2025 Research and Creative Activities Symposium (RaCAS)

RaCAS is CU Denver's annual celebration of student-driven research, scholarship, and artistic endeavors. This year, we are thrilled to return to campus with a hybrid in-person event!
In the Virtual Project Showcase, you will find digital presentations showcasing the work of over 300 student presenters. We encourage you to take time to explore projects both within and outside your discipline - you never know where inspiration will strike! RaCAS is about community, conversation, and collaboration and we encourage you to use the comment walls to start a conversation with student presenters. Presentations will remain posted after RaCAS so you can continue to discover and enjoy them!

View All Projects: https://symposium.foragerone.com/2025-racas/presentations

Thank you to all the Presenters, Mentors, Reviewers, and Volunteers for a fantastic 2025 RaCAS event!

PEOPLE'S CHOICE AWARDS BY CATEGORY

- Arts & Media: Civic Engagement in the CU System from the years 1960-Present, **Cesar Rodriguez**
- Biomedical Sciences: From Lung to Lab: Enhancing Sputum Quality for Rheumatoid Arthritis Research, **Shrostina Magar, Bertina Quach**
- Natural & Physical Sciences: A RAD Search: Identification of antiphage defense systems using a conserved serine recombinase, **Navtej Singh**
- Social Sciences & Humanities: Cultivating Community: Understanding AANHPI Student Success Beyond the Model Minority Myth, **Lucie Dao, Nhi Dang, Bertina Quach, My-Quynh Ta, Daranee Taychachaiwongse Teng**
- Tech, Engineering, & Math: PhishSense, **Ashlynn Hainey, Deveyn Hainey**

SUSTAINABILITY AWARDS

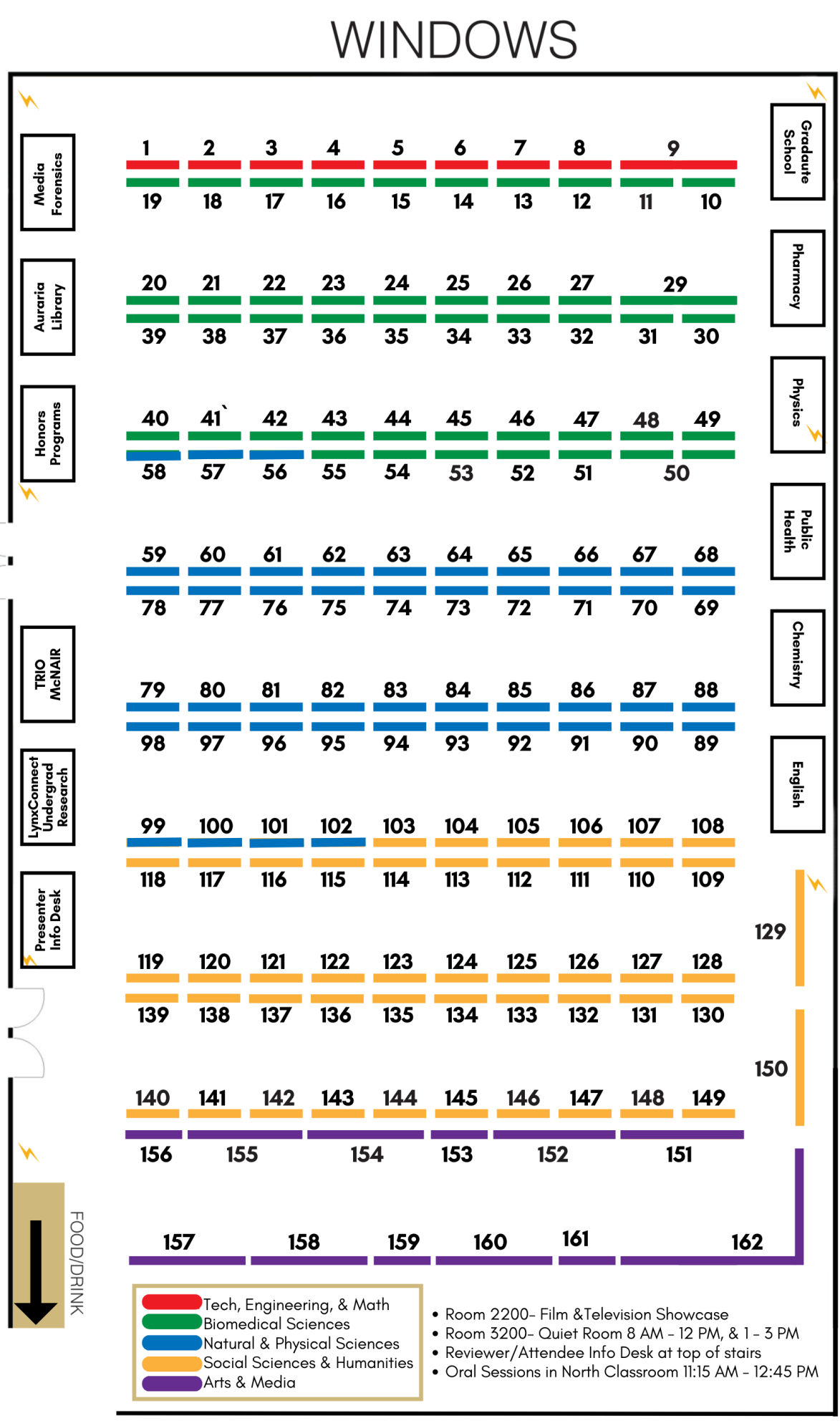
- Top Oral Presentation: Assessing Differences in Adverse Maternal Outcomes by Zip Code and Social Vulnerability in a Low-Risk Obstetric Cohort, **Gabriella Mayne**
- Oral Presentation Runner-up: Rising Temperatures, Cognitive Decline: The Impact of Climate Change on Brain Health in Vulnerable Populations, **Laila Zeid**
- Top Poster Presentation: Diminishing Snowpack and Greenhouse Gas Fluxes: Investigating CO_2 Dynamics in Subalpine Ecosystems, **Emma Tunks**
- Poster Presenter Runner-Up: Wintertime Thermal Refugia on the South Platte River Downstream of a Wastewater Treatment Facility, **Gretchen Wilson, Emily Melton, Weston Burcar, Ryan Emmerson, Jake Casey**

UNDERGRADUATE MENTOR OF THE YEAR WINNER

- Kathryn Hamilton, Ph.D., Physics

UNDERGRADUATE MENTOR OF THE YEAR TOP NOMINATIONS

- Benjamin Greenwood, Ph.D., Psychology
- Marty Otañez, Ph.D., Anthropology
- Ivan Ramírez, Ph.D.: Health and Behavioral Sciences
- Michael "Bodhi" Rogers, Ph.D., R.P.A., Physics


WINDOWS
Media Forensics
Auraria Library
Honors Programs
TRIO McNAIR
LynxConnect Undergrad Research
Presenter Info Desk
Graduate School
Pharmacy
Physics
Public Health
Chemistry
English
1 2 3 4 5 6 7 8 9
19 18 17 16 15 14 13 12 11 10
20 21 22 23 24 25 26 27 29
39 38 37 36 35 34 33 32 31 30
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FOOD/DRINK
Tech, Engineering, & Math
Biomedical Sciences
Natural & Physical Sciences
Social Sciences & Humanities
Arts & Media
• Room 2200- Film &Television Showcase
• Room 3200- Quiet Room 8 AM - 12 PM, & 1 - 3 PM
• Reviewer/Attendee Info Desk at top of stairs
• Oral Sessions in North Classroom 11:15 AM - 12:45 PM

RaCAS 2025 ABSTRACTS

Alphabetical By Title

3D printing with Psychedelics in a Museum Exhibition: Exploratory Notes
Luke Dressler *Social Sciences & Humanities*
Mentor: Marty Otañez

Abstract:
Psychedelics are often associated with the hippies and counter-cultural movements in the 1960s and 1970s. In 2025, psilocybin mushrooms and other psychedelic substances are stigmatized. Individuals who use psilocybin seek to improve their health or to enjoy leisure time activities. Others recognize the substance as a resource to connect cultural and historical heritages, especially for Mesoamerican and South America groups. In addition to offering a connection to medicinal, spiritual, and ancestral worlds, psilocybin allows healing from the trauma of colonization and white supremacy culture. These problems are manifested today with indigenous people and their traditional knowledge being left out of conversations to legalize psychedelics. To destigmatize psilocybin and increase public knowledge of indigenous approaches to natural medicine substances, our research team used 3D models of psilocybin mushrooms to bring cultural context and community awareness to fungal medicine. The goal is to create a baseline to discuss and highlight psilocybin, including its significance along historical, cultural and wellness lines. 3D objects are being integrated into a planned museum exhibit in fall 2025 through mixed media, 3D scanning/printing and video tutorials. Small model(s) related to psychedelics and their culture will be presented to display an accessible firsthand experience. Models were scanned manually or obtained from model websites and printed using the MakerBot Replicator device. Tutorials on the steps to 3D print models are included to educate peers and non-campus community members with an interest in 3D printing. Destigmatizing psilocybin is part of the process of decolonizing psychedelics and making space for concerns and experiences of non-dominant cultural members to be shared more broadly. Ultimately, my project displays innovative ways to integrate 3D printing in conservation and educational initiatives involving natural plant medicines and other 21st Century issues that impact indigenous and non-indigenous community members.
https://symposium.foragerone.com/2025-racas/presentations/73614

A Comparative Analysis of the Effects of Transcutaneous Auricular and Implanted Vagus Nerve Stimulation
Angel Ausmus *Biomedical Sciences*
Mentor: Cristin Welle, PhD

Abstract:
Vagus nerve stimulation (VNS) has emerged as a promising neuromodulation therapy for a variety of conditions, including epilepsy, major depression, and post-stroke motor deficits. Historically, VNS has been achieved through surgical implantation of a stimulator device on the cervical vagus nerve, which necessarily involves the risks associated with invasive procedures. Transcutaneous auricular VNS (taVNS), a form of VNS that directly stimulates the auricular branch of the vagus nerve, has recently been presented as a non-invasive alternative that may provide equivalent therapeutic effects without surgical intervention. Prior research has suggested that taVNS parallels implanted VNS (iVNS) in treatment of major depression and epilepsy, and iVNS and taVNS have been shown to exhibit similar projections to the brain. Despite promising evidence of the therapeutic applications and effectiveness of taVNS, the extent of the similar and disparate neurobiological effects of the two modalities has yet to be elucidated. As a functionally diverse nerve with a complex branching structure, it is possible that stimulation of different branches would result in divergent therapeutic applications and efficacies. Studies directly comparing patterns of neural activation and deactivation as a result of these modalities are limited, and filling this gap in research is necessary if taVNS is to be employed more widely as an alternative to iVNS. To address this gap, we utilized c-Fos brain mapping in mouse models to compare the patterns of neural activation following either taVNS, iVNS, or sham stimulation. Statistical analysis of the preliminary c-Fos expression data from the three groups revealed convergent and divergent activation patterns, reinforcing the conception of taVNS and iVNS as comparable but distinct therapeutic approaches. Clarifying the relationship between the neurophysiological effects of taVNS and iVNS using c-Fos expression data may translate to the optimization of treatment choice and subsequently improve therapeutic outcomes.
https://symposium.foragerone.com/2025-racas/presentations/73765

A Fun, Educational Nightmare: The Uncanny Horror of *Don't Hug Me I'm Scared*
Aayjah Royston *Arts & Media*
Mentor: Yang Wang

Abstract:

Puppet performance arts have drawn the attention of scholars interested in the grotesque and uncanny. John Bell argues that puppet theatre is essentially linked with readings of the uncanny, while Janet Banfield examines the ontological uncertainty of puppets in relation to their human controllers. Despite a plethora of recent popular media focusing on these themes, much of the existing scholarship does not address contemporary puppet performances or the nuanced audience interpretations of performing puppets. This thesis will examine the uncanny horror created by media focused on haunted or embodied children's objects through a case study of the 2022 television show *Don't Hug Me I'm Scared* (*DHMIS*). *DHMIS* examines the ontological uncertainty of its characters and story, inciting in the viewer emotions related to horror and the uncