistently lower recovery of a spiked-in virus (Bovine Coronavirus) than samples from 19 WWTPs that do not add ferric chloride. We hypothesize that ferric chloride addition may be responsible for reduced recovery of BCoV, and that it may also affect our ability to detect SARS-CoV2. We used samples from Drake Water Reclamation Facility to test this. We also predict that adding EDTA, a chelating agent, may increase RNA recovery in these samples.

In-vivo behavior and clinical analysis of adipose-derived mesenchymal stem cells as a potential therapy for mouse-adapted prion disease.

Connor Siebenaler, Arielle Hay, Sean Boland, Mark Zabel, Julie A. Moreno
College of Natural Sciences

Presenter(s): **Connor Siebenaler**
Advisor/Mentor: Dr. Moreno
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42827

Prion diseases are fatal, transmissible, neurodegenerative diseases that are found in both humans and animals. Previous research shows that the infectious or misfolded form of the prion proteins, PrPSc, accumulates in the brain, increasing neuroinflammation and behavioral deficits early in the disease process before neuronal death. Currently, there are no known therapies for prion diseases. We hypothesize that delivering adipose-derived mesenchymal stem cells (AdMSCs) intranasally into mice twice a month could help in reducing neuroinflammation halting subsequent neuronal death. AdMSCs have been previously shown to target inflamed tissues and secrete anti-inflammatory cytokines reducing inflammation. To track the efficacy of this treatment, we observe prion-infected mice over ~28 weeks and monitor hippocampal-specific behavior, nesting ability, and clinical signs throughout the disease course.
Brain tissue was also taken throughout to assess neuropathology and inflammatory signaling changes. We clinically score the mice after signs of behavioral deficits around week 17 and observe nesting behaviors as a complementary method of behavioral change throughout the study. Burrowing involves measuring the amount of food remaining from a tube following 30 minutes of observation. In this study, we see a significant reduction in spongiosis, the hallmark of prion neuropathology change, with AdMSC treatment compared to our untreated mice and no observable changes in behavior or clinical signs with treatment. Analysis of neuropathology is still underway and future studies may include changing our delivery system of the AdMSCs to the brain.

Inbound Arrivals: Using weather surveillance radar to quantify the timing of spring trans-Gulf bird migration

Annika L. Abbott, Yuting Deng, Katie Badwey, Kyle G. Horton
Warner College of Natural Resources

Presenter(s): **Annika Abbott**
Advisor/Mentor: Dr. Kyle Horton
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42592

Each spring, hundreds of millions of migratory songbirds that winter in the Caribbean and Central and South America cross the Gulf of Mexico en route to breeding grounds in North America. The northern Gulf of Mexico coastal region is critical to migrants as it provides the first possible stopover location after a long, nonstop trans-Gulf crossing. However, this region has high levels of anthropogenic activity, making migrants vulnerable to a multitude of potentially lethal obstacles. Understanding the timing of mass migratory arrivals along the coast is imperative for advancing conservation of this critical region through the identification of key times in which to direct conservation actions (e.g., temporary halting of wind turbines, reduction of light pollution).

To this end, we assessed 10 years of weather surveillance radar data from 5 sites along the northern Gulf coast to quantify the daily timing and intensity of trans-Gulf migrant arrival. On a daily scale, we found that migrant intensity peaked an average of 9 hours after local sunrise, occurring earliest at furthest eastern regions of the Gulf. On a seasonal level, the greatest number of arrivals occurred between late April and early May, with peak intensity occurring latest at furthest west sites. Overall intensity of migration across all ten years of data was greatest at the most western sites and decreased the further east a site was located. These findings emphasize the use of the Gulf of Mexico region by migratory birds, providing information that can both advance our understanding of trans-Gulf migration and support conservation of migratory birds in this critical region.

Increased gliosis in aged canines as a model for Alzheimer's Disease

Quinsker A. Frimpong, Amelia Hines, McKenzie Richards, Stephanie McGrath and Julie A. Moreno
College of Natural Sciences

Presenter(s): **Quinsker Frimpong**
Advisor/Mentor: Dr. Moreno
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42761

Canine Cognitive Dysfunction (CCD) is a common neurodegenerative disease found in dogs over the age of 8. There is a great deal of similarity between CCD and Alzheimer's Disease (AD) found primarily in aged humans 65 and older. This makes dogs a great model organism for understanding the disease mechanism that causes neuroinflammation and accumulation of misfolded proteins. Just like Alzheimer's Disease, CCD is a naturally occurring disease of age, in an animal that shares the same environments and risk factors (ie. diet, exercise, exposure to pollution) as humans, further justifying the use of canines as a model for AD. Many areas of the brain have been shown to be disrupted by the misfolding of proteins and inflammation as an indicator of AD, this includes the cortex and hippocampus. Here we are studying aged canines that have not been diagnosed with CCD to determine if neuroinflammation occurs more in the aged population. Astrocytes in the central nervous system serve an important role in providing synaptic support and controlling the blood brain barrier. Both glial fibrillary acidic protein (GFAP) and S100Œ≤ can be used as markers for inflamed astrocytes. We have found an increase in GFAP and S100Œ≤ positive cells in aged dogs compared to young dogs. Understanding why this is happening will allow us to further study the disease mechanisms for neuroinflammation and provide future therapies.

Influence of Habitat Fragmentation on Sagebrush Specialist Dispersal in Wyoming

Shannon Kirkland, Erin Buchholtz
Warner College of Natural Resources

Presenter(s): **Shannon Kirkland**
Advisor/Mentor: Erin Buchholtz, PhD

Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43025

As climate change worsens and human land use increases, important ecosystems like the sagebrush will experience habitat loss and fragmentation. The habitat fragmentation of the sagebrush will affect species that rely on the habitat for survival. In this study, we look at habitat fragmentation in Wyoming between two years (2020 and 2080) and how it could impact species that have different dispersal distances. We use GIS processing to reclassify the sagebrush percent cover and to highlight where the sagebrush is predicted to decrease from 2020 to 2080. We use landscape metrics in R to determine the amount of fragmentation that will occur within both the state and the species ranges. We then compare the predicted sagebrush cover with the range maps and the predicted fragmentation results to predict how the species will likely be affected. We predict there to be a correlation between the results to where the species' dispersal distances will not be able to overcome future fragmentation without adaptation. The results of this study will be beneficial to land managers of the United States and Wyoming, Wyoming Game and Fish Department, non-governmental conservationists, and private landowners. These stakeholders can use the results to implement conservation strategies and corridors.

Insulin-like peptides (ILP) in Gecarcinus lateralis and their role in molt regulation

An-Ping Yu, Mihika T. Kozma, Donald L. Mykles
College of Natural Sciences

Presenter(s): **An-Ping Yu**
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42773

Crustaceans regularly undergo growth and regeneration through the molt cycle. Four stages of the crustacean molt cycle are controlled by levels of circulating ecdysteroids, which are synthesized by Y-organs (YO). Insulin-like peptides (ILPs) are members of the insulin superfamily and are known to regulate growth and development in arthropods. ILPs have been characterized in insects, but their role in the molt cycle of crustaceans is unknown. An insulin receptor (InsR) was previously detected in the YO transcriptomes of the blackback land crab, *Gecarcinus lateralis*. Thus, ILPs may activate signal cascades that ultimately regulate ecdysteroid synthesis. A potential role of ILPs is the delay of regeneration and molting. In *Drosophila*, an ILP secreted by damaged imaginal discs inhibits ecdysteroid synthesis and delays metamorphosis. Correspondingly in crustaceans, limb regeneration and molting can be inhibited if regenerating limb buds are damaged. Growth of intact limb buds does not continue again until damaged regenerating limb buds are replaced. The goal of this study is to identify ILPs and characterize their role in regeneration and molt regulation of crustaceans. Three putative ILPs (ILP-1, ILP-2, ILP-3) were identified in the eyestalk ganglia and YO transcriptomes of G. *lateralis* through phylogenetic analyses. Additionally, limb buds were autotomized at different regenerative states of G. *lateralis*, and will be used to generate new transcriptomes. By analyzing changes in gene expression of ILPs across different limb bud states, this study will provide a better understanding of ILPs and their role in molt regulation. Support: NSF (IOS-1922701) and CSU Honors Program.

Integration of Robotic Manipulator and Laser-Assisted printing for Automated Manufacturing of Composite Materials

Samuel Radosevich, Morteza Ziaee and Carter Dojan
Walter Scott, Jr. College of Engineering

Presenter(s): **Samuel Radosevich**
Advisor/Mentor: Dr. Mostafa Yourdkhani
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42895

Fiber-reinforced polymer composites (FRPCs) are widely used in many applications due to their excellent strength- and modulus-to-weight ratios. Boeing 747 fuselage, wind turbine blades, and Formula 1 chassis are only a few examples of the applications of FRPCs. Current manufacturing of these high-performance thermoset composites, however, requires energy-intensive and time-consuming processing conditions for complete curing of a product. Another challenge with manufacture of FRPCs is the design of expensive tooling or molds for every new design. At CSU, we are addressing these manufacturing issues by 3D printing composite structures. The goal of my research project is to investigate the automation and control of a 6-axis robotic arm and integration of a novel printing technique developed in our research group to enable in-the-air printing of complex composite structures. I have been able to successfully develop three-dimensional print path and manufacture composite structures with minimal tooling or support materials. Using this novel manufacturing approach, we can significantly reduce the cost and time of composite manufacturing and extend the application of these lightweighting materials.

Interactive 3D Architecture Webpage

Sara Bovaird, Dr. Maria Delgado
College of Health and Human Sciences

Presenter(s): **Sara Bovaird**
Advisor/Mentor: Dr. Maria Delgado
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42853

With the onset of COVID, students were impacted by the lack of immersive learning opportunities available to them in the city of Sterling, Colorado. Last summer, my professor, Dr. Maria Delgado, and I, worked closely on creating a product to enhance high school student's online learning opportunities. Utilizing Matterport, a 3D space capturing system, the CSU Architectural Virtual Library website provides a portal for Sterling students to access historic buildings from their community. Within the virtual immersion, these students can open embedded digital tags with in-depth information about each building. This information was collected from different community members and clubs, and the website itself was shaped by their input. Viewed by community members, students, teachers, and tourists, the website serves to educate the public on architecture and promote Sterling's rich community.

Investigating the Effects of Cannabis Use on Obsessive-Compulsive Disorder Symptomology Through the Overlap Between Anxiety Disorders and OCD

Emily Turner, Brad Conner Ph.D., Noah Emery Ph.D.
College of Natural Sciences,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Emily Turner**
Advisor/Mentor: Dr. Brad Conner
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43077

BackgroundObsessive-compulsive disorder (OCD) and many other anxiety disorders (ADs) have well-established basal ganglia (BG) dysfunction. BG pathways are heavily regulated by the endocannabinoid system (ECS) through endocannabinoid activation of cannabinoid receptor 1s (CB1s). OCD has not been well researched in the context of cannabis use, and the rates of cannabis use continue to increase. The present study aims to connect the molecular activity of BG circuitry controlled by the ECS with THC consumption's activity on the CB1 and how this impacts OCD symptomology through an examination of the existing research literature.MethodsLiterature searches were conducted using Google Scholar and PubMed. All resources used were peer-reviewed publications. Papers were screened for their references and what papers referenced them to find further connected research.
Results: People with idiopathic OCD have hyperactivity in the orbitofrontal cortex (OFC), the caudate nucleus of the striatum, the thalamus, and the anterior cingulate cortex (ACC). The BG has connectivity with all of these structures and is implicated in developing the inflexible and rigid routines, habits, and compulsions associated with OCD. Additionally, the hyperactivity of the direct pathway in the BG has been suggested to cause a positive feedback loop in which obsessive thoughts persist. The dopaminergic communication between the indirect and direct pathways in the BG is closely controlled in part by endocannabinoid (ECBs) activity at CB1s. The most prominent G-protein coupled receptor (GPCR) in the brain is CB1 with some of the highest concentrations found in the BG. Both ECBs have a higher affinity for the CB1 over the CB2, and THC and CBD have lower affinities than the ECBs. THC has a higher affinity than CBD for CB1s. Activated CB1s inhibit neurotransmitter release, and chronic or recent cannabis exposure leads to down-regulation of CB1, but the effects are reversible. Consequently, ECBs mediate neuronal plasticity, dopaminergic activity, and long-term depression (LTD).
Late adolescents and young adults use cannabis at the highest rates, and, also have the highest risk for developing anxiety and depression, and higher cannabis use has been associated with symptoms of anxiety.
Conclusions: The downstream effects of cannabis use on CB1s mediate many cognitive processes. Chronic cannabis use leads to lower levels of CB1, which may facilitate higher levels of hyperactivity in the BG circuitry involved in OCD through a loss of inhibition. The present study presents the idea that the effects of long-term cannabis use on people with OCD may cause more severe symptoms of this disorder. Symptom severity increased with more frequent use of cannabis, so more cannabis studies need to be performed to better understand the effects on human physiology, neurochemistry, and personality.

Investigating the role of phospholipase A2 and arachidonic acid during a dengue virus, serotype 2 infection

Camryn S Guenther, Elena Lian, Laura St Clair, Rebekah Gullberg, Rushika Perera
College of Natural Sciences,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Camy Guenther**
Advisor/Mentor: Dr. Rushika Perera
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42968

Dengue viruses are transmitted by Aedes aegypti mosquitoes and cause over 400 million infections annually. These viruses hijack host lipid pathways in the cell to support their replication. A pathway of interest is arachidonic acid (AA) metabolism. AA and lysophospholipids are released by cytosolic and secreted phospholipase A2 (PLA2) enzymes from cell membrane phospholipids. This process is called the Lands cycle. AA is also a well-known precursor of anti-viral inflammatory mediators. Previous studies by our laboratory have already shown that reduction of AA through a knockdown of AA producing PLA2 isoforms (2A, 4A, and 4C) decreased infectious viral titer during a DENV2 infection. The goal of the current study is to identify why AA plays such an important role during the virus life cycle. First, we have investigated which steps of the viral lifecycle are impacted by the reduction of AA through an siRNA-mediated knockdown of PLA2 (2A, 4A, and 4C). Second, we have conducted experiments to determine if exogenous AA addition to a viral infection has an impact on levels of viral titer. Third, we have studied if exogenous AA addition can recover infectious viral titer in the siRNA treated PLA2 knockdown cells. It is our hypothesis that PLA2 and AA may have dual roles during virus infection, both in supporting viral replication and creating the anti-viral inflammatory precursor molecules. Progress on this work will be presented.

Investigation and Optimization of Trans-Cinnamic Acid Production in E. coli

Hayley Ma
Walter Scott, Jr. College of Engineering

Presenter(s): **Hayley Ma**
Advisor/Mentor: Dr. Christie Peebles
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43075

Trans-cinnamic acid is a platform chemical to many aromatic chemicals that are essential components in conventional fuels and chemicals. Trans-cinnamic acid (t-CA) is formed through the denitrification of phenylalanine. Therefore, by utilizing and overproducing the phenylalanine ammonia lyase (PAL) gene t-CA production is enhanced. Three low-copy plasmids containing three different PAL genes were constructed and transformed into Escherichia coli (abbreviated as E. coli). The low-copy plasmids were used in shake flask cultivations used to determine the highest t-CA producer of the three engineered strains. The winning strain produced 210 mg/L t-

CA in shake flask cultivations. The desired gene and promoter of were cut out of the winning strain and used to construct a high-copy plasmid, transformed into E. coli. Utilizing the new engineered E. coli, production increased to over 245 mg/L t-CA. With feeding phenylalanine in shake flask cultivations trans-cinnamic acid concentrations as high as 865 mg/L were achieved.

Is Sustainable Freshwater Net-Pen Aquaculture Truly Sustainable?

Kyaran Matturro, Ed Hall
Warner College of Natural Resources

Presenter(s): **Kyaran Matturro**
Advisor/Mentor: Dr. Ed Hall
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42912

In this study, we evaluate whether aquaculture sustainability certifications include ecosystem impacts in their criteria. Aquaculture, colloquially known as fish farming, has been growing in popularity because of the growing global demand for fish, shellfish, and various aquatic plants. These facilities are often considered to have significantly fewer environmental impacts than traditional agriculture does, and the demand for inexpensive protein-rich food-stuffs has allowed for the practice to become more widespread over the years. An analysis of five different sustainability certifications for freshwater net-pen aquaculture facilities reveals that there are no consistent standards to limit the effects of eutrophication of the water bodies these facilities inhabit. Our study concluded that the water quality standards for most certificates measure, but do not limit, levels of effluents like nitrogen (N) and phosphorous (P) for each farm. This reveals that these facilities are not as sustainable as previously considered because excessive inputs of reactive N and P result in the inevitable eutrophication of freshwater ecosystems. In a world that is grappling with the human impact on the ecosystems that support us, this lack of standardization could have adverse effects on the native ecosystems that inhabit the areas where these facilities are.

Is the Chemistry First Year Seminar Curriculum Adequately Preparing Students with Research and Critical Thinking Skills?

Christina Fournier
College of Natural Sciences

Presenter(s): **Christina Fournier**
Advisor/Mentor: Dr. Carlos Olivo
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43022

This study was designed to help assess first-year chemistry students at CSU to see whether the first-year chemistry seminar prepared them with research and critical thinking skills. By assessing the students, we can see where we need to improve the curriculum to help them conduct successful research in future labs. The objective of this study was to determine how to adequately

prepare students with research and critical thinking skills through the curriculum of the chemistry first-year seminar. We looked through the syllabi of different universities around the country to see how they introduce these foundational skills. Using this information as a framework, we developed a survey asking students how the course prepared them for research and what they would change. The survey was successful in helping us get an insight of how students felt about the course and what we could improve on in the curriculum. With a response rate of 35 students out of 50 that were enrolled in the course, we were able to see that the course did not offer enough hands-on activities and presentational experiences. It can be concluded that students want more hands-on activities and more presentational experiences in order to help them expand their knowledge and present their findings on their research. By incorporating more activities such as independent research or interactive lesson plans into the first-year chemistry seminar, students would be able to develop their research and critical thinking skills to a greater degree and gain experience to be successful in future research.

Is Upper and Lower Extremity Vibration Threshold Influenced by Protocol Requirements?

Lana Razma, Dr. Neha Lodha
College of Health and Human Sciences

Presenter(s): **Lana Razma**
Advisor/Mentor: Laura Taylor
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43038

Introduction: Vibration detection is negatively affected in Multiple Sclerosis, however, little is known how other neurodegenerative diseases, such as Alzheimer's Disease (AD) influence vibration detection. The detection of vibration threshold may serve as an additional diagnostic tool for AD. Current AD research and interventions depend on early diagnosis. Additional diagnostic tools could be beneficial in clinically diagnosing AD earlier. The purpose of this pilot study was to investigate differences in the detection of vibration threshold between two Protocols with the goal of utilizing one of the two Protocols in future projects with cognitively-normal and cognitively-impaired participants. Typically, vibration threshold is detected by progressively decreasing the stimulus. However, this method is limited because participants could become acclimated to the vibration. We hypothesized that increasing the vibration stimulus, rather than decreasing, would lead to lower vibration thresholds in the upper and lower extremities.
Methods: Ten healthy, young adults (22.7 ¬± 6.57) participated. Participants completed Protocol 1, vibration stimulus incrementally decreased, then Protocol 2, vibration stimulus incrementally increased, in first the self-selected dominant upper extremity, then the dominant lower extremity.
Results: Vibration threshold is significantly higher in the lower extremity than the upper extremity in both Protocol 1 ($p = 0.01$) and Protocol 2 ($p = 0.02$). However, there is no significant difference in vibration threshold for the upper or lower extremity between the two Protocols. In the upper extremity, women had a higher vibration threshold than men for both Protocols. In Protocol 1, for the lower extremity, women had a higher threshold than men and in Protocol 2,

for the lower extremity, there was no difference in vibration threshold between genders. Of note, these findings are limited because our small sample size did not provide sufficient power to identify significance. Conclusion: Our preliminary findings indicate that either Protocol 1 or 2 could be used in future studies to detect vibration threshold.

Jealousy in Domesticated Canines

MacKenzey Kologlu
College of Liberal Arts

Presenter(s): **MacKenzey Kologlu**
Advisor/Mentor: Christopher Kopack
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42700

Jealousy is a secondary emotion thought to be associated with a situational threat made by a rival to a pre-established bond. Although primordial forms of jealousy have been alluded to in domesticated canines regarding a threat to the dog-owner bond, no study has incorporated direct dog-dog interactions when attempting to illicit a jealous response. This study uses a live "rival" canine which the owner exclusively interacts with, both of which the dog in the dog-owner relationship in question can directly interact/inject themselves with. Results from this study show much more highly pronounced results than those which use inanimate or animatronic "rivals", and suggest that there are three primary forms in which jealousy can be expressed: an attention-seeking, aggressive, or sulking response. Only dogs with no history of aggression of any degree towards humans or other dogs were used in order to eliminate such explanations for certain observed behaviors and the experiment was conducted in a neutral environment to both parties as to eliminate the possibility of territorial aggression or behaviors.

Ketamine's rapid antidepressant effects are mediated by Ca2+-permeable AMPA receptors in the hippocampus

Anastasiya Zaytseva, Isabella Schmidt, Maddy Wustrau, Evelina Boukova, McKennon Wiles, Michael J Doolittle, Seonil Kim
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Anastasiya Zaytseva**
Advisor/Mentor: Dr. Seonil Kim
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42915

Depression is a complicated mental illness, the causes of which are not entirely known yet. Depression is a mood disorder that affects the brain through chemical imbalances regulated by inadequate neurotransmitter release and decreased neuronal activity in the hippocampus. Treatment options are centered around medication and/or cognitive therapy. Antidepressants are common classes of medication prescribed to patients. While they do show improvement/ relief from symptoms, choosing the right medication is more of a trial-and-error process, which

means that it may take a long time to stabilize a depressed patient, leaving some at an increased risk for suicide. Additionally, some cases are treatment resistant. Recently, ketamine has become a center of interest due to its antidepressant effect. Currently, the FDA has approved ketamine as a nasal spray treatment for cases of severe depression and suicidal ideation. Ketamine is known to act at the glutamatergic synapse and block NMDA receptors. However, the exact intracellular mechanism is unknown. In our research, we have found that ketamine increases surface level expression of AMPA receptors permeable to calcium, which indicates an alternative mechanism for calcium influx into the cell. This data suggests that calcium permeable AMPA receptors could be the potential mechanism for ketamine's antidepressant effects.

Large Genome Size Effect on Brain Morphology in Plethodon Salamanders

Priya Krakker
College of Natural Sciences

Presenter(s): **Priya Krakker**
Advisor/Mentor: Dr. Rachel Mueller
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42979

Plethodon is a genus of lungless salamanders that consists of 53 species. These salamanders have some of the largest genomes of all vertebrates (23Gb-67Gb). Salamanders serve as a powerful model organism for studying the implications of large genome size, given their large and variable genome size. Specifically, the questions being asked are, how do genomes evolve, particularly those at the extremes of genome size, and how does genome size impact cell biology, organismal biology, and the evolutionary trajectories of these salamanders? The big idea from those questions that is relevant to this research is that large genome size means large cell size, which can be a determining factor for morphology. This study aims to answer those questions in relation to the impact of genome size on brain development and morphology. This study is the first of its kind for Plethodon salamander brains. Data analysis consisted of studying brain morphology by measuring total brain volume, standardized brain volume, brain ventricle volume, and the relationship between total brain volume and ventricle volume (n=9). This was done using the computer application 3D Slicer to make 3D renderings of each brain. The results showed that genome size did not change directly as a function of genome size. It was concluded that brain development is independent from evolutionary change in genome/cell size. Following the analysis of brain volume, the direction of this research has moved to landmarking the salamander brain as a method for determining brain shape, something yet to be done in salamanders.

Learning Pathological Cell Types Using Convolutional Neural Networks: A Transfer Learning Approach for Single Cell Image Classification

Sydney Alderfer, Lubna Tahtamouni, Ashok Prasad
Walter Scott, Jr. College of Engineering,College of Natural Sciences

Presenter(s): **Sydney Alderfer**
Advisor/Mentor: Dr. Ashok Prasad

Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42892

Cell morphology and cytoskeletal organization can provide great insight into cell health and disease states. In cancer cells, cytoskeletal dynamics, filament organization, and overall cell morphology are known to be altered substantially. Machine learning methods have been recently applied to extract novel biological insights from a variety of clinical image data types, including individual cancer cell images. While these images hold a wealth of information about cell state, it is difficult to generate the large datasets required for many machine learning methods. We used a small fluorescence microscopy image dataset of retinal pigment epithelial (RPE) cells to investigate the effectiveness of convolutional neural networks (CNNs) to distinguish between normal and oncogenically-transformed cells and between different subtypes of transformed cells of the same cell line. The dataset included the parental cell line ARPE19 and three laboratory-derived APRE19 cell lines that were transfected with key oncogenes. We found that the CNN could accurately identify cancer cells from the parental cell line with an accuracy of about 95% or better at the single cell level, significantly better than with artificial neural networks (ANNs) using the same image dataset. Furthermore, CNNs could not only accurately distinguish each transformed cell line from the parent cell line but also from the other transformed cell lines, indicating that each single oncogenic mutation produces a unique signature in actin morphology. Machine learning models that can accurately identify tumor cell properties at the level of a single genetic mutation could prove immensely useful in clinical settings.

Life Cycle and Techno-Economic Comparison of EV Charging Systems

Dominic Dallago, Noah Horesh
Walter Scott, Jr. College of Engineering

Presenter(s): **Dominic Dallago**
Advisor/Mentor: Dr. Jason Quinn
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42859

This research aims to compare the cost and environmental effects of four different EV charging systems. The goal of this comparison is to inform policy makers on the environmental and economic tradeoffs of the implementation of different charging systems. Life cycle and techno-economic analysis models were used to analyze each system. The models consider how different times of use for each charging system effect both price and emissions based on local grid mixes and electrical pricing. The systems are compared on a state-by-state basis for the year 2020 and 2050. This work will be the first to compare all currently developed charging technologies and how their specific use schedules effect emissions and lifetime costs. Furthermore, through this research lifecycle and techno-economic models were built that will allow for the comparative analysis of future systems. This work found that based on current energy grid pricing and emissions that the PC home charging network is the optimal system to deploy in 2020. With a cleaner energy grid in the future, the WPT system will be the cleaner technology to deploy; however, the WPT system may still be economically unfeasible unless costs are reduced.

Liposomal Biologically Active Aromatic Acids: Benzoic and Salicylic Acids

Anna Galaeva, Sarah Sanders, Debbie Crans
College of Natural Sciences

Presenter(s): **Anna Galaeva**
Advisor/Mentor: Sarah Sanders, Debbie Crans
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42924

The interactions of benzoic and salicylic acids with liposomes were characterized to understand molecular interactions of the two acids with the membrane. The liposomal system was made of soy α-phosphatidylcholine (SPC) bilayers that allowed the determination of molecular interactions and potential positions within the membrane using ^{1}H NMR. Benzoic and salicylic acids were both found to penetrate the membrane interface deeper when in their protonated forms. Significant broadening of the aromatic peaks demonstrated a pH dependence for both acids. They both penetrated deeper around their pKa. This provides justification for the inhibitory activity of benzoic and salicylic acids in lower pH environments. Also, this shows the next piece in understanding of the uptake of benzoic and salicylic acids in bacteria.

Longitudinal SARS CoV-2 identification in human stool and associated gut microbiota

Nicole Natter, Bridget A. Baxter, Maddie Tipton, Kailey Berry, Kristen Otto, Abby Veath, Pankaj Trivedi, Emily N. Gallichotte, Emily Fitzmeyer, Michael C. Young, Gregory D, Ebel, August Luc, Jim Huang, Carol Wilusz, Stephanie M LaVergne, Kim McFann, Julie
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Nicole Natter**
Advisor/Mentor: Dr. Elizabeth Ryan
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42884

Severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) has caused the deaths of millions and infected over 200 million since its emergence in December of 2019. Diagnostic tests for SARS-CoV-2 typically involve nasopharyngeal and saliva biospecimens, whereas little is known regarding the persistence of SARS-CoV-2 detection following acute infection in human stool. A cohort of adults with confirmed SARS-CoV-2 infection were asked to submit stool samples over the course of six months to one year as part of the Northern Colorado COVID-19 Biorepository (NCT04603677). Of 139 participants enrolled, 109 adults provided at least one stool sample. From the 63 females and 46 males analyzed so far, 39.4% tested positive at least once in the stool and 14% had persistent positive stool detection by either real-time PCR or ddPCR. Additionally, a relationship between BMI and microbiota composition was identified in a subset of participants by 16S sequencing that merit investigation alongside differences in persistent stool virus detection. This pilot analysis supports a higher SARS-CoV-2 PCR detection rate in adults who are overweight and obese when compared to normal weight. Moreover, a higher number of females

with positive SARS-CoV-2 PCR in stool suggests potential for sex differences. We conclude that the intestinal colonization of virus merits further investigations with respect to changes to microbiota and persistent immune activation, as well as development of post-acute sequelae, namely long-COVID symptoms. Future studies are also needed to evaluate differences between variants for gastrointestinal involvement during initial disease progression and in cases of re-infection during the pandemic.

Loss of the Mitochondrial Calcium Uniporter Leads to Altered Transport Dynamics in C.elegans

Ennis Deihl, Rachel Doser, Dr. Fred Hoerndli
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Ennis Deihl**
Advisor/Mentor: Dr. Fred Hoerndli
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42951

Transport of ionotropic glutamate receptors (iGluRs) is necessary for the maintenance and proper function of excitatory synapses which are crucial for normal cognition, learning, and memory. Our research has shown that the long-distance trafficking of glutamate receptors is regulated by calcium signaling and its downstream effectors such as the kinase CaMKII. It is also known that iGluR transport is facilitated by molecular motors that require a substantial amount of ATP to work continuously. Interestingly, in addition to regulating iGluR transport, calcium signaling upregulates ATP production in neuronal mitochondria. Influx of calcium into the mitochondria also allows the neuron to maintain relatively low levels of cytosolic calcium. Calcium buffering is thought to be important for the specificity of calcium-dependent signaling pathways. However, little is known about how calcium dependent iGluR transport is affected by this mechanism. This led to the question: Is mitochondrial calcium buffering necessary for normal transport and synaptic localization of iGluRs? In vivo imaging of fluorescently tagged iGluRs was performed in a strain of the transparent nematode C. elegans that possesses a loss-of-function mutation in the pore forming subunit of the mitochondrial calcium uniporter (MCU), as well as in strains possessing normal mitochondrial buffering. In the absence of MCU, the overall amount of iGluR transport remained unchanged, however, dendritic transport dynamics differed in a way known to decrease delivery of iGluRs to synapses. This suggests that mitochondrial buffering plays a role in regulating synaptic delivery of these receptors, though interestingly MCU loss does not impact the number of iGluRs at the synapse.

Manipulation of Recombination-dependent DNA Replication in Thermococcus kodakarensis

Jaylin Mandley, Geraldy Liman
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Jaylin Mandley**
Advisor/Mentor: Dr. Thomas Santangelo
Category: Research Poster

Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43064

DNA replication is an essential process that all organisms use to pass down genetic material from one organism to the next generation. In order for DNA replication to occur, a multiprotein molecular complex called a replisome is required to begin the DNA replication process. Most organisms are known to utilize origin-dependent replication (ODR) where the replisome is organized at a DNA replication origin(s) at a specific location or locations in the genome. In some organisms, origin-independent replication is possible through recombination-dependent replication (RDR). Until recently, it was previously thought that ODR was the most common form of DNA replication in all organisms (Hawkins et al., 2013). However, research demonstrates that the optimal growth of the hyperthermophilic marine archaeon Thermococcus kodakarensis is not dependent upon replication origins and instead requires RDR to undergo DNA replication (Gehring et al., 2017). RDR initiation in T. kodakarensis relies on the functioning DNA strand exchange RadA protein found in the replisome. A possible environmental switch commonly found in DNA replication, recombination, and repair (RRR) related proteins like RadA is called an intein, a peptide sequence that can auto-catalytically splice itself from a protein under certain environmental cues. Because an intein is contained within RadA protein in T. kodakarensis, there might be a link between the intein contained within RadA and the molecular mechanism controlling the use of ODR versus RDR DNA replication strategies. This research focuses on the homing endonuclease found within the intein of T. kodakarensis RadA protein that could be the specific mechanism controlling intein regulation of ODR versus RDR DNA replication strategies in T. kodakarensis.

Mapping Museums: A Spatial Analysis of the Gregory Allicar Museum of Art at Colorado State University

Aiden Lyde, Peyton Meyer, Madelin Risch, Grace Tiberi, Ryan Murray
College of Liberal Arts

Presenter(s): **Aiden Lyde**
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42993

The goal of this project is to identify parts of the world that are represented in the Gregory Allicar Museum of Art at Colorado State University. Museums are powerful institutions for identity formation. As international studies students, we believe it is important to be mindful of bias in art consumption and to have exposure to a variety of perspectives. Thus we felt it was important to understand how the museum provides accessibility to international art for the community. Due to the museum's location within a predominantly white community where indigenous cultures have historically been repressed, we hypothesized that a majority of the works featured in the museum would originate from Western cultures. To answer our research questions, our project consisted of statistical analysis and mapping techniques in order to visually display the data collected. Our findings show that the museum's artworks originate from a variety of different countries, particularly in Africa, North America, and Europe. However, our findings also revealed a notable lack of representation from South and Central America, the Middle East, and

Asia. We hope that by highlighting the geographical origins of art in the museum, patrons will have more awareness of the scope of cultural representation and will be encouraged to think critically about how this affects their interpretation of global artwork. Lastly, we hope to draw attention to the importance of cultural representation in art education.

Mechanisms of Amyloid Buildup in Alzheimer's Disease

David Reyes
College of Natural Sciences

Presenter(s): **David Reyes**
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42920

The buildup of amyloid beta proteins is a major characteristic of Alzheimer's Disease. This buildup will then cause disease through disrupting neuronal functions and lead to degradation of brain tissue. There may be two different pathways in which the precursor to the amyloid beta protein is processed in which one pathway leads to the production of amyloid beta proteins. An interaction between two proteins may also help promote the pathway that prevents amyloid production.

Monitoring Sustainable Development Goal Indicator 11.3.1 for Urban Areas in South Africa

Cody Bingham, Dr. Jody Vogeler
Warner College of Natural Resources

Presenter(s): **Cody Bingham**
Advisor/Mentor: Dr. Jody Vogeler
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42860

Urban areas are expanding globally, with many areas of Africa at the forefront of this trend experiencing unprecedented rates of growth (Guneralp B. et al 2017). There is particular interest in monitoring the rate and sustainability of urbanization near protected areas where changes in land cover and land use may have greater impacts on ecosystem services. The United Nations has created the Sustainable Development Goal [SDG] 11.3.1 indicator which assesses the potential sustainability of urban expansion based on land cover and population growth of a certain area. Using optical satellite derived land cover classification products from 2014 and 2020 in South Africa and global gridded population data sets, we extracted settlement classes and population growth rates to calculate the SDG 11.3.1 indicator for expanding urban areas on the periphery of Kruger National Park. By targeting focal areas within this region that represent a range of urban sizes and potential expansion patterns, we can gain a better understanding of the potential sustainability of different SDG 11.3.1 values and potential ecosystem service trade-offs associated with the urbanization driven land cover and land use changes. It is expected that urban land cover changes in the Greater Kruger Strategic Development Programme area are influencing ecosystem service tradeoffs because of the decreasing area of other land cover.

Morphology of Differentiated THP-1 cells infected with Mycobacterium abscessus

Diana Jimenez, Ilham Alshiraihi
College of Natural Sciences

Presenter(s): **Diana Jimenez**
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43071

Mycobacterium abscessus cause skin and pulmonary infection in immunocompromised individuals. Pulmonay infections with M. abscessus are particularly challenging to treat because this bacillus displays intrinsic antibiotic resistance to most front-line drugs. Tigecycline, the first tretracycline with glycyl moiety, overcomes the common resistance mechanism in rapid-growing mycobacteria.

It is known that Mycobacterium abscessus is an intracellular macrophage pathogen, and the objective is to see the changes in morphology when macrophages are infected with M. abscessus. The main interest is the morphology of the infected cells and the morphology of the cells once we start an antibiotic treatment. There should be a noticeable change between the two cells.

Motor accuracy relates to the cognitive performance in individuals with stroke

Huck Colby, Prakruti Patel, Neha Lodha
College of Natural Sciences

Presenter(s): **Huck Colby**
Advisor/Mentor: Dr. Pakruti Patel
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42935

Introduction: Precise motor actions like walking require planning and selection of appropriate motor response, elements that require sound cognitive abilities. Stroke affects both motor and cognitive abilities; however, whether reduced cognition impacts motor performance is not known. Recent data suggests that cognition plays a critical role in producing steady motor output. The purpose of this study is to evaluate the relationship between cognitive and motor performance in stroke survivors.

Methods: Thirteen stroke survivors and 12 healthy controls performed motor control and cognitive tests. We measured motor accuracy with error on visuomotor force tracking task involving dorsiflexion force. We measured cognition using the Stroop test quantifying executive function, the Symbol Span test quantifying working memory, and the visual search test quantifying selective attention.

Results: The stroke group showed a significantly decreased motor accuracy and increase in motor variability relative to the controls. The stroke group showed significantly higher Stroop interference score, and increased response time on the visual research task compared to the control group. Force error was positively related to Stroop interference score (r = 0.42, p=0.01), and response time (r =0.35, p=0.05), and negatively related to symbol span score (r = -0.38, p=0.03), for both groups together. Reduced performance on cognitive domains of executive function, working memory, and selective attention correlated with reduced motor accuracy.

Significance: Stroke survivors showed impaired cognitive and motor performance. Importantly, the relationship between several cognitive domains and motor accuracy suggests that movement impairments after stroke may be contributed by decline in cognitive function.

Nanoconfinement and Sugars: Impacts of Mannose in Reverse Micelles

Mia Halliday, Sam Miller, Nancy Levinger
College of Natural Sciences

Presenter(s): **Mia Halliday**
Advisor/Mentor: Dr. Nancy Levinger
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43047

Hexose sugars are commonly found in biological systems. Although they share the same chemical formula, C6H12O6, their structures lead to varied properties, in part due to differing stereochemistry. Many studies have explored hexose sugars in bulk solution, but in biologically relevant systems they exist in nanoconfined spaces, e.g., within cells. Biological nanoconfined spaces are hard to study directly owing to their complexity. Thus, we enlist reverse micelles, a common model system, where a polar phase (such as a water droplet) is confined in a self-assembled structure surrounded by a non-polar phase, to study hexose sugars in nanoconfinement. Glucose, the fuel for many organisms and the most abundant of the hexose sugars, has been studied in nanoconfinement. On the other hand, nanoconfined mannose, another hexose sugar with an important role in enzyme activation, has yet to be studied. We report the size of mannose containing reverse micelles measured with dynamic light scattering, the ratio of different molecular forms (known as anomers) in nanoconfined environments using 1H-NMR, and the exchange between water and mannose OH groups using EXSY-NMR. With the addition of mannose, we found that reverse micelles size remains nearly unchanged. Nanoconfined mannose also shows a change in anomeric ratio, shifting closer to 50% Œ± and 50% Œ≤, similar to what has previously been observed for glucose. The water-mannose proton exchange rates slow down when nanoconfined. Although the exchange is slower than mannose in bulk aqueous solution, the exchange is faster than glucose in the same environment.

Natural Model of Tuberculosis Meningitis using Aerosolized Mycobacterium tuberculosis in Guinea Pigs

Charlize E Geer, Amanda Latham, David F Ackart, Amelia Day Hines, Randall J Basaraba, Julie A Moreno
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Charlize Geer**
Advisor/Mentor: Amanda Latham
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42965

Tuberculosis (TB) remains one of the most devastating infectious diseases worldwide, with tuberculosis meningitis (TBM) being the more deadly form. TBM occurs when Mycobacterium tuberculosis (Mtb) crosses the blood brain barrier (BBB) and causes inflammation of the meninges and brain damage. Additionally, central nervous system (CNS) damage can occur when the intensely immunogenic response to peripheral Mtb infection of the lungs reaches the brain. Currently, the most common model for TBM utilizes rabbits infected with Mtb by subarachnoid inoculation. While effective, this model does not reflect natural exposure to Mtb nor disease progression comparative to that of human patients. We have proposed a more effective method of studying TBM through the use of guinea pigs, which show disease pathology and symptoms similar to human TB infection, given a high dose of Mtb by aerosol exposure. In this study, young Dunkin Hartley guinea pigs were infected with high doses of one of two Mtb strains, either the common laboratory strain H37Rv or the hypervirulent strain HN878. Animals were terminated at 15 dpi and then various staining techniques, including immunohistochemistry, were performed to evaluate neurotoxicity. Mtb induced lesions within the brain, and there were increased activated microglia at the sites of damage. Although no Mtb colonies were cultured from brain homogenate, our preliminary findings demonstrate that aerosolized infection using high dose and a high virulent strain of Mtb in guinea pigs could serve as a more accurate model to study TBM, rather than directly injecting Mtb into the CNS.

Neural Embeddings for Gene Expression Features

David Kott
College of Natural Sciences

Presenter(s): **David Kott**
Advisor/Mentor: Dr Michael Kirby
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42239

Traditional methods of genetic embeddings are easy to implement but are high in dimensionality and lack clustering of similar genes. By using the weights of a shallow convolutional neural network, we can sharply reduce dimensionality with co expressed genes being tightly clustered. To explore this embedding method, we used the GSE 3702 dataset. This set contains information on patients who were injected with one of four influenza viruses then had information collected on response to virus and expressions of 23,000 genes in blood cells. Of the four diseases examined, all had distinct snake like patterns. The converged shape was also robust to hyper

parameter changes such as hidden layer size and random weight initialization. The clustering of the neural embedding shows potential to improve effectiveness of genetic machine learning with the lower dimension offering cheaper computational cost.

Neurotoxicity and Cognitive Decline in Guinea Pigs with Systematic Mycobacterium Tuberculosis Infection

Isla Anderson, Amanda Latham, Charlize Geer, David F Ackart, Amelia Day Hines, Randall J Basaraba, Julie A Moreno
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Isla Anderson**
Advisor/Mentor: Amanda Latham and Dr. Julie Moreno
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42930

Tuberculosis (TB) is a bacterial infection caused by *Mycobacterium tuberculosis* (Mtb) infecting around 10 million people each year. Primarily in the lungs, TB induces a robust immune response causing the formation of granulomas. Cross-sectional studies have found associations between TB and increased risk for neurogenerative diseases, including Parkinson's Disease and dementia. TB patients co-infected with HIV also experience accelerated cognitive decline compared to HIV infection alone. These correlations exist without evidence of central nervous system (CNS) Mtb infection or tuberculosis meningitis, where infection progresses to the brain causing inflamed meninges. Using guinea pigs infected with Mtb by aerosol exposure, an animal model demonstrating pathology closest to human disease, we investigated the neurotoxicity and CNS pathology associated with peripheral TB infection. Through use of behavior tests and immunohistochemical staining, animals with systemic Mtb infection show impaired cognitive functioning and markers of CNS inflammation and neurodegeneration compared to uninfected controls. Guinea pigs 60- and 90-days post infection had non-spatial memory loss and anxiety-like behaviors indicative of declined cognition. Neuropathology analysis showed a significant increase in pro-inflammatory astrocytes and microglia in various brain regions. Misfolded proteins phosphorylated tau and accumulated amyloid beta, characteristic of common dementias, were also found within these brain regions. The presence of these inflammatory and degenerative biomarkers establish confidence in the correlation between peripheral tuberculosis and damage to the CNS. These findings will enhance our ability to prevent individuals with TB from experiencing permanent deficiencies and deepen our understanding of how the peripheral immune system affects the brain.

Optimization and Initial Characterization of the Reptile Microbiome

Gabriell Papp, Kyra Pyron, Paige Fortunati, Ashley McGrew, and Traci Kinkel
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Gabriell Papp**
Advisor/Mentor: Traci Kinkel
Category: Research Poster

Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43054

In the case of vertebrate ectotherms that rely heavily on a complex microbiome to survive, rising global temperatures are of great concern to the survival of these animals. Research has shown that variations in environmental temperature can significantly impact the essential microbiome of various animal species. Despite the growing threat to these animals, research surrounding reptile microbiomes is limited. Hence, this work outlines the optimization of culture dependent and independent methods used for the collection and characterization of captive raised reptile skin and gut microbiomes. Skin, food, and fecal samples were collected opportunistically from two adult bearded dragons as well as additional fecal samples from captive raised reptiles of various species before DNA was extracted and purified using Qiagen genomic DNA isolation kits for tissue and stool. The next steps involved PCR amplification with 16S rRNA V4 region primers followed by a second round of PCR to include index sequences. Amplified samples were then validated and analyzed with microbiome sequencing. Future direction for this project will entail repetition and expansion of collection and sequencing methods before assays can be performed on a broader array of vertebrate ectotherms to investigate the influence of temperature fluctuation on microbiome diversity.

Organic Carbon Oxidation in Lowland Tropical Forest Soils

Katelyn Heinsma, 2nd person Emily Blackaby, 3rd person Daniela Cusack
Warner College of Natural Resources

Presenter(s): **Katelyn Heinsma**
Advisor/Mentor: Dr. Daniela Cusack
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42856

Soils are able to store large quantities of carbon (C) through direct fixation of carbon dioxide into inorganic compounds and indirect fixation from above group biomass that is then incorporated into the upper layers of the soil and transported down throughout the soil profile through leaching. Tropical forests contain the most C-rich soils globally, however, their sorption potential is still largely unknown. The sorption of dissolved organic C to soils is likely influenced by differences in precipitation and soil fertility. Prior to sorption experiments, all C must first be removed from soils while leaving the minerals intact. To test C removal, fours sites across rainfall and fertility gradients were chosen from low-land tropical forests in Panama. Soil samples were taken from 0-100cm depths, with a soil sample taken at 0-10cm and then 25cm depth intervals. Depths 0-10 and 75-100cm were chosen to test C removal at both high and low C concentrations. All samples were placed in 35ml Sodium Hypochlorite and shaken at room temperature at 180 rmp for 24 hrs. This process was repeated three time for one subset and five times for a second subset. Samples were then analyzed using an Elemental Analyzer to determine final soil C concentrations and compared to determine the effectiveness of C removal.

Pharmacokinetic Investigation of Commercially Available Edible Marijuana Products in Humans: Potential Influence of Body Composition and Influence on Glucose Control

Hannah Butterklee, Taylor Ewell, Kieran Abbotts, Natasha Williams, Matthew Bomar, Kole Harms, Jordan Rebik, Sarah Mast, Natalie Akagi, Gregory Dooley, and Christopher Bell
College of Health and Human Sciences

Presenter(s): **Hannah Butterklee**
Advisor/Mentor: Dr. Chris Bell
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42808

The purpose of the study was to describe and compare the pharmacokinetics of five commercial edible marijuana products, determine the influence of body composition on pharmacokinetics, and, in light of epidemiology suggesting marijuana may offer diabetes protection, explore the influence of edible marijuana on glucose tolerance. Seven regular users of marijuana self-administered five edible products in a randomized crossover design; each product contained 10 mg of delta-9-tetrahydrocannabinol (THC). Thirty minutes following marijuana ingestion, participants imbibed a 75 g glucose beverage. Time-to-peak plasma THC concentration (T_{max}) ranged between 35 and 90 min; maximal plasma THC concentration (C_{max}) ranged between 3.2 and 5.5 ng/mL. Relations were identified between body composition and pharmacokinetic parameters for some products; however, none of these body composition characteristics were consistently related to pharmacokinetics across all five of the products. Edible marijuana had no effect on oral glucose tolerance compared with a marijuana-free control (Matsuda Index; $p > 0.395$). Commercially available edible marijuana products evoke different plasma THC concentrations shortly after ingestion, but do not appear to influence acute glucose regulation. These data may allow recreational marijuana users to make informed decisions pertaining to rates of edible marijuana ingestion and avoid overdose.

Piloting the Isolation of Genomic DNA from Helminth Eggs

Ellery Sherman, Gabriell Papp, Emily Bradford, Paige Fortunati
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Ellery Sherman**
Advisor/Mentor: Dr. Ashley McGrew, Dr. Traci Kinkel
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43003

There are many critical aspects of a parasite's life cycle that allow them to advance to their next stages of growth and development. In recent research, bacteria such as Wolbachia pipientis have been found in the microbiome of Dirofilaria immitis which can be an adaptive advantage for the parasite (McHaffie, 2012). The objective of our research was to extract DNA from parasite eggs to see if there is any bacteria aiding their advancement to their next life cycle stage. We hypothesized that there would be evidence of bacteria interacting with parasite eggs to improve their microbiome or influence the developmental stages of the parasite. Fecal samples, from which parasite eggs were isolated, were opportunistically collected from parasite infected hosts. This research pilots methodology for extracting DNA from helminth egg samples collected using

a modified fecal floatation technique. Using different DNA isolation kits (Qiagen- both Tissue and Stool), we were able to successfully extract gDNA for both fecal and egg samples to be utilized in 16S microbiome sequencing analysis. We anticipate completing the data analysis for this project and being able to identify the presence or absence of endosymbionts in the egg samples Future directions to continue investigating this line of study would involve surveying more diverse animal hosts that are infected with various helminths to expand our knowledge of the presence of endosymbionts throughout the different stages of the helminth life-cycles.

Polygenic Risk Scores for Depression and Brain Structure in Children and Adolescents

Hailee Hurtado, Bailey McClellan-Short, Melissa Hansen, Jordan Strack, Budhachandra Khundrakpam, Uku Vainik, & Emily C. Merz
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Hailee Hurtado**
Advisor/Mentor: Dr. Emily Merz
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42983

Major Depressive Disorder (MDD), which is a major public health concern, has been associated with structural differences in the prefrontal cortex (PFC) and parts of the limbic system. Although MDD is known to have a strong genetic basis, the role of genetic risk for MDD in shaping brain structure in typically developing children and adolescents is unclear. Genome-wide polygenic risk scores for MDD (PRS-MDD) derived from genome-wide association studies (GWAS) have been significantly associated with risk for MDD in independent samples. Cortical thickness is known to decrease across development whereas cortical surface area increases during childhood then decreases during adolescence. This study examined whether these age-related changes in brain structure varied by PRS-MDD in typically developing children and adolescents. We expected that higher PRS-MDD would be associated with greater age-related cortical thinning in medial PFC regions. Participants were 416 typically developing children and adolescents with no history of neurological disorders, bipolar disorder, or autism spectrum disorder (age range: 3 to 20 years). PRS-MDD were computed based on the most recent major GWAS of MDD (Howard et al. 2019). T1-weighted magnetic resonance imaging (MRI) data were acquired. Our results showed that age-related cortical thinning in the medial orbitofrontal cortex (OFC) was moderated by genetic risk for depression. Elevated risk for depression may lead to changes in medial OFC thickness prior to the onset of the disorder. These findings could be used to optimize and test the effectiveness of treatment for depression.

Presence of Non-Tuberculosis Mycobacterium in Nelson Reservoir and Williams Lake

Erin Kerby, Carolina Mehaffy
College of Health and Human Sciences

Presenter(s): **Erin Kerby**
Advisor/Mentor: Dr. Carolina Mehaffy
Category: Research Poster

Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42857

Precise motor actions like walking require planning and selection of appropriate motor response, elements that require sound cognitive abilities. Stroke affects both motor and cognitive abilities; however, whether reduced cognition impacts motor performance is not known. Recent data suggests that cognition plays a critical role in producing steady motor output. The purpose of this study is to evaluate the relationship between cognitive and motor performance in stroke survivors.MethodsThirteen stroke survivors and 12 healthy controls performed motor control and cognitive tests. We measured motor accuracy with error on visuomotor force tracking task involving dorsiflexion force. We measured cognition using the Stroop test quantifying executive function, the Symbol Span test quantifying working memory, and the visual search test quantifying selective attention.ResultsThe stroke group showed a significantly decreased motor accuracy and increase in motor variability relative to the controls. The stroke group showed significantly higher Stroop interference score, and increased response time on the visual research task compared to the control group. Force error was positively related to Stroop interference score ($r = 0.42$, $p=0.01$), and response time ($r =0.35$, $p=0.05$), and negatively related to symbol span score ($r = -0.38$, $p=0.03$), for both groups together. Reduced performance on cognitive domains of executive function, working memory, and selective attention correlated with reduced motor accuracy.SignificanceStroke survivors showed impaired cognitive and motor performance. Importantly, the relationship between several cognitive domains and motor accuracy suggests that movement impairments after stroke may be contributed by decline in cognitive function.

Prey selection of diploid and triploid Walleye in a prey-limited system

Kade Jackson, Collin Farrell, Brett Johnson, Chris Myrick, Yoichiro Kanno, Adam Hansen
Warner College of Natural Resources

Presenter(s): **Kade Jackson**
Advisor/Mentor: Dr. Brett Johnson
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42799

Walleye Sander vitreus are a highly sought-after sportfish in North America but they are not native to Colorado waters. Dispersal of Walleye across the landscape, whether by legal, illegal, or natural means, are of concern to native species recovery efforts, as predation by and competition with invasive Walleye are known to have negative impacts on native species. Because triploid fish are typically sterile, the stocking of triploid Walleye is an alternative management approach to limit the risk of establishing new populations in areas with sensitive native species. There are few studies that have examined the trophic dynamics of triploid fish relative to diploid conspecifics, and under natural conditions. Lab studies with other species suggest that triploid fish may be less aggressive predators than diploid fish. Managers wishing to stock triploid walleye would have a better idea of what they might consume and how they would fare in their waters if more was known about prey selection of wild triploid walleye relative to diploid walleye. In this talk, we will present preliminary results of diet composition and prey size selection of a diploid and triploid Walleye population in Narraguinnep Reservoir, Colorado.

Promoting a Sense of Belonging in Students of Underrepresented Identities in University Engineering Classrooms

Jadelyn Lippmann, Dr. Zachary Mercurio
Walter Scott, Jr. College of Engineering

Presenter(s): **Jadelyn Lippmann**
Advisor/Mentor: Dr. Zachary Mercurio
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42937

Currently, at the University level, the rate of diversity amongst minority groups and majority groups is strikingly disproportionate. This is particularly seen within STEM fields, where white men have historically dominated this field. While in the last several decades, there has been a lot of progress made in seeing more representation in STEM fields, there is still a lot of work to be done. We must strive and push for a diverse STEM field that truly represents the diverse world that we live in. Due to the disproportionate diversity representation, it must be asked and determined what is not only leading to this, but also what we can do as a community to mitigate this. My research focuses on determining how to best promote a sense of belonging amongst students of underrepresented identities. The findings of this study will benefit all students, faculty, program diversity and improvement of representation in STEM fields. The final findings will be presented to Walter Scott College of Engineering faculty with hopes of benefiting students educational experience.

Protein Interaction With Condensed Chromatin in a Model Chromosomal Environment

Kelly Britton, Amanda Kuerzi, Dr. Jeffrey Hansen
College of Natural Sciences

Presenter(s): **Kelly Britton**
Advisor/Mentor: Dr. Jeffrey Hansen
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42949

SIRT6 is a mammalian protein that binds heterochromatin that's found to be important in maintaining metabolic and genomic stability. The majority of SIRT6's function is mediating interactions between other regulatory proteins and chromatin. SIRT6 is known to bind to heterochromatin to function. It's useful to use in-vitro chromatin models to probe binding properties of chromosomal proteins. Our in-vitro model is 12 nucleosomes evenly spaced on a DNA template which upon introduction of magnesium chloride forms chromatin-like condensates. These condensates will be used to analyze the binding properties of SIRT6 to chromatin with and without the linker histone H1. Using a simple binding pelleting assay we saw that SIRT6 binds to condensates both in the presence of H1 and without. Using fluorescence microscopy we saw that Sirt6 both in the presence and absence of H1.0 was able to organize

arrays with greater organization in the Sirt6 and H1.0 sample. From here we can run further binding assays to see if SIRT6 preferentially binds to other linker histones.

Proximity of urban expansions Near Protected Areas In South Africa

Owen Joyce, Jody Vogeler
College of Natural Sciences

Presenter(s): **Owen Joyce**
Advisor/Mentor: Dr. Jody Vogeler
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42980

Land cover and land use are rapidly changing around the world, especially in South Africa. Changing land cover and land use pose serious threats to certain environments because of the ecosystem services they provide to both humans and wildlife. Rapidly urbanizing areas can cause a variety of trade-offs in the ecosystem services that an area provides. This study aimed to identify the impacts of urban expansion near protected areas and to highlight the hotspots of rapidly expanding urban centers in close proximity to protected areas where ecosystem services may be most affected. Three datasets for land cover and land use were collected from South Africa's Department of Forestry, Fisheries, and the Environment (DFFE) for 1990, 2014, and 2020. A file with protected areas across South Africa was used and was also from the DFFE. Lastly, a dataset of gridded population change was used from worlpop.com. The annual change rate (ACR) was calculated for 1990-2014, 2014-2020, and 1990-2020. The land consumption (LCR), population growth rates (PGR), and the LCRPGR were calculated to determine which areas may be experiencing unsustainable urban growth. Areas with the highest values were considered the hotspots within the scope of this study. These results were analyzed to determine the ecosystem service tradeoffs associated with urban expansion.

Pyruvate Dehydrogenase E1-Alpha Subunit Deficiency

Phoenix Espinoza, Dr. Kimberly Jeckel
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Phoenix Espinoza**
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/40999

Pyruvate dehydrogenase E1-alpha subunit deficiency (PDH E1-alpha deficiency) is an X-linked disease characterized by lactic acid build-up within cells due to a lack of the enzyme pyruvate dehydrogenase (E1) within the pyruvate dehydrogenase complex (PDC). The PDC is responsible for the oxidative carboxylation of pyruvate to acetyl-CoA, destined for the citric acid cycle. Disruption of this complex inhibits acetyl-CoA production, ultimately reducing the amount of ATP available for cellular processes. To meet cellular energy demands, alternative mechanisms of ATP production take place, promoting increased lactic acid production within cells. This build-up causes lactic acidosis which decreases kidney and liver function, produces Kussmaul breathing,

muscle cramping, pain, and weakness, digestion issues, polyuria, and polydipsia. Diminished ATP production may result in poor feeding, growth retardation, hypotonia, ataxia, poor coordination, partial or complete loss of motor milestones, difficulty or inability to walk, dystonia, seizures, brain lesions, underdevelopment of the corpus callosum, and atrophy of the cerebral cortex. The abnormal brain structures resulting from diminished ATP abundance may cause developmental delay and intellectual disability. PDH E1-alpha deficiency is caused by a mutation of the PDHA1 gene existing on chromosome Xp22.12. PDH E1-alpha deficiency is an autosomal recessive disease, although skewed towards mutation. PDH E1-alpha deficiency treatment includes dietary supplementation with lipoic acid, carnitine, and thiamine which help to stimulate the production of E1. A low carbohydrate, high-fat diet may also reduce the risk of acidosis. While the prognosis of PDH E1-alpha deficiency is poor, further research may improve disease outcomes.

qPCR analysis of Artibeus jamaicensis innate immune system gene regulation in response to Cedar virus infection

John Allen, Juliette Lewis, Dr. Tony Schountz
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **John Allen**
Advisor/Mentor: Juliette Lewis
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43015

Cedar virus (CedV) belongs to the genus henipavirus, which is a member of the paramyxoviridae viral family. Notable members of the henipavirus genus include Hendra virus (HeV) and Nipah virus (NiV), both being BSL-4 pathogens. While HeV and NiV are known to be highly pathogenic in both animals and humans, CedV has been shown a lack of pathogenicity in relevant animal models. Species of bats belonging to the Pteropus genus are known reservoirs of the Cedar virus. Considering the role that bats are known to play in transmission of medically important viral infectious pathogens, it is important to study the immune responses that viruses such as Cedar virus elicit when inside these animals. The transcriptional level of forty seven genes that produce proteins involved in the innate immune system of A. jamaicensis was observed in response to CedPV and CedPV that had been passaged on A. Jamaicensis primary kidney (AJK) cells. Cellular RNA was extracted from CedPV-infected AJK cells at select timepoints and qPCR was utilized to quantitatively observe which genes are upregulated or downregulated. Resulting data shows that the A. jamaicensis innate immune response to CedPV infection is heavily reliant on type I interferon related genes, along with genes associated with the formation of the NLRP3 inflammasome. AJK cells challenged with AJK-passaged CedPV showed more cytopathic effect, including syncytia formation associated with CedV infections in previous studies. At later time points, upregulation of death-receptor associated genes and increased focal degeneration were present. This study suggests that CedPV triggers a robust innate immune response in A. jamaicensis kidney cells.

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

Christian Narby, Trevor Thomas, Kyle Horton

Warner College of Natural Resources

Presenter(s): **Trevor Thomas, Christian Narby**
Advisor/Mentor: Dr. Kyle Horton
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43011

Previous studies indicate that wildfires are increasing in frequency, scale, and intensity in the Western United States and that these fires may have significant detrimental effects on migratory birds; however, many of these studies are site-specific and require intensive field-based methods which leaves a lack of understanding on the impacts of fires on a macroscale. To fill this need, we use remote sensing to quantify avian land-use before and after forest fires throughout the Western US. This study utilizes weather surveillance radar data collected one hour after sunset and averaged for two years per spring and fall migration season, processed, and compared separately. Forest fires were selected within areas free of blockages and within 80km of radar stations, their boundaries being delineated by shapefiles from 2009 to 2018. To test for differences in migrant land use, we compare stopover density within each forest fire polygon from two years before and two years after the corresponding fire event. We used a paired t-test to quantify statistical differences in mean reflectivity in pre- and post-burn areas and found a statistically significant increase in avian migratory stopover density during the spring migration season, and no change in the fall. Remote sensing is a powerful tool for quantifying differences in avian migratory stopover responses to burn events and represents a unique way to study avian and fire ecology on a macro scale while helping to improve conservation and fire management efforts.

Quantitative analysis of wound healing assay

Jiangyu Sun
College of Natural Sciences

Presenter(s): **Jiangyu Sun**
Advisor/Mentor: Dr.Lubna Tahtamouni, Dr. Ashok Prasad
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42780

Wound healing assay is an experimental method used in the study of cell movement to detect collective cell migration. We created a pipeline using the CellProfiler software that measures the area of the wound rather than the width since it is a more reliable method to detect the wound. We tested wound healing assay images of different triple-negative breast cancer (TNBC) cell lines, HeLa cell lines, and images acquired by different researchers to detect the functionality of the pipeline. Moreover, the pipeline was compared to two commonly used analysis methods: ImageJ and manual measurement to reflect the reliability of the data obtained from our CellProfiler pipeline. Our results show that the CellProfiler pipeline we created is user-friendly, time-saving, and reliable. Therefore, we advocate the use of wound area rather than wound width to reflect the rate of cell migration. The CellProfiler pipeline can automatically and quickly capture the

edges of the scratch and calculate the area to get more accurate cell migration data and save researchers' time.

Rapid Public Attitude Change Towards Wolf Reintroduction: Factors that Influenced the Shift

Lauren Balsley, Olivia Curlej, and Mireille Gonzalez
Warner College of Natural Resources

Presenter(s): **Lauren Balsley, Olivia Curlej**
Advisor/Mentor: Mireille Gonzalez
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42995

Our research project dives into the social dimensions of wolf reintroduction within Colorado by observing the post-election survey taken by the public. The survey provided a space for the public to share if their opinion on reintroducing wolves into Colorado had changed or not over the past year. Additionally, detecting what persuaded the public's opinions to sway more negative or positive. We used data from the 2020 post-election follow-up survey taken by residents of Colorado. The project focuses on one specific question, if their opinion had changed or not, and we analyzed the responses for general themes as to what influenced that change. Our data showed that the majority of the public's opinion on wolf reintroduction had changed after the election; those who had a change in opinion were mostly negative. Some things that caused these changes in opinion include people feeling socially pressured to do so or them feeling a more immediate threat from the wolves possibly being reintroduced. Our results show that there is still a misunderstanding between those that are for wolf reintroduction and those that aren't. Our findings could help highlight how much influence certain outside sources have on human opinions on this conservation issue.

Recommendation Guided Immersive Visual Explorations using Random Forests

Emma Hamilton, Mandey Brown, Meridith McCann, Saptashwa Mitra
College of Natural Sciences

Presenter(s): **Emma Hamilton, Mandey Brown, Meridith McCann**
Advisor/Mentor: Dr. Sangmi Pallickara
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42925

Recently, Virtual Reality (VR)/Augmented Reality (AR) has gained significant traction with popular applications in entertainment, architectural visualization, space exploration, and education/training. VR has become a viable option for research-oriented applications because of their affordability and by enabling new types of visual analytics. Although data visualizations are widely embedded in large-scale data analytics applications, these 2D/3D graphics are designed for traditional desktops and do not translate to successfully immersing users to perform knowledge discovery in the VR environment. In particular, navigating in virtual spaces with their rich set of features and attributes is extremely challenging especially when trying to accomplish

a complex analytics goal. Our approach includes a recommendation system that provides suggestions to the users such as candidate attributes that show similar trends or attributes that are highly correlated with the feature of interest using Random Forests. We applied our approach over the COVID-19 dataset.

Scheduling Issues in Low-Level Work

Lindsey Gross, Prof. Samantha Conroy, Prof. Adela Chen
College of Business

Presenter(s): **Lindsey Gross**
Advisor/Mentor: Professor Samantha Conroy, Professor Adela Chen
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42900

Certified Nursing Assistants (CNA's) are arguably the most underpaid and poorly treated workers in the working class today, yet they have vital jobs in society. To make a difficult job even harder, the scheduling methods used for CNA's are inconsistent, creating further tension within the field. A qualitative analysis of twelve Reddit threads was conducted in order to understand scheduling-related issues that affect the quality of life of CNA's and the ultimate outcomes of those problems. From these threads, there were several trends extracted. These trends specifically focus on scheduling problems, drivers of the problems, short-term outcomes, and long-term outcomes.

Seasonal cold prevents obesity-related glucose intolerance in golden-mantled ground squirrels

Cheyanne Izon, Ashley B. Heim, Gregory L. Florant, Adam J. Chicco
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Cheyanne Izon**
Advisor/Mentor: Dr. Adam Chicco
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43059

Seasonal hyperphagia-induced increases in adiposity plays an adaptive role in winter survival for many mammalian species. However, in humans, obesity is known to increase the risk of developing other morbidities, including cardiovascular disease, high blood pressure, and diabetes. Our lab has previously shown that seasonally colder temperatures (15ºC) preserve glucose tolerance in Golden-mantled ground squirrels (Callospermophilus lateralis; GMGS) despite development of significant obesity in early autumn compared with squirrels of similar body composition housed in warmer conditions (22ºC). The current study sought to determine changes in enzyme expression in liver, skeletal muscle and brown adipose tissue (BAT) that might explain how seasonal cold exposure preserves glucose tolerance in these obese mammals. Protein analysis was performed via Western Blotting techniques in muscle, liver, and BAT. It was found that GMGS obesity favors hepatic insulin sensitivity and uptake of glucose

over fatty acids in the prehibernation period regardless of temperature. However, in skeletal muscle, cold exposure tends to prevent a loss of glucose oxidation and fatty acid uptake capacities seen in obese GMGS housed in warm temperatures. In BAT, cold exposure inhibits increases in glucose oxidation seen in warm animals, perhaps favoring fuel storage that is essential for survival during hibernation. These findings highlight tissue-specific interactions between seasonal obesity and ambient temperature that likely determine the success of hibernation in GMGS, with potential implications for emerging evidence that cold exposure may elicit metabolic benefits to humans at risk for obesity-related metabolic disease.

Selective co-activation of α7- and α4β2-nicotinic acetylcholine receptors reverses beta-amyloid-induced synaptic dysfunction in Alzheimer's disease

Jessica Roberts, Sarah Stokoe, Matheus Sathler, Robert Nichols, Seonil Kim
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Jessica Roberts**
Advisor/Mentor: Dr. Seonil Kim
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42875

Alzheimer's Disease (AD) pathology disrupts the cholinergic systems in the brain, which are involved in modulating cognitive processes and learning and memory. Evidence indicates that in AD, cholinergic signaling is impaired and there is a loss of cholinergic neurons. Several of the FDA-approved therapeutics for AD are acetylcholinesterase inhibitors; however, these treatments lack selectivity and modestly alleviate symptoms. The amyloid-beta (Aβ) peptide, an initial driver of the AD pathology, differentially interacts with subtypes of the nicotinic acetylcholine receptor (nAChR) and induces synaptic disruption. In the hippocampus, α7, α4β2, and α3β4 nAChRs are predominately expressed. However, co-immunoprecipitation indicates that Aβ only interacts with α7 and α4β2 nAChRs. The α7 and α4β2 nAChRs, but not the α3β4 nAChRs, share an arginine 208 and glutamate 211. We mutated these residues in the α7 receptor to mimic the α3 receptor and mutated the α3 receptor residues to mimic the α7 receptor. Co-immunoprecipitation with Aβ42 suggests that arginine 208 and glutamate 211 are critical for Aβ-nAChR interactions. Additionally, Aβ depresses surface expression of AMPA receptors (AMPARs) and diminishes phosphorylation of AMPAR subunits. We found that co-stimulation of α7 and α4β2 nAChRs could reverse this Aβ-induced synaptic dysfunction. Furthermore, we determined that concurrent stimulation of α7 and α4β2 nAChRs reverses the decrease in long-term potentiation prompted by Aβ. These results suggest Aβ exhibits nAChR subtype specificity and targeting the impacted nAChR subtypes may ameliorate Aβ-generated synaptic dysfunction in the AD pathology.

Soil Fauna as Potential Drivers of Microbial Necromass Production and Long-term Carbon Storage

Emilija Miskinyte, Aaron Prairie
Warner College of Natural Resources

Presenter(s): **Emilija Miskinyte**
Advisor/Mentor: Aaron Prairie
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43033

Soil mineral-associated organic matter (MAOM) is derived mainly from microbially-sourced compounds and is the long-term storage of carbon in soil. With this in mind, the purpose of this study is to discover if soil fauna act as drivers of microbial necromass production and soil organic matter persistence through their impact on microbial activity, growth, and turnover. Microcosm CO2 respiration levels will inform us of microbial activity changes, we will track the organic matter formation with isotopically enriched litter, and it will be statistically analyzed with linear regressions. We anticipate the results to show that the presence of bacterivores (nematodes) will reduce microbial biomass but increase soil microbial activity and microbial turnover, leading to greater necromass production and MAOM formation. And that higher trophic level predators will release grazing pressure from bacterivores, increasing microbial biomass but reducing microbial activity and microbial turnover. This will result in less necromass production and reduced MAOM formation. By having a better understanding of the mechanisms that drive the formation of mineral-associated soil organic matter, we are en-route to advancing models that forecast biogeochemical patterns and designing a management plan to fight climate change.

Solving a Puzzle: Identifying Candidate Receptorsfor the Molt-Inhibiting Hormone

Luisanna Hernandez Jeppesen, Dr. Mihika Kozma, Dr. Jorge Perez-Moreno, Dr. Donald Mykles
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Luisanna Hernandez**
Advisor/Mentor: Dr. Mihika Kozma
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42978

Molt-inhibiting hormone (MIH) plays a key role in the crustacean molt cycle. It is secreted from the X-organ (XO) in the eyestalk ganglia, and acts on the Y-organ (YO) in the cephalothorax. MIH keeps the YO in its basal state, thereby inhibiting ecdysteroid synthesis and, consequently, molting. MIH belongs to the crustacean hyperglycemic hormone (CHH) superfamily, whose receptors have not been fully characterized in crustaceans. They are predicted to be G protein-coupled receptors (GPCRs) because their downstream signaling mechanisms include cyclic nucleotide second messengers, a GPCR family trademark. The goal of this research is to deorphanize and identify candidate MIH and CHH receptors expressed by the YO of the blackback land crab, *Gecarcinus lateralis*, since previous research only identified 4 candidates among >90 class A GPCRs from YO transcriptomes. This study identified 4 additional putative CHH receptor (CHHr) sequences in *G. lateralis* using phylogenetic analyses with a custom transcriptomic database of >190 crustaceans. Sequence homology to a well-characterized member of the CHH superfamily, ion transport peptide receptors (ITPr) in the silk moth, *Bombyx mori*, was used to identify candidate CHHr. Differential gene expression analysis of these 8 putative CHHr in the YO of *G. lateralis* across molt cycle stages is ongoing. The

identification of target receptors for MIH will solve a big piece of the puzzle in the story of crustacean molting. Support: NSF (IOS-1922701) and CSU Honors Program.

Spectroelectrochemistry: Using Light and Electricity to Analyze Vanadium complexes

John Hagan, Allison Haase, Kate Kostenkova, Drew Walters
College of Natural Sciences

Presenter(s): **John Hagan**
Advisor/Mentor: Debbie C Crans
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43055

Vanadium complexes have been shown to have very interesting biological properties including anti-diabetic, anti-cancerous, and anti-tuberculosis. These compounds display redox characteristics where changes in the Schiff-base scaffolding directly affect the potential range that a compound will oxidize or reduce in. We can use spectroelectrochemistry to analyze redox active complexes in changing electric environments. In these experiments, we have characterized the redox behaviors of [VO(SALIMH)X] and [VO(Cl-SALIMH)X] catecholate derivatives where SALIMH and Cl-SALIMH are imidazole Schiff base scaffolds and X are catecholate ligands.

Stakeholder Engagement in Rangeland Management and Restoration Projects

Hunter Geist-Sanchez, Dr. Carrie Havrilla, Retta Bruegger, Emily Lockard, and Dr. Mark Brunson
Warner College of Natural Resources

Presenter(s): **Hunter Geist-Sanchez**
Advisor/Mentor: Dr. Carrie Havrilla
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42852

Throughout the summer and fall semester of 2021, I worked with the CSU Dryland Ecology and Management Lab at the CSU Southwestern Colorado Research Center in Yellow Jacket, CO. Together we partnered with RestoreNet, which is a networked ecological experiment and protocol on the cutting-edge of restoration science in arid and semi-arid rangelands. My work focused on the creation of a survey with emphasis on social-ecological dynamics of the local area. The end goals of the survey included characterizing restoration goals and expectations RestoreNet partners have for their restoration projects, understand partner motivation for engaging in RestoreNet, and evaluate if RestoreNet's communication is meeting expectations throughout the project.

Static Analysis Preprocessing & Benchmarking to Reduce False Positives

Nicholas Schneider, Andrew Derr, Jake Isley, Sudipto Ghosh, Indrakshi Ray
College of Natural Sciences

Presenter(s): **Nicholas Schneider**

Advisor/Mentor: Professor Sudipto Ghosh
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43056

With static analysis tools becoming more prominently used and relied upon to prevent software vulnerabilities, benchmarking and reducing false positives from analysis has become increasingly important. Preprocessing test case source code to remove redundant and flow control code before running the static analysis tools could reduce false positives by simplifying and further standardizing the input for the static analyzers. To evaluate this, several approaches were designed to automatically benchmark two open-source static analysis tools, CppCheck and FlawFinder, on two prominent test suites, the Juliet Test Suite for C/C++ and the Toyota ITC Dataset. Five preprocessing algorithms were designed and run on copies of the test suites to evaluate their effectiveness. There was a slight reduction in the probability of false alarm in both CppCheck and FlawFinder. Accuracy in CppCheck increased but slightly decreased in FlawFinder. Recall for CppCheck decreased while FlawFinder's recall remained the same. These results indicate that designing and using preprocessing algorithms could potentially have some impact on improving results in static analysis tools, but further research covering more flow variants with additional preprocessing algorithms is needed to confirm this with stronger results. More robust parsing and processing of the C/C++ source code by utilizing language parsers could also help to improve the preprocessing algorithms interactions with the source code. These preprocessing approaches could be applied to integrated development environments (IDEs) and continuous integration pipelines to attempt to reduce false positives when being scanned by a static analysis tool.

Structural and Functional Comparisons of Chitin from Insects versus Crustaceans

Shelby Toler, Paul Mathews, John Wilson, Valerie Stull, Tiffany Wier, Charlene Van Buiten
College of Health and Human Sciences

Presenter(s): **Shelby Toler**
Advisor/Mentor: Dr. Charlene Van Buiten
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42617

Chitin is a polysaccharide found in the exoskeleton of arthropods and the cell wall of fungi. It has become a focus in the research community due to its antimicrobial and probiotic properties as well as its potential use as a digestion aid. While traditionally sourced from crustaceans such as crab and shrimp, chitin can also be found in the exoskeleton of insects. Insect-based food ingredients, particularly protein, have been explored in recent years due to the environmental advantages of farming insects in comparison to traditional livestock farming including reduced land and water requirements and lower greenhouse gas emissions. The objectives of this study were to optimize chitin extraction from insect sources and to compare the functional properties of insect chitin to chitin derived from its more traditional dietary source, crustacea. As the food industry shifts towards more sustainable food production practices, it is necessary to understand

how these changes in sources and practices might affect the utility of these functional ingredients in the production of processed foods.

Structural dynamics of Mrc1 and its role in regulation of DNA replication

Sreeya Kairamkonda, Adam Timmerman, Grant Schauer
College of Natural Sciences,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Sreeya Kairamkonda**
Advisor/Mentor: Dr. Grant Schauer
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42828

DNA replication is an essential part of the human body, in which the DNA damage response system helps it to run smoothly. Specifically, the replisome is a multiprotein complex that needs to bypass DNA damage in order for replication to proceed properly. Mrc1 is a mediator protein in the replisome that is present at replication forks and is required for normal DNA replication. Mrc1 integrates multiple signals as a safeguard mechanism to protect genomic integrity during replication stress, which includes DNA damage, nucleotide damage, and collisions with transcription machinery during S-phase. It is vital for the replication process as it prevents problems like replication fork collapse, chromosomal rearrangement, and generation of DNA damage, all of which have the potential for carcinogenesis. We are now just beginning to understand the complexities of all the different parts of the replisome, but do not know much about the structure or dynamics of Mrc1. By understanding the role of Mrc1 in the replisome and how its structural dynamics regulate replication, we can begin to understand how to treat diseases caused by replication malfunction. Using biochemistry and single-molecule FRET (fluorescence resonance energy transfer) to discover the structural components of Mrc1 will allow us to research the protein's role in maintaining integrity of the genome as part of the DNA damage response system. Doing more research on Mrc1 will help researchers and clinicians better understand DNA replication and the implications of when there is damage inflicted on this process.

Synthesis of Menaquinone Derivatives via Cross-Coupling Reactions

Rose Wipke, Skyler Markham, Dr. Debbie Crans
College of Natural Sciences,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Rose Wipke**
Advisor/Mentor: Dr. Debbie Crans
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42869

One particular interest of research in the Crans group is lipoquinones. A specific class of lipoquinones called menaquinones may prove valuable to study for the role they play in proton accepting and donating in prokaryotes. The importance of this is the electron transport system in the membranes of bacteria, including the bacteria mycobacterium tuberculosis, which causes

tuberculosis disease. The electron transport system in these bacteria is vital for the cell's survival. If we can understand how the menaquinones work in that system, we can better understand how to disrupt the functioning of mycobacterium tuberculosis, thus disrupting its disease-causing effects. For this to be done, these menaquinones must be synthesized so they can be studied in a lab, outside of the bacteria. Our goal is to synthesize several menaquinone derivatives by utilizing a reductive cross-coupling reaction.

Synthesis of Protein Standards for Structural Characterization of Branched Polyubiquitin Chains

Claire Lundstrom, Dr. Robert Cohen, Dr. Tingting Yao
College of Natural Sciences

Presenter(s): **Claire Lundstrom**
Advisor/Mentor: Dr. Robert Cohen, Dr. Tingting Yao
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42963

Ubiquitin (Ub) is a small, highly conserved eukaryotic protein that serves as a post-translational modification to regulate multiple essential processes in all cells. Ub monomers can be assembled into architecturally diverse polyubiquitin (polyUb) chains by attachment of one Ub's C-terminus to any of the 8 amino groups of another Ub. The functional cellular response of substrate ubiquitination depends on polyUb architecture; polyUb chains can be assembled using one or multiple types of Ub-Ub linkages, and chains formed can be linear or branched. In cells, the functions and precise structures of branched chains are poorly understood. A recent breakthrough to characterize branched chains employs Lbpro, a viral protease that can disassemble polyUb chains by cleaving the last two glycine amino acids from the Ub C-terminus. However, standard analysis (enzymatic digestion of branched poly-Ub chains followed by mass spectrometry (MS)) is unable to identify different types of branched Ub. The overall goal of this project is to enable characterization of branches within polyUb by coupling MS with the resolution of FAIMS, a type of ion mobility spectrometry able to resolve polypeptide isomers. The initial challenge is preparation of linkage-specific branched Ub standards to optimize the FAIMS-MS technique. For this purpose, recombinant forms of Ub are expressed in E. coli and chemically modified to add diGly peptides onto one or more lysine sidechains; this will mimic the Ub products from Lbpro-catalyzed disassembly of polyUb, provide standards needed to delineate Ub linkage types by FAIMS-MS, and further efforts to decipher the complex Ub code.

The Dynamics of Precipitation, Carnivore Conflict, and Livestock Loss in Tanzania

Ryley M. Gross, Martin Morales, Dr. Jonathan Salerno
Warner College of Natural Resources

Presenter(s): **Ryley Gross, Martin Morales**
Advisor/Mentor: Dr. Jonathan Salerno
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42910

Across the globe, livestock owners may experience significant livelihood impacts from livestock loss. Agro-pastoralists living near Ruaha National Park in Tanzania, East Africa, most commonly experience loss of their livestock due to depredation by large carnivores and disease. Livestock depredation near Ruaha National Park is common because the park is a large, protected area that is home to an abundance of various carnivore species. To address the issue of livestock loss near the national park, household reports were collected across the Ruaha landscape. These data were used to look at the relationships between monthly precipitation and frequency of depredation events as well as livestock disease rates. The results have revealed that months with higher precipitation result in an increase in depredation events and also an increase in livestock diseases as a consequence of water saturated soils. With a better understanding of carnivore depredation behavior and disease frequency during wet periods, conservation practitioners can begin to find additional trends which can lead to bridging the gap between carnivore and human conflict. This project is meant to lead to more research projects collaborations with communities living near Ruaha National Park.

The Effect of College Experience on Test Anxiety

Shilo K. VonWeller, Sarah J. Myers, Matthew G. Rhodes
College of Natural Sciences

Presenter(s): **Shilo VonWeller**
Advisor/Mentor: Sarah Meyers, M.S.
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42985

College students often struggle with developing good study habits and usually experience some form of frustration or feelings of being overwhelmed. Exams specifically are often reported as a major source of stress for students. In our work, we expect that students' experience with college and study skills will grow as students progress through their program, attend lectures with different teachers, and study with other students. As they gain more experience, this may reduce anxiety levels particularly towards college tests. A reduction in test anxiety may also occur as students progress through a semester and begin to understand the professors' expectations. For this study, we will determine whether there is a relationship between the amount of time at college and students' reported test anxiety level. We will both examine whether test anxiety decreases over a semester and whether more years in college is associated with lower test anxiety. Students enrolled in 100- and 200-level psychology classes over the period of 3 semesters participated in a survey that measured their experiences of test anxiety at the beginning and end of the semester, and the number of semesters they have attended school. We expect test anxiety levels to decrease across the semester and that more experienced students will report less stress than new students. If test anxiety is most prevalent at the start of the educational instruction, whether it is the beginning of the semester or the beginning of college, students will greatly benefit from some pre-education intervention and better resource awareness.

The Effect of Soil Amendments on Soil Health

Bianca Hodge Pardo, Sean Stokes, Dr. Thomas Borch
College of Natural Sciences

Presenter(s): **Bianca Hodge Pardo**
Advisor/Mentor: Dr. Thomas Borch
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43061

There are many causes that can lead to soil degradation, so the focus of this research is to limit degradation in an agricultural soil by using soil amendments and focusing especially on the total SOM present in the soil. The purpose of this study is to understand the changes in organic matter concentration occurring in the soil after the addition of different soil amendments, and how those changes affect other components of the soil like nutrient concentration and pH. The hypothesis for this research states that it is expected to see first a decrease in organic matter in the soil samples, due to priming effect, however an increase is expected as the soil then tries to go back to equilibrium after some time. Some major results include the total SOM present in each sample decreased in the first 6 months due to priming effect but by the 12 month time point all samples showed some amount of increase in SOM concentration. Additionally, it is possible to see different levels of [SOM] depending on which amendment was used

The Effectiveness of Cannabinoids as a Treatment for Tourette Syndrome: A Review

Emma M. Wheeler, Dr. Noah N. Emery, Dr. Hollis C. Karoly
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Emma Wheeler**
Advisor/Mentor: Dr. Noah Emery
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43048

Gilles de la Tourette Syndrome (TS) is a neurological disorder characterized by the presence of both vocal and motor tics, or uncontrollable actions, as well as an extremely high rate of comorbid disorders. TS is believed to develop based on a combination of genetics and environment though the exact nature of this relationship is unknown. Currently, Tourette Syndrome is thought to stem from dysfunction within the Basal Ganglia as well as hyperactivity of the Dopaminergic system, causing the increased occurrence of tics as well as behavioral and learning challenges commonly observed in people with TS. Today, the prevalent treatment for someone struggling with symptoms of Tourette Syndrome is antipsychotic medication. Not only do antipsychotics pair poorly with other medications, forcing those with Tourette Syndrome to choose what to medicate, but they have very challenging side effects. For many people with Tourette Syndrome, living with the symptoms is their only option due to the lack of available safe and effective treatments.¬† This literature review explores the possibility of using Cannabis as a treatment for Tourette Syndrome. Following a narrative format, recent research in this field will be compiled in order to examine the effectiveness, safety, and accessibility of Cannabis compared

to other treatment methods. The purpose of this review is to explore whether Cannabis may be a superior treatment method, and will utilize primarily cognitive/behavioral data to come to a conclusion.

The Effects of Cannabidiol Administration on Blood Alcohol Level and Intoxication

Leila Zulic, Patrick Gonzalez, Meggan Drennan, Mark Prince PhD, Greg Dooley PhD, William DeJong PhD, Mike Milburn PhD, and Hollis Karoly PhD
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Leila Zulic, Patrick Gonzalez**
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43065

Background: Promising research has been done to evaluate the effectiveness of cannabidiol (CBD) as a resource for moderating alcohol consumption and dependence, though most studies have been done on rodents. The present study will assess the potential impact of plant-based CBD on motor and balance impairment caused by alcohol, intoxication, and craving in humans - all important factors in determining if CBD could be helpful in alcohol use disorder (AUD) treatment.Method: Recruited participants reported heavy drinking and no recent or regular cannabis use. Participants completed 3 sessions in which they randomly consumed either 30 mg CBD, 200 mg CBD or placebo CBD prior to drinking a standardized dose of alcohol, resulting in approximately .06g/dL blood alcohol content (BAC). An hour after consuming the alcohol, breath alcohol content (BrAC) was recorded and impairment tasks and questionnaires were administered every 30-minutes for 4 hours. Blood was drawn at baseline, time of peak CBD, and time of peak BAC.Preliminary results: At peak BrAC, psychomotor performance is worst for the placebo condition, followed by 200 mg CBD, and best for 30 mg CBD (p=.038). Results support sex differences in BrAC curves, as well as differences measures of alcohol urges, low arousal positive affect, and psychomotor impairment among different treatment differences.Discussion: These outcomes will further our understanding of CBDs role in moderating alcohol craving and impairment in humans as well as understanding the relationship between the endocannabinoid system and alcohol consumption having potential implications for CBD as an AUD treatment.

The Effects of Lipids on Myoglobin Expression

Jazreal Sanchez, Victoria Hurteau, Melissa Morado, Shane Kanatous
College of Natural Sciences

Presenter(s): **Jazreal Sanchez**
Advisor/Mentor: Dr. Shane Kanatous
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43051

Lipids (fatty acids) are affected by trophic level shifts due to global climate change, altering the fatty acid composition in predator and prey relations. The rise in temperature is causing acidification, altering the consumption of resources throughout the food chain from

cyanobacteria to carnivores, such as seals (Pinnipeds). Global climate change could limit the types of fats available to be consumed. Lipids consumed by the seals are primarily through fish, which are high in Omega-3 fatty acids, and from indirectly consuming krill. Not only are fatty acids stored in adipose, or subcutaneous tissue, as blubber for insulation, but specific lipids also play a role in maintaining aerobic activity through intracellular stimuli in the skeletal muscles. The purpose of this studies' objective is to determine if lipids isolated from krill or fish oil will have an increase in skeletal muscle aerobic capacity. Using C2C12, immortalized mouse cells, we will investigate the change in aerobic activity in response to krill and fish oil. The results from this experiment will then be compared to the previous studies conducted on seal skeletal muscle cells. This will allow for a better understanding of global climate shifts and the effects on marine predators' specific aerobic capacity in the skeletal muscles to be able to hunt prey in their environment. Any potential changes could have a severe effect on the ability to forage in seals

The effects of specific lipids on aerobic capacity

Victoria Hurteau, Jazreal Sanchez, Melissa Morado, Shane Kanatous
College of Natural Sciences

Presenter(s): **Victoria Hurteau**
Advisor/Mentor: Dr. Shane Kanatous
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43021

Climate change has many far-reaching effects on the environment. One understudied area is the affects climate change has on the body composition of animals. Recent studies have found a shift in body composition in many prey species, such as fish and krill, in response to changing environmental temperatures. In addition, specific dietary needs or essential fatty acids from prey species play important roles in intracellular stimuli for skeletal muscle adaptations important for animal performance. This study plans to investigate the effect of fatty acids, isolated from different trophic levels in the marine environment, on the expression of the myoglobin protein. Myoglobin is an important protein that plays a key role in oxygen homeostasis in skeletal muscle cells, especially in diving mammals such as seals. My study will focus on determining the effects of lipids isolated from krill and fish oil on the expression of myoglobin in mouse skeletal muscle cells. Once these cells have been grown and exposed to lipids from different sources, they will then be harvested and the protein concentration of the myoglobin will be measured. These results will be compared to studies on seal muscle cells. By completing these investigations, we will better understand how our changing world will affect animal performance on land and in the sea. Marine predators such as seals and sea lions are dependent on specific myoglobin levels in their skeletal muscles to be able to hunt for prey in their specific environments; any potential changes in these levels could have severe effects on their foraging abilities.

The effects of zep1 mutation on biomass yields of Phaeodactylum tricornutum

Natalie Liberati, Andrew Paton, Yu Bai, and Dr. Graham Peers
College of Natural Sciences

Presenter(s): **Natalie Liberati**
Advisor/Mentor: Dr. Graham Peers and Andrew Paton
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42881

Microalgae are currently being researched as potential fossil fuel alternatives, chemical feedstocks, and pharmaceuticals. Based on current data, there is still room for improving photosynthesis, potentially increasing yield to its theoretical maximum biomass yield. In industrial conditions, dense culturing is needed for high yields of biomass. These high cell concentrations decrease light penetration into a culture. Past studies have shown that reduced cellular pigmentation can improve this situation and increase overall photosynthetic yields. We are currently studying a mutant of the diatom species *Phaeodactylum tricornutum* to see if it is effective at adjusting light-harvesting per cell. This mutant, the *zep1* mutant, is unable to make fucoxanthin, an accessory pigment of photosynthesis. This should allow more light to penetrate the culture and reach more cells, increasing growth and biomass accumulation. Overall, we hypothesize that the *zep1* culture will accumulate more biomass than the wild-type culture.

The impact of GMI1 in mitochondrial and chloroplast genomes of Arabidopsis thaliana

Melody Weber, Gus Waneka, Evan Forsythe, Amanda Broz, and Daniel Sloan
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Melody Weber**
Advisor/Mentor: Dr. Daniel Sloan
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/37800

Mitochondria and plastid genomes within land plants display notably hindered sequence evolution [1]. Wu et al. (2022) found that in *Arabidopsis thaliana*, *MSH1*is necessary for the maintenance of low mutation rates in mitochondrial and plastid genomes. Inquiry regarding the molecular mechanisms affording land plants these low mutation rates has prominent implications in better understanding the underlying factors of mitochondrial genetic disorders in humans due to shared ancestry. Interestingly, data is present to suggest the molecular coevolution of *MSH1* and *gmi1* [3]. In *Arabidopsis thaliana*, *gmi1* is known to play a role in DNA repair via homologous recombination; Böhmdorfer et al. (2011) posited that *gmi1* acts alongside other proteins to promote arrest of the cell cycle, allowing cells to undergo critical DNA repair. We conducted research to further investigate the relationship between *MSH1* and *gmi1.* With extractions of the plant's genome, whole genome sequencing ensued and coverage ratios between *gmi1* mutant and wildtypes were constructed for mitochondrial and plastid sequences, respectively. We hypothesized that *gmi1* is involved in the maintenance of mitochondrial and chloroplast genomes and accordingly, that its knockout would result in decreased stability of these genomes as compared to wild type *Arabidopsis* individuals. Results were inconclusive in that some mutant:control ratios suggested a correlation between *gmi1* knockout and instability while other unperturbed

patterns implicated the lack thereof. Further studies are needed to more conclusively elucidate the role of *gmi1* in mitochondrial and plastid stability.

The impact of osteosarcoma exosomes on the lung microenvironment

Sophi Schofield, Laurel Haines, Eric Palmer, Daniel Regan
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Sophi Schofield**
Advisor/Mentor: Dr. Daniel Regan
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43031

Osteosarcoma is the most common bone cancer found in children and has a very high mortality rate due to the development of metastasis. Most often, this metastasis occurs in the lung which has resulted in a 70% mortality rate even with adjuvant chemotherapy. OS lung metastasis forms due to the factors released by the primary tumor that "prime" the lung for the growth of tumor cells. One of these factors is a microscopic extracellular vessel known as an exosome. Exosomes can make changes to supportive tissues of the lung to promote metastasis in selectively tracked organs. We hypothesize that OS exosomes are taken up by resident alveolar macrophages in the lungs which then orchestrate immunological and structural changes to the lung microenvironment. To evaluate this, we investigated OS exosome distribution in vivo in a mouse model as well as in vitro using human alveolar macrophages obtained from healthy, non-smoker donors. We evaluated the biodistribution and cellular uptake of OS tumor-secreted exosomes in a mouse model and it showed that macrophages can indeed take up and respond to OS exosomes in vivo. We then treated cultured macrophages with OS exosomes over a 72-hour period and then evaluated macrophage phenotype, viability, and the resultant cytokine profile using multiplex cytokine analysis. Our findings suggest that OS exosomes may alter the phenotypic state of macrophages in the lung to promote metastasis.

The Importance of RNA Modifications for Life at High Temperatures

Victoria Talbott, Kristin Scott, Liam Elkins, Brett Burkhart
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Victoria Talbott**
Advisor/Mentor: Dr. Thomas Santangelo
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42899

RNA is initially composed of four bases adenine, uracil, guanine, and cytosine, but mature RNAs can contain nearly 200 modified bases. These RNA modifications are more commonly found in stable RNAs such as tRNA and rRNA however there is a rising awareness of the importance of modifications in mRNA. Though there is a rising awareness of the importance of mRNA modifications not much is known about the methyltransferase responsible for the modifications and how the RNA targets are identified or how the mRNA modifications impact cellular stability.

One such mRNA modification is 5- methylcytosine. 5-methylcytosine (m5C) modifications are abundant in tRNAs and rRNAs, but m5C is also found in mRNA; the abundance of this modification in T. kodakarensis makes an ideal model organism to study these modifications. T. kodakarensis is a hyperthermophile that thrives at 85¬∞ C, so it is hypothesized that large numbers of m5C modifications in T. kodakarensis increase or at least impact cellular stability. To determine if m5C modifications impacted cellular stability growth curves of strains deleted for a single methyltransferases and wild-type strains were compared to see if there was a difference in phenotypes.

The influence of light and darkness on aphid feeding behavior

Patrick Murray,Daniel Kunk, Vamsi Nalam
College of Agricultural Sciences

Presenter(s): **Patrick Murray**
Advisor/Mentor: Dr. Vamsi Nalam
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42919

Bird cherry-oat aphids (Rhopalosiphum padi) are a pest for many cereal crop species around the world. They feed on the sugar-rich sap (phloem) of their host plants and are capable of vectoring barley yellow dwarf virus, which can seriously damage crops. Considering that phloem sap is R. padi's only source of nutrition and they live on the plant leaves at all times, understanding how their feeding behaviors change throughout the day may allow growers to implement management techniques to reduce losses. Using the electrical penetration graph (EPG) technique, R. padi feeding on wheat (Triticum aestivum L., cv. Chinese Spring) plants was measured over a 24-hour light and dark cycle. Our results indicate that during the daytime aphids spent a longer average time probing plant tissue without feeding ($p=0.00018$), as well as more total time spent on the plant without probing or feeding ($p=0.002$). During the nighttime, the aphids showed longer average durations of phloem salivation ($p=0.03$). These data confirm previous findings that day/night differences in aphid feeding behavior could potentially be exploited by growers in order to reduce feeding and, in turn, crop damage and virus transmission.

The Inside Scoop on Stress and Status: A Mediation Analysis

Alexys Murillo, Gloria Luong, Ben Prytherch
College of Health and Human Sciences,College of Natural Sciences

Presenter(s): **Alexys Murillo**
Advisor/Mentor: Dr. Gloria Luong
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43037

The negative health impacts of stress reactivity, i.e., affective responses to stressors, have been well documented in prior research. Positive affect (PA) and negative affect (NA) reactivity refers changes in affect in response to stressor days compared to non-stressor days. Subjective social

status (SSS), one's perceived social standing, has been established to be associated with stress reactivity. Event appraisals (evaluations of the severity of the stressor, as well as feelings of control over the situation) and coping strategies (cognitive and behavioral strategies aimed at dealing with stressful situations) can modify affect reactivity to stressors. The current investigation aims to explain the relationship between SSS and stress reactivity through a mediation mediation analysis examining appraisals of stressor severity, control over the stressors, and coping strategies such as emotion-focused coping and problem-focused coping. The results supported our hypothesis that low SSS is related to higher stress reactivity. Additionally, we found that perceived severity was the only, and strongest, statistically significantly mediator explaining how SSS is related to both PA and NA reactivity. Taken together, these results help to clarify the pathways behind the association between SSS and stress reactivity which has important implications for improved health outcomes

The interactions between LCLU changes and NFEPA rivers in GKSDP, South Africa

Keana Shadwell, Dr. Jody Vogeler
Warner College of Natural Resources

Presenter(s): **Keana Shadwell**
Advisor/Mentor: Dr. Jody Vogeler
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42842

As population growth and urbanization in South Africa increase, communities must prepare for tradeoffs in ecosystem services that could impact how they interact with their environment. This project focused on quantifying increasing urban settlement and the agricultural areas surrounding National Freshwater Ecosystem Priority Areas (NFEPA) within the Greater Kruger Strategic Development Plan region of South Africa to better understand and anticipate ecosystem services tradeoffs that may result. The project gathered land cover and land use (LCLU) layers from 1990, 2014, and 2020 and isolated urbanization and agricultural area changes across these years. A literature review was conducted to explore which ecosystem services tradeoffs may result from the observed LCLU changes, specifically urbanization and agricultural expansions, around NFEPA rivers. Increases in both settlement and agricultural land were observed, as well as ecosystem services tradeoffs such as the risk of increased runoff and pollution, decreased biodiversity, economic gains from agriculture, and more cultural services as a result of this LCLU change. These findings suggest that coexistence among humans and their environments may lead to both beneficial and harmful ecosystem services tradeoffs which should be considered alongside human development and sustainable land planning.

The Molt Cycle in Gecarcinus lateralis: A Novel Model for GIV-Mediated RTK Signaling

Sydney Collins, Dr. Mihika Kozma, Dr. Donald Mykles
College of Natural Sciences

Presenter(s): **Sydney Collins**
Advisor/Mentor: Dr. Mihika Kozma

Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42988

Crustaceans molt to grow and regenerate lost limbs. A neuropeptide called molt-inhibiting hormone (MIH) regulates the molt cycle via inhibition of ecdysteroid synthesis by the Y-organ (YO). Receptor tyrosine kinases (RTKs) and G protein-coupled receptors (GPCRs) expressed by the YO are hypothesized to mediate MIH signaling. This study investigates crosstalk between RTK and GPCR signaling pathways. The interactions between these two pathways are mediated by a multimodular protein, Girdin (GIV), which has remained uncharacterized in crustaceans until now. Following the activation of RTKs, GIV can selectively bind to G protein subunits (G_a), and thereby initiate GPCR signal cascades without the direct activation of GPCRs. GIV is known to regulate cell migration/growth through cell signal enhancement and inhibition. The goal of this study is to identify GIV in YO transcriptomes of the blackback land crab, *Gecarcinus lateralis*, and characterize its role in the molt cycle. Homologues to GIVs were identified in YO transcriptomes using bioinformatics and phylogenetic analyses. Diagnostic GIV features, such as structural domains and motifs, and binding sites for RTKs and G_a subunits were successfully identified within the *G. lateralis* GIV sequence. An analysis of differential gene expression of GIV across the molt cycle of *G. lateralis* is ongoing. Thus, we propose a novel model of GIV-mediated RTK/GPCR signaling that provides further insight into the regulation of crustacean molting. Support: NSF (IOS-1922701) and CSU Honors Program.

The Social Context of Greeting Calls in African Elephants (Loxodonta africana)

Piper Dumont, Michael Pardo, George Wittemyer
Warner College of Natural Resources

Presenter(s): **Piper Dumont**
Advisor/Mentor: Michael Pardo and Dr. George Wittemyer
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42846

Understanding how animals mediate social interactions via communication is crucial to understanding how complex social structures are maintained. Elephants have unusually large fission-fusion social networks with long-term social bonds, yet the ways in which they modulate vocal signals according to social context remain poorly understood. Elephants often produce "greeting" calls when one individual approaches another. We investigated how the acoustic structure and pattern of occurrence of greeting calls vary according to social context. We recorded greeting calls from individually identified wild elephants in Samburu National Reserve, Kenya, and measured several features describing the frequency contour, formants, and time. A larger age gap between the caller and the receiver was associated with increased frequency modulation. Older callers were more likely to receive a vocal response than young callers. Finally, the approachee was significantly more likely to call than the approacher. These findings indicate that African elephants adjust their greeting calls according to the age of their interacting partner relative to themselves. Age is known to be strongly correlated with dominance in elephant

communities, so modulating their calls might be a way in which elephants reflect their social hierarchies.

The Use & Impact of Deliberative Pedagogical Skills Amongst Post-Graduate CPD Leaders

Laura Moritz
College of Liberal Arts

Presenter(s): **Laura Moritz**
Advisor/Mentor: Dr. Zachary Mercurio
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42996

I am researching the use and impact of deliberative dialogue skills and deliberative pedagogy amongst post-graduate leaders who worked with the Center for Public Deliberation (CPD) while at Colorado State University. In order to gather data on this subject, I will be utilizing an exploratory line of questioning to conduct surveys with CPD alumni that will later be analyzed with a narrative analysis approach. Thus far I have completed research on the existing literature that addresses the history and effectiveness of deliberative pedagogy and deliberative dialogue skills that mold effective leaders who are able to create positive changes towards the issues of polarization and echo chambers. With these positive impacts in mind, my research is interested in expanding the field by gathering data on the shelf life of CPD-taught leadership skills in the workplaces of alumni in the variety of disciplines in which they reside (humanities, business, and the public policy/government specifically). Overall my research works to understand the long-term impacts of collegiate involvement in a deliberative organization on leaders in their workforce as well as to help inform these deliberative organizations about what skills are the most practical. My research will address, how do graduates who engaged in deliberative pedagogy programs utilize deliberative skills in their current career fields? And, what inhibitors or barriers have stood in the way of leadership success when it comes to using deliberative dialogue skills?

Time and Space Use of Carnivores and Prey in Colville National Forest

Kaycey Ayala, Matthew Hyde, Rae Nickerson
Warner College of Natural Resources

Presenter(s): **Kaycey Ayala**
Advisor/Mentor: Matthew Hyde
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43010

The growing effort to conserve and reintroduce carnivore populations has led to the increased risk of overlap between human and carnivore populations. This has serious implications for livestock operations as there is a correlation between predator population size and depredation events. As part of a Conservation Innovation Grant from the Natural Resources Conservation Service, we carried out a camera-trapping study of a grazing allotment in Colville National Forest

to pilot the evaluation of range riding to prevent livestock depredations across the West. While preventative strategies are well known and studied, they are often expensive and not applicable for every ranch. Thus, we set out to determine if prey abundance could be used to predict carnivore hotspots to focus depredation prevention efforts on areas of high risk. To achieve this, we installed 40 cameras throughout the allotment to collect data on species occurrence and activity. Using R software, we analyzed if there was a correlation between ungulate and carnivore activity patterns. We then transposed the data onto a heat map to illustrate areas with the highest abundance of species. We observed overlap between ungulate and carnivore species, as well as a correlation between high ungulate and high carnivore activity. Our research suggests that using camera traps to identify areas of high predation risk could lead to more effective targeting of depredation prevention strategies.

Time distribution differences in resting behavior of California sea lions (Zalophus californianus) between sex

Jazlyn Nie
College of Natural Sciences

Presenter(s): **Jazlyn Nie**
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42863

California sea lions (Zalophus californianus) are a local species on the West Coast of North America. The population of California sea lions has been increasing since 1975, when they were protected under the Marine Mammal Protection Act (MMPA). Their population was still growing at the time this research was conducted in Los Islotes, Baja California (which translates to “the islets,” a small island) in November 2021. According to a previous study, pinnipeds spend up to 90% of their time resting during the non-breeding season (Stirling, 1971). However, little research has been done on the difference between sexes regarding their resting behaviors. Male and female California sea lions have unique sexual dimorphisms in terms of physical appearance, which provides us with the preconditions for our experimental design when selecting individuals of our desired sex. In this study, we performed five-minute focal observations on four samples of both male and female California sea lions in terms of their resting behaviors with detailed classification. We compared and analyzed those eight samples, and our results demonstrated that both males and females spend most of their terrestrial time laying on their backs, basking in the sun. In general, more vocalizations and head movements were observed in males compared to their female counterparts. Studying the distribution of resting behavioral differences between sexes can provide insight into colony dynamics and the social rankings of individuals. Though more experiments and long-term observations are still required to improve the accuracy, our data can be applied to future pinniped behavioral studies and conservation management. Stirling. (1971). Studies on the behaviour on the South Australian fur seal, Arctocephalus forsteri (Lesson) II. Adult females and pups. Australian Journal of Zoology, 19(3), 267,273.

To Clear or Not Clear a Nematode

Emily Bradford, Paige Fortunati, Gabriell Papp, Ellery Sherman, Ashley McGrew, Traci Kinkel

College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Emily Bradford**
Advisor/Mentor: Dr. Traci Kinkel
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43050

Our parasite group's major research interest is to investigate the microbiome of helminths and their hosts, this project aims to define methodology for sample preparation. The process of incorporating a surface sterilization procedure prior to DNA extraction is a crucial step in studying the microbiome of helminth worms, in order to ensure that the endosymbionts thought to be associated with the worms are not contaminated with host GI lumen contents. Clearing is a commonly used practice in morphologic identification of nematodes and allows for the cuticle to become transparent to effectively look at the worm's identifying features. Through visual examination following sterilization, a physical change in the integrity of nematodes that were previously cleared was noted. The objective of this study was to determine whether clearing the worm affects the quality of DNA isolated from that sample. It was hypothesized that there would be a difference in DNA quality and quantity extracted from cleared nematodes and non-cleared nematodes, as well as qualitative differences in the worms differentially treated. To quantify and assess the quality of the DNA samples, we used a nanodrop and will be utilizing 16S microbiome sequencing analysis to determine the impact of clearing on downstream applications. With this information, we can better prepare and optimize future protocols for helminth microbiome analysis.

Transmission properties of North American sheep scrapie prions in transgenic mouse models

EmmaKate Raisley, Julianna Sun, Nick Heyer, Jifeng Bian, Sehun Kim, Jenna Crowell, Juergen Richt, Jason Bartz, Tracy Nichol, Terry Spraker, Glenn Telling
Walter Scott, Jr. College of Engineering,College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **EmmaKate Raisley**
Advisor/Mentor: Dr. Glenn Telling
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42832

Scrapie of sheep and goats and chronic wasting disease (CWD) of deer and elk are examples of fatal transmissible neurodegenerative diseases of animals and humans caused by novel proteinaceous infectious agents referred to as prions. While transmission of prions within a species is relatively efficient, albeit, with prolonged times to disease onset, the potential for prions to transmit between species is exemplified by the development of Creutzfeldt Jakob disease in humans as a result of contamination of the food chain with cattle prions referred to as bovine spongiform encephalopathy (BSE) or mad cow disease. We and others have modeled the transmission characteristics of prions in mice engineered to express prion protein (PrP) genes from animals and humans. We previously created transgenic mice expressing the gene for the sheep PrP, referred to as TgOv, and showed that they were susceptible to established, well-

characterized UK sheep scrapie isolates. Since little is known about the properties of scrapie prions causing disease in North American sheep and goats, we challenged TgOv mice with scrapie isolates from different locations in the USA to determine whether their transmission properties were distinct from or broadly similar to UK scrapie. Since the origins of North American CWD are unclear, we also used Tg mice expressing deer or elk PrP to test the hypothesis that North American scrapie was the origin of CWD.

Tumor exosome educated primary human lung fibroblasts modulate osteosarcoma cell proliferation

Carina Easton, Eric Palmer
College of Natural Sciences

Presenter(s): **Carina Easton**
Advisor/Mentor: Dr. Daniel Regan
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42969

Osteosarcoma (OS) is the most common primary malignant bone cancer, primarily affecting pediatric populations. While primary tumor treatments have improved, the development of secondary lung metastases is associated with a significantly poorer prognosis. Emerging data in other cancers is beginning to elucidate the relationship between tumor cells and host stromal cells of distant organs in facilitating metastasis. One such mechanism involves tumor secretion of exosomes, nano-sized membrane-bound extracellular vesicles whose biological cargo remotely influences non-malignant host cell response in distant organs to generate tumor permissive environments. However, despite the almost exclusive tropism of OS metastasis for the lung, the mechanisms by which OS-derived exosomes promote this process are not understood. To investigate this, we evaluated human OS cell proliferation following in vitro exposure to conditioned media from OS exosome treated donor derived lung fibroblasts Exosomes were isolated from the human OS cell line MG63.0 via ultracentrifugation and size-exclusion chromatography. Purified exosomes were then used to 'educate' human donor-derived primary lung fibroblasts (LFs; n=3). Conditioned media of OS exosome educated LFs was characterized by a significant increase in pro-metastatic cytokines including IL-6, IL-8, and CCL2 as compared to untreated LFs. Cell imaging of RFP+ OS cells demonstrated cell line and culture condition-dependent differences in OS cell proliferation in response to LF conditioned media. These preliminary data suggest that OS cells are responsive to paracrine cues from LFs and that this cell-cell interaction may be involved in OS metastasis. Experiments to fully determine the functional impact of LFs on OS behavior are ongoing.

Undergraduate Students: Relationship Satisfaction and Self-Esteem

Sydney Zadrozny, McKenna Daly, Parker Davis, Ania Stein, Elizabeth Jewell
College of Health and Human Sciences

Presenter(s): **Sydney Zadrozny, McKenna Daly**
Advisor/Mentor: Dr. Allison Bielak

Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/38503

Relationships represent an integral part of a young person's life, especially within an undergraduate collegiate experience. Dating specifically has been researched but there has been little to no research in relation to relationship type and satisfaction as well as relationship satisfaction and self-esteem. The present study utilized self-determination theory and past representations of satisfaction and self-esteem in research to hypothesize that undergraduate students at Colorado State University (CSU) who reported they were in a casual relationship would convey less relationship satisfaction than students in a committed relationship. It was also hypothesized that there would be an association between relationship satisfaction and self-esteem. The study sample comprised 53 students, aged 18-24, drawn from a diverse student sample at CSU all of which completed the study questionnaire which utilized the Hendrick Relationship Assessment Scale and the Rosenberg Self Esteem Scale. Results show that there was an identifiable difference between relationship type and relationship satisfaction that supports the first hypothesis and results also show that there was no association found between relationship satisfaction and self-esteem concluding that the hypothesis was not supported by the data. Limitations of the data and the study's findings further represent the need for future investigation of these topics in which future research might focus on mental health variability in association to relationship satisfaction.Keywords: undergraduate dating, relationship satisfaction, self-esteem.

Understanding Extremophile Metabolism Through Protein Interactions

Teagan Rockwood, David Crosby, Seré Williams, Danielle Riley
College of Natural Sciences

Presenter(s): **Teagan Rockwood, David Crosby**
Advisor/Mentor: Dr. Thomas Santangelo, Seré Williams
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42982

The first known signs of life on earth likely appeared around 3.8-4.2 bya during the Hadean to Archean era transition in a world with a hot, hostile, and anaerobic atmosphere. Since photosynthetic organisms did not emerge until ~500 million years later, early life likely extracted nutrients from geological features, such as hydrothermal vents. Microbial life still flourishes in such extreme environments which require alternative physiologies to support life. The diversity of these microbial physiologies remains of interest to examine likely ancestral metabolisms and the adaptations that permit life in extreme environments. The hyperthermophilic marine archaeon Thermococcus kodakarensis has emerged as an ideal model species to investigate unique metabolisms in environmental conditions believed to mimic those of early Earth. Despite occupying nutrient-poor environments, T. kodakarensis shows resilience to environmental changes as well as rapid growth suggesting an efficient and dynamic metabolism. Known diversity in metabolic function, a malleable genetic system, and the cellular machinery to produce biological hydrogen makes T. kodakarensis a compelling species to investigate metabolic flux.

The goal of my undergraduate research is to decipher the metabolic protein interactions of T. kodakarensis to explain how this model extremophile grows rapidly in harsh and nutrient poor environments.

Untangling the Pseudomonas aeruginosa Biofilm

Paul O'Toole, Grace Borlee
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Paul O'Toole**
Advisor/Mentor: Brad Borlee
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42914

Biofilm-associated infections caused by Pseudomonas aeruginosa are resistant to treatment with antibiotics. Extracellular proteins and exopolysaccharides are key components of the biofilm matrix. CdrA is a secreted protein that mediates biofilm formation in P. aeruginosa by binding to exopolysaccharides such as mannose-rich Psl. We characterized a library of random transposon mutants using twitching motility, aggregation, and biofilm formation assays to determine permissive and non-permissive mutations in CdrA. We hypothesize that these transposon mutants will reveal which CdrA domains are responsible for mediating key interactions that contribute to binding to eukaryotic cells and cell-cell adhesion, which contributes to biofilm formation and alters motility.

Upstream to downstream changes in aquatic invertebrates through fire-disturbed abandoned beaver dams

Kelley Sinning, Nathan Dorff, Dr. LeRoy Poff, Dr. Dan Preston
Warner College of Natural Resources

Presenter(s): **Kelley Sinning**
Advisor/Mentor: Nathan Dorff
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43009

By slowing water movement and spreading out flow, beaver dams can benefit riparian ecosystems and help to maintain bioavailable nutrients in aquatic systems. Due to increased wildfire, beaver reintroductions and beaver dam analogs are being considered as effective and economical tools to help raise water tables and create potential fire refuges for aquatic and riparian biota. Beaver dams and their analogs help protect and maintain diversity of benthic macroinvertebrates communities, which are a significant source of energy for stream and terrestrial consumers. To assess the longitudinal effect of beaver dams in fire-disturbed areas on the aquatic invertebrate community, we collected replicated benthic samples in 2020 and 2021 from upstream, downstream, and within three ponds of an abandoned beaver dam complex in south-central Wyoming burned by the 2018 Ryan Fire. Results showed distinctive communities among the three habitats (upstream, downstream and pond) and seasons. Pond habitats were

dominated by bivalves and other lotic specialists. Habitat downstream of abandoned beaver dams had indications of possible refuge for benthic invertebrates from the most severe impacts of fire (i.e., post-fire flood and scour). As we continue to see climatic driven changes in hydrology and wildfire season, it is imperative that we understand the impact of beaver dams in fire-disturbed areas on the macroinvertebrate community and whether beaver reintroductions are a useful tool for maintaining diversity and food web integrity.

Urine metabolomics using two different platforms reveals dietary biomarkers of increased cowpea consumption by young children and pregnant women in Ghana

Madison Tipton, Bridget Baxter, Kailey Berry, Brooke Sayre-Chavez, Maria Munoz-Amatriain, Corey D. Broeckling, Mark Manary, Elizabeth P. Ryan
Warner College of Natural Resources

Presenter(s): **Madison Tipton**
Advisor/Mentor: Dr. Elizabeth P. Ryan
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42826

Many children under the age of five living in sub-Saharan Africa are at risk for malnutrition. Legumes are a source of dietary fiber, essential amino acids, prebiotics, and bioactive metabolites that have shown importance for healthy growth. Cowpeas can help combat malnutrition and have ideal agronomic traits for semi-arid regions. Dietary biomarkers of cowpea intake are needed to establish relationships with growth. Urine was collected from a clinical nutrition trial in Ghana for assessing small molecule markers of cowpea intake using non-targeted metabolomics. Twenty-four children (9-21months of age) and 21 pregnant women (>18 years) had a washout period with no cowpeas consumed in the diet that was followed by a 20-day dose-escalation of two local cowpea varieties every five days. Urine was analyzed by ultra-performance liquid chromatography tandem mass spectrometry using two distinct platforms along with the foods. Two-way ANOVA was applied to compare metabolite profiles before and after consumption, whereby 235 metabolites in urine were identified from Platform A and 930 metabolites in urine were identified from Platform B. Principal components analysis revealed distinctions between the women and children. Mansouramycin C showed significantly increased levels in urine for children and pregnant women on Platform A and five metabolites (e.g. S-methylcystine, S-methylcystein sulfoxide, delta-CEHC sulfate, N-acetylalliin, and N-acetyl-S-allyl-L-cysteine) were increased from Platform B. 8-methoxykynurenate, creatinine, uridine, and N4-acetylsulfamethoxazole were significant in pregnant women in the Dagbantuya/Sangyi varieties on both platforms. Increased levels of S-methylcysteine and S-methylcysteine sulfoxide were targeted for quantification and showed utility as a broad-spectrum legume dietary exposure biomarker.

Using Qualitative Interviews to Assess How Adults with Chronic Acquired Brain Injury Perceive Adaptive Yoga

Abby Richard, Dr. Jaclyn Stephens, Dr. Gupta Kalpana, Denny Press, Joseph Bunch
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Abby Richard**
Advisor/Mentor: Dr. Kalpana Gupta
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43074

Acquired brain injury (ABI) often elicits significant functional impairments. Although rehabilitation services in weeks and months post-injury aim to reintegrate people into society and reduce impairment, many people live in their communities with residual impairment and limited access to services that could address them. Thankfully, holistic therapies, such as adaptive yoga, have shown potential for addressing functional impairments in adults with chronic ABI and are becoming more and more available in communities, like Fort Collins. However, it is unknown if adults with chronic ABI perceive yoga as potentially useful for addressing their impairments.The purpose of my thesis is to explore how individuals ABI perceive adaptive yoga, via the use of qualitative interviews. As part of a larger study, the research team recruited twelve participants with chronic ABI from the local community for in-person yoga classes; nine attended all or nearly-all yoga classes. Two weeks after yoga classes, I conducted qualitative interviews with these nine participants. They answered questions about their experience, described changes they saw in themselves, and shared how they would change future yoga classes. To describe participants' responses, I will complete thematic analysis using NVivo software, and I will summarize overlapping themes. Ideally, these data will elucidate how adults with ABI perceive adaptive yoga and guide the applied portion of my thesis. Specifically, using input from ABI participants, I will create multiple adaptive yoga flows to be implemented in future yoga studies

Using water isotope composition to study hydroclimate variability in northern Colorado.

Adam Walsh, Dr. Jeremy Rugenstein
Warner College of Natural Resources

Presenter(s): **Adam Walsh**
Advisor/Mentor: Dr. Jeremy Rugenstein
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42838

Anthropogenic climate change is likely to alter the terrestrial hydrological cycle. The isotopic composition of waters ($\delta^{18}O$ and δD) is useful for tracing the movement of water over time and space (Liu et al., 2010). Long-term monitoring of water isotopes shows that $\delta^{18}O$ and δD values decrease as precipitation moves from the coast to continental interiors and reflect the influence of summer vs. winter moisture sources (Liu et al., 2010). A long-term record of $\delta^{18}O$ and δD in northern Colorado will help to quantitatively study variations in moisture sources in the modern as atmospheric CO_2 increases in the region. Studying how Colorado's moisture sources will respond to rising CO_2 is necessary for assessing future water availability in the region. This research project collects water samples from streams and two new precipitation sampling stations established in northern Colorado. Samples are filtered and measured for stable water isotopes at the NREL EcoCore Facility at Colorado State University using a Picarro

Water Isotope Analyzer. Our initial data indicates $\delta^{18}O$ and δD decreases westward, consistent with increasing elevation, and monthly variability in $\delta^{18}O$ and δD is highest in precipitation but far lower in monthly sampled streams. In general, stream waters have $\delta^{18}O$ and δD that corresponds more closely with wintertime precipitation. Quantitatively understanding these variations in $\delta^{18}O$ and δD will contribute to current research in relating paleorecord data and current climate models as CO_2rises.

Using water isotopes to understand sources of moisture in Colorado and New Mexico

Gabriela Sanchez Ortiz, Siânin Spaur
Warner College of Natural Resources

Presenter(s): **Gabriela Sanchez Ortiz**
Advisor/Mentor: Dr. Jeremy Caves Rugenstein
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42898

The stable isotope (d18O and dD) composition of meteoric waters, including precipitation, streams, and groundwaters, combined with authigenic carbonate samples has been used to infer sources of moisture in past climates. Our area of study focuses on the paleoclimate of the Southwest, specifically northern New Mexico, and southern Colorado. Here, the North American Monsoon in the summer and the westerlies of the winter are the two primary sources of moisture. To understand the relationship between the hydrogen and oxygen stable isotopes in our study area, we measured the isotopic composition stream samples collected from northern New Mexico. The global meteoric water line (GMWL) summarizes the annual average relationship between the two stable isotopes and can be defined as dD = 8 * d18O + 10. Our local meteoric water line (LMWL) has a lower slope of 7.41. This lower slope suggests that evaporation plays an important role in our data. Further, our more southerly stream samples in northern New Mexico had higher d18O and dD, indicative of a greater proportion of summer monsoonal moisture in this region. Our initial findings also showed higher d18O and dD at lower elevations, possibly as a result of distillation. Intriguingly, groundwater samples from New Mexico, collected on a monthly basis, showed almost no change in d18O and dD, indicating that shallow groundwater in the Sangre de Cristo Mountains is well-buffered against seasonal changes in moisture source. Precipitation samples are currently being collected and will be measured during the summer. Ultimately, these data will help inform future work to understand changes in these moisture sources in the geologic past.

Where the Rubber Meets the [Inaccessible] Road: Recommendations on Improving Disability Rights Policy in Jordan

Samuel Stoltz
Warner College of Natural Resources

Presenter(s): **Samuel Stoltz**
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43041

Jordan's 2017 *Law on the Rights of Persons with Disabilities* was hailed as "the most advanced in the region" when it was passed, offering comprehensive protections for people with disabilities. Four years later and little has changed throughout the country with most locations remaining difficult to access, even for able-bodied people. Most previous research on disability policy has been theoretical, focusing more on the type of legislation that should be passed rather than how it is implemented. Additionally, the data collected on implementation of disability rights legislation has been centered in the Western world, and has significant limitations in being applied to Jordan. I collected data from a series of interviews conducted with lawmakers and academics, a questionnaire distributed to disabled Jordanians and their families, and through site visits to several locations in Amman. Using a logic model, I analyzed the inputs and throughputs of the disability rights system against several cultural context factors to see if Jordan's legislation has been properly suited to the unique local culture. Contrary to previous findings, the inputs of the system (Jordan's disability legislation) and the throughputs (implementation documents) properly accounted for Jordan's local culture to maximize their effectiveness. However, through interviews with several experts, a number of other barriers limiting the success of Jordan's disability legislation implementation were uncovered, including an inflated public payroll and cost-based disability language. My findings and recommendations provide a new model to analyze the cultural relevance of legislation, and offer secondary factors to consider when analyzing legislation implementation.

Wildfire Impact on Mountain Stream Macroinvertebrates

Spencer Tennant, Weinan Zhao, Fernando Carvallo, Jordan Trujillo, Pete Zagorski, Dr. Dan Preston
Walter Scott, Jr. College of Engineering,College of Natural Sciences

Presenter(s): **Spencer Tennant, Weinan Zhao**
Advisor/Mentor: Dr. Dan Preston
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42960

Many of the areas affected by wildfires in Colorado have endured a range of burn severities. Key indicators of the health of mountain stream ecosystems post-fire are the macroinvertebrates, which differ in their tolerance to disturbance. On this premise, the impacts of wildfires on ecosystems and aquatic organisms can be observed by collecting samples from burned areas from multiple streams across the entire wildfire. In the summer of 2021, samples were collected from the Cameron Peak Fire in Rocky Mountain National Park. These samples were sorted and identified to order or family under a microscope. Through data analysis, the correlation between burn status and the abundance and composition of macroinvertebrates was analyzed. From the samples that have been analyzed, the conclusion is that there is a relatively small impact on the community structure of aquatic macroinvertebrates from the 2020 wildfires at the sites in the study. At the same time, the abundance of macroinvertebrates was reduced in the areas most severely affected by wildfire.

Women's Work Relationships and the Double-Bind

Molly Peek, Tiffany Trzebiatowski
College of Veterinary Medicine and Biomedical Sciences

Presenter(s): **Molly Peek**
Advisor/Mentor: Dr. Tiffany Trzebiatowski
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42801

Most work environments rely on the interconnectivity of different individuals and their unique skill sets, allowing for development, organization, and progress within the given settings. These skill sets condense to the general idea of relationship skills, or the specific behaviors and actions made while interacting with others in a professional setting. These relationship skills can be broken down into three categories. The first are professional skills which include formal interactions in the workplace regarding pay, negotiation of position, career progression, and the actual tasks related to the job. The second are people skills which include the ability to interact effectively with mentors, same-gender peers, networks in and out of the workplace, and work friendships. These people skills allow opportunities for professional skills to be utilized most effectively. Third, there are personal skills, which include an individuals' ability to react to situations with emotional intelligence, composure, while also utilizing factual knowledge and personal experience. The combination of these skills impacts success and failure for workers, especially women who have more pre-established societal expectations regarding relationship formation in the workplace. Women are expected to utilize these skills in ways that reinforce gender roles of being caring and warm, and mismanagement of these skills may result in backlash or negative career consequences. This poster will focus on the importance of relationships in the workplace, the skills required in the workplace to form relationships, and why women are expected to utilize these skills in gender role congruent ways despite often conflicting professional role demands.

δ13C Analysis of the Pennsylvanian Fountain Formation

Jacob Flack
Warner College of Natural Resources

Presenter(s): **Jacob Flack**
Advisor/Mentor: Dr. Jeremy Rugenstein
Category: Research Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43070

The Late Paleozoic Ice Age, lasting from approximately 360 to 260 Mya, was the most recent long-term glacial-interglacial cycle aside from the Pleistocene. Understanding the climate dynamics of the Late Paleozoic is therefore particularly critical to more advanced modeling of modern climate change. Conflicting evidence and incomplete data have largely precluded an unequivocal local paleoclimate model for the Late Pennsylvanian (~ 300 Mya) Fountain Formation. Sweet and Soreghan have interpreted the presence of polygonal mud cracks as strong evidence for repeated

diurnal freezing and thawing of the topsoil. Despite global icehouse conditions at this time, Colorado was roughly located within 5o of the equator and this particular depositional setting was relatively near to sea level. These seemingly contrary factors cast some doubt on this possibility and elicit further research. Here, global Late Paleozoic δ13C data have been compiled with others recently derived from coeval localities in Northern Colorado. The δ13C anomalies for carbonates collected at Satanka cove and Lorry State Park range from -3.58 to -0.83%. Samples collected from Box Elder Canyon have been prepared for pending isotope analysis. This data assemblage is the quantitative foundation for a novel spatiotemporal investigation of the local Fountain Formation paleoclimate within the broader context of the Late Paleozoic Ice Age.

Service Learning Posters

Building Blocks Towards Succes: First-gen mentorship towards post-grad

Bemnet Tefera
College of Liberal Arts

Presenter(s): **Bemnet Tefera**
Category: Service Learning Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43084

As a first-generation college student, I understand the anxiety around graduation and what comes after. Specifically, it is difficult having no guidance regarding the work field. While classes and other opportunities teach vocational skills as well as communication skills. There is little to no information on how to navigate the "real" world. My project aims to partner with the Alumni Center to create a program that will guide/mentor fourth-year students and some third-year students. My hope is to have alumni who are interested in volunteering help guide and answer questions from fourth-year students on a monthly basis. My focus is to have first-generation students of color come to this program to hear directly from alumni who have graduated and have begun their careers. Many students of color have little knowledge regarding interviewing, resume building, how to look for jobs, and how to network. Furthermore, I think that it is important to hear from someone who has been in that position and succeeded. Therefore I hope that the students who participate in this will have more confidence and knowledge regarding workplace environments, networking, etc. The end goal I hope to achieve through this program is that a good amount of students have plans after graduation and or understand the ins and outs of a job. In the future, I want to see my program expand by having an event at the end of the semester where students network and practice what they have learned as well as celebrate their journey.

Co-designing an Experiential Textile Science Lab at Colorado State University

Shelby Norris, Claire Atkinson, Sara Bovaird, Cassandra Richer
College of Health and Human Sciences

Presenter(s): **Shelby Norris**
Advisor/Mentor: Dr. Leah Scolere
Category: Service Learning Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42844

As a student-led service-learning project, this collaboration focused on the renovation of the existing Textile Science Lab located in the Gifford building as part of the Department of Design and Merchandising at CSU. Adopting a "designing with" co-design approach, this project involved client stakeholders, end-users, and members of the Facilities Management Remodel and Construction Services as a part of the design process. The co-design process included a student-

facilitated visioning session with diverse stakeholders, site observations of the existing lab use, and precedent analysis of labs to inform the proposed design. In addition, 3D-scan technology was used to create a digital twin model of the existing space as a communication tool among stakeholders in the design process. Informed by the design research and co-design process, the proposed design incorporates an innovative lab layout with a textile library to showcase physical samples and their applications. The proposed design highlights material sustainability, lab efficiency, emerging technologies, and a collaborative spatial layout to enhance experiential learning. Guided by the project concept of magnified collaboration, the design focuses on enhancing the visibility of faculty expertise, student engagement, & industry partnerships.
Continued work is being completed to refine the material and furniture selections for the lab that focus on sustainability, material health, and performance as well as gathering additional feedback from end-users.

Addressing Homelessness in the City of Fort Collins

Mariela Paul
College of Health and Human Sciences

Presenter(s): **Mariela Paul**
Category: Service Learning Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43080

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

Sembrando Oportunidades

Estefany Revilla
College of Health and Human Sciences

Presenter(s): **Estefany Revilla**

Advisor/Mentor: Sam Desta
Category: Service Learning Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43095

For the past 7 years, I have volunteered my time to a family who has two boys with special needs. Through this experience, it is that I was able to see the lack of resources available to Spanish-speaking families. I also noticed how most Latino families did not seek the support they needed due to the language barrier, immigration status, or lack of health insurance. All of these factors have not enabled Latino families and their children to receive the support they need or feel integrated into the community. I became involved with an organization in the Roaring Fork Valley, which serves the purpose of supporting Latino families who have children with special needs to receive the support they need. I hope to continue to advocate for Latino families who have children with special needs and educate communities about ways we can integrate them into our communities and support them.

Participatory Design with Rural Communities Enhances Educational Experiences

Jeremy Johnston, Ariane Urresti, and Jenna Vigil
College of Health and Human Sciences

Presenter(s): **Jeremy Johnston, Ariane Urresti, Jenna Vigil**
Advisor/Mentor: Dr. Maria Delgado
Category: Service Learning Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42971

Problem/Background/Objective: Currently, designs that do not include the user-centered perspective leads to unfunctional design. (Schuler, & Namioka, 1993). Due to this issue, rural communities seek collaboration opportunities (e.g. through universities) to expand their community outreach to design buildings that integrate more user-centered experiences. At the same time, universities are seeking participatory design experiences for students. Participatory design is defined as a design approach that involves various stakeholders to ensure design effectiveness (Kang et al., 2015). The collaboration between Washington County Commissioners and Colorado State University interior architecture (IA) student interns did just that. Together, the interns, county commissioners, rodeo professionals, and design stakeholders worked together in participatory design to create a 90,000 square foot event center.
Methods: Students met with rodeo professionals through the IA internship program to learn of the professional's arena engagement and interactions to enhance the user-centered design, which allows for effective strategies to enhance space functionality. Students met both in-person and online to generate the final design.
Conclusion: The final design product will be presented to the community (50-30 people) via a live presentation and a virtual reality experience to help garner financial support and community engagement to make the project viable.
Significance: This is important because it helps the community while also enhancing students' success because studies show that students reported experiencing deeper emotional growth

due to their knowledge that their design solutions would ultimately improve the lives of others in the community., Gomez-Lanier, L. (2016).

A Videoconference-delivered Exercise Program for Cancer Survivors

Tyler Gormly, Lydia Prien, Mary Crisafio, Dr. Heather Leach
College of Health and Human Sciences

Presenter(s): **Tyler Gormly**
Advisor/Mentor: Dr. Heather Leach and Mary Crisafio
Category: Service Learning Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42962

PURPOSE: Fit Cancer is an 8-week, group-based exercise program. In 2020, the COVID-19 pandemic forced Fit Cancer to adapt the program to be delivered 100% online, via Zoom videoconferencing. The purpose of this service learning project is to evaluate participant's satisfaction and the effects of the online Fit Cancer program delivered 1/2021-12/2021.METHODS: Fit Cancer includes circuit-based aerobic and resistance exercise sessions 1x/week, and three discussion sessions that provide knowledge and skills for physical activity (PA) behavior change. Outcome assessments were conducted via zoom before and after the program, and included questionnaires to measure quality of life (QOL), PA, program satisfaction, as well as a bicep curl and sit-to-stand tests to measure physical function. RESULTS: A total of 46 participants completed the pre/post-program assessments. The average age was 60 years old, most participants were female (95.7%); and diagnosed with ovarian (60.9%), breast (30.4%) or other (8.7%) cancer. Adherence to the exercise and discussion sessions was 88% and 89%, respectively. From pre to post program, QOL improved from 75.8 to 78.3. On average, MVPA increased from 147 mins/week to 229 mins/week, bicep curl improved from 29 to 34 reps, and sit-to-stand improved from 12 to 13 reps. The majority of participants (>90%) reported that they enjoyed participating in Fit Cancer and they would recommend the program to fellow cancer survivors.CONCLUSION: A video-conference delivered exercise program was feasible and enjoyable for cancer survivors, and may help improve PA, QOL, and physical function.

Mental Health Support for Undocumented Students

Fernanda Alarcon-Avila
College of Natural Sciences

Presenter(s): **Fernanda Alarcon-Avila**
Category: Service Learning Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43069

Research and lived experiences show that undocumented students have to navigate college with added stressors. These added stressors can contribute to high levels of depression and anxiety. Mental health resources are not accesible to undocumented populations due mental health stigmitization at home, inaccesible healthcare, and unequipped mental health professionals. It is because of these obstacles that my project focuses on making mental health accessible to

undocumented students at CSU. For the past three years, I have helped create a strong relationship between Undocumented Dreamers United (UDU), a student led organization on campus for undocumented students, and a multicultural counselor from the CSU health network. This is in an effort to: 1) distigmatize mental health for undocumented students in a safe space 2) expose a counselor at CSU to the undocumented student community and 3) increase student's knowledge over how to improve their mental health. This project is unique as I utilize my own identity as an undocumented student to accurately assess the needs of our community. The effectiveness of this relationship will be measured through a survey conducted during spring semesters 2020, 2021 and 2022. Future steps include creating action steps depending on the survey responses and expanding resources for undcoumented students outside of UDU by seeking structural change at CSU.

El Sueño Inalcanzable: Redefining the College Journey for Latine Youth

Jose Duenas
College of Natural Sciences

Presenter(s): **Jose Duenas**
Advisor/Mentor: India Luxton
Category: Service Learning Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43035

The journey to college can be hard enough for the average individual. For Latine and undocumented students, the journey becomes far more difficult as they attempt to seek help from an education system built to serve white values. Research has shown that Latine students tend to face depravity of information regarding essential steps to take to attain a college education. This systemic push-out is further exacerbated when accounting for the discrimination Latine students face in the education system. With the heap of legal obstacles already faced by the undocumented population, the hope of college can often be subjected to remain a mere dream. Through a collaboration of my identity as a Latine student and my opportunity to deeply study the issue as part of a research team, I will examine the struggles Latine and undocumented students face in the pursuit of higher education. This will be done in an effort to redefine the college journey for Latine students by targeting the core issues that underlie the struggles. Through an evaluation of the results yielded, I will take the next steps in working with local organizations to help the Latine community within Northern Colorado. Local organizations have the power to empower Latine youth who want to pursue a college education. The systems have worked against marginalized communities since their inception and it is time to make a change.

Educational Equity for English Language Learners

Abighail Tekeste
College of Liberal Arts

Presenter(s): **Abighail Tekeste**
Category: Service Learning Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/40460

Through my experience as an English Second Language (ESL) student and working with ESL students in FT Morgan high school, I have noticed the disparities that exist within the education system for ESL students. During my first year at CSU, I worked with students at Fort Morgan high school through the Key Communities with a focus on Education and Diversity, which further developed my interest to continue working with them. Through adversities such as language barriers and legal status, access to higher education is hindered, and my goal is to target this by creating a system of workshops centered around higher education through applications and scholarships for the seniors at Ft Morgan high school.

The Intersection of Oral Health and Overall Health

Alexandria Walker, Traci Kinkel and Riley Anderson
College of Health and Human Sciences

Presenter(s): **Alexandria Walker**
Advisor/Mentor: India Luxton, Sam Desta, and Traci Kinkel
Category: Service Learning Poster
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42834

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

I hope to be able to talk to local dentists and ask for donations for toothbrushes, toothpastes, and floss that people usually get after every hygiene visit. I plan to package and distribute these to the local homeless people that I serve at the Fort Collins Rescue Mission. My plan is to give one bag to every person when they're getting their meal with an informational pamphlet regarding the importance of dental health & overall health. My goals and visions are to fill a void by supplying resources and educating others to help improve dental hygiene and overall health of homeless and low-income people.

Visual Art

A Broken Record
Jevon McKinney
College of Liberal Arts

Presenter(s): **Jevon McKinney**
Category: Visual Art
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42864

Have you ever danced the night away to the sound of "My Girl" by the Temptations? Listened to the lyrics of 2Pac and Biggie Smalls or gotten down to the rhythms of Ms. Mary J. Blige or Megan Thee Stallion? The truth is there are so many Black artists whose impact on the music industry has been profound. However, those are considered the top 0.01% of all Black artists. How many of these Black Artists have actually been given the right amount of recognition for their work? Have the messages of equality and activism filled in their music fallen on deaf ears? Have these artists really gotten the respect they deserve from the music industry and society as a whole? All of this will be investigated in “A Broken Record.” It explores the censorship, appropriation, and overall treatment of Black Musicians in our society. By exploring the traces of Black artists in the roots of music history with local Colorado artists and educators such as University of Denver Professor Roger Holland, Singers Kid Astronaut & Json Martin, and national saxophonist and radio host Tony Exum Jr., to get their perspectives on the state of Black Music as well as the history of its themes and mistreatment. I direct a crew with camera, lighting, and sound in order to create a film that I hope will contribute to the long-needed discussion about giving Black artists the recognition they deserve.

First Gen Film

Gerson Flores Rojas
College of Liberal Arts

Presenter(s): **Gerson Flores Rojas**
Category: Visual Art
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/43815

My name is Gerson and I am a junior at Colorado State University majoring in journalism. I am also a first generation student and a Puksta scholar. My time at CSU has brought me to the realization that the experiences of first gen students are often untold. Sure, the schools website states that over 20% of all students are first gen, but what exactly does that mean?

My project aims to answer this question.

This semester I dedicated myself to reaching out to first gen students, initiative directors, counselors, and student parents to paint a much clearer image of what it means to be a first gen student.

I interviewed, researched and documented the experiences of students on campus. And brought it all together to present it in the form of a video.

To be completely clear, my CURC project is a creative video on the lived experiences of first generation students at Colorado State University.

Students Come First: The Journey of CSU's First-Generation Students in the Honors Program

Aspen Flores
College of Liberal Arts

Presenter(s): **Aspen Flores**
Category: Visual Art
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/42961

Through a documentary, I highlight first-generation students in the Honors Program at Colorado State University. This ten-minute video showcases the unique challenges of first-generation Honors students, with additional information from CSU faculty to support the personal claims. My interest in this subject comes from a mix of personal experience and observations around campus. Many first-generation students already defied all odds to get to college, but those in the Honors Program fight additional challenges. Although one in five students at CSU are first-generation students, we do not have much information established specifically on first-generation students in the Honors Program. Creating a documentary opens a somewhat unexplored path and brings attention to a diverse set of students who break academic boundaries. My interview questions act as my "research" questions to find out more about first-generation Honors students. This documentary features interviews with two students, a CSU research analyst, an Honors professor, and a scholar contact for the Community for Excellence. Everyone involved is a first-generation student. This project helps define what it means to be a first-generation student, what unique challenges these students face, and how it influences their experiences within the Honors Program at CSU. Often being a first-generation student feels isolating, especially without the support of others. As a solution, my documentary explores the disparities first-generation Honors students endure, creates an interest in this under-documented group, and inspires others facing a similar and challenging path.

Written Work

2014

Rory Low
College of Liberal Arts

Presenter(s): **Rory Low**
Category: Written Work
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/40875

In 2014 I was the first person to ever publicly transition at my high school. 2014 is my own 'uncarvable marble turned marvel' coming of age story. The multigenre meld of poetry and illustration is an excessive and haunting contemplation of my gender dysphoria, coming out, trauma, and healing. 'Flashes,' and 'Dysphoria: A Love Poem' are poems included for submission from this work. State legislatures have proposed over 186 anti-trans bills in the last 2 years targeting access to healthcare; ability to change legal documents; inclusion of LGBTQIA+ voices in schools; and policies that encourage blatant discriminatory violence. 2014 is for the trans girl in Texas contemplating suicide because she might be forced off puberty blockers, for the nonbinary kid in Idaho whose mom won't let them get a binder, and for the queer college kid in Florida who dreams of teaching but now is at a career impass because he can't say gay in the classroom. 2014 is my coming of age story turned call to action; in nature it is a counternarrative and deliberate refusal to be silenced in the face of systemic violence. 2014, my poems, and creative work contribute to the rising collective of gender nonconforming voices that refuse to be erased.

Challenges to Rural Resilience in Japan and France: A Comparative Study

Natalie Montecino
College of Liberal Arts

Presenter(s): **Natalie Montecino**
Advisor/Mentor: Dr. Andrea Duffy
Category: Written Work
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/40968

Rural decline has been occurring on a global scale for many years now, with each community experiencing the phenomenon in unique ways. Japan and France, two highly developed nations in the world today, have been particularly hard hit by an emptying of the countryside and the collapse of rural economies. This comparative study analyzes the economic and cultural consequences of rural decline, and how these nations are working to revitalize their respective countrysides with varying degrees of success. Despite their distinct cultural, historical, and geographical differences, Japan and France feature a number of striking similarities with regard to the trajectory of their rural decline that gives value to this comparison. Through the use of a

comprehensive literature review and primary source analysis, I argue that historical trends have ushered in an era of intense rural decline for both nations that is negatively impacting urban and rural communities alike. I have found that without direct and consistent action in these rural communities, it is unlikely that the trend of rapid decline will be reversed for either Japan or France. In contributing to inter-regional comparative analyses, I aim to fill a gap in the currently available literature and offer relevant recommendations for future development work at the local, national, and international level.

Chapter 1 of Weather, Beasts, & Growing Things, a speculative fiction novel.

Charlotte Suttee
College of Liberal Arts

Presenter(s): **Charlotte Suttee**
Category: Written Work
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/40745

Weather, Beasts, & Growing Things is a novel tasked with exploring how to live with others in a landscape compromised by globalized extractive economies and impending destruction from all fronts. It explores important narratives of nonhuman personhood, queer-ecology, and multispecies being.
Plot Summary: Weather, Beasts, & Growing Things is a sci-fi semi-apocalyptic story following a nonbinary young adult named Stevven Pane who operates an unsanctioned GreenRoof (urban garden) atop a condemned, drowned, apartment on the coast of South Carolina. The city finally evicts Stevven, along with 9-year-old Eli and his mother Mary, Neo Native American fugitive Gino, and gossip magazine journalist Barbara. This motley crew is forced to navigate the neoliberal cyberpunk urban landscape and miles of abandoned highways riddled with homicidal anarchists and pagan communities to reach the last home Stevven ever trusted, University grounds nestled in the foothills of the Blue Ridge Mountains.

Climatic Migration and Policy Solutions along the U.S.-Mexico Border

Claire Walther
College of Agricultural Sciences,College of Liberal Arts,Warner College of Natural Resources

Presenter(s): **Claire Walther**
Advisor/Mentor: Dr. Stephen Mumme
Category: Written Work
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/40923

Earth's climate is changing, and humans are facing more and more complex and compounding issues associated with these changes daily. One such issue manifests on the global stage as the immigration crisis. The movement of people as they seek refuge, asylum, and new beginnings following hardships in their homelands is straining national identities and multinational relationships, including those between the U.S. and Mexico. The border between

the two nations is characterized by intensely troubled regions with heightening rates of migration. According to research from the Congressional Research Service, a majority of these migrants are from three nations - Honduras, Guatemala, and El Salvador - collectively known as the Northern Triangle. As more and more displaced people flood into the border region from the Northern Triangle, gaps are revealed in the political infrastructure meant to assist them. These global issues are deeply interconnected, and comprehensive action must be taken immediately to mitigate environmental and socio-political disasters. This essay explores these relationships between policy, migration, and climate to illuminate problems associated with existing political action and isolate potential solutions. To gain a comprehensive understanding of these complex issues, this essay will begin by addressing the causes and consequences of climate change. Next, this essay will explore the relationship between the Northern Triangle and migration to the border region. Finally, current climate immigration policy will be analyzed, and recommendations will be made for further political action.

Home is the Thrum Singing Beneath Skin

Abigail Thomas
College of Liberal Arts

Presenter(s): **Abigail Thomas**
Advisor/Mentor: Dr. Sasha Steensen
Category: Written Work
Link: https://symposium.foragerone.com/csu-curc-2022/presentations/40959

Home is the Thrum Singing Beneath Skin is a poetry chapbook exploring my identity through landscape. As someone who lived in Nebraska for the first eighteen years of my life, the landscape there functions as a foundation for my identity. I've been molded by the mud, humidity, and limestone of the region. Moving to Colorado to attend Colorado State University marked a huge shift in my life, culturally and geographically. Suddenly I was surrounded by granite, desert flowers, and ash. I was in a place where I could be my most authentic self, but at the same time, I felt like I was slowly shriveling up and becoming a husk. Events such as the Coronavirus pandemic and the Cameron's Peak wildfire impacted my mental health as well as my quality of life in this new state. As an individual who has always been very close to my family, there was also a lingering sense of guilt for moving five hundred and thirty miles away. This collection explores what it means for me, a child of the river valley, to be placed in a semi-arid desert, alone and struggling to flourish. Themes of family, displacement, transformation, and home provide a backbone for this chapbook that explores who I'm trying to be, who I am, and who I can no longer return to.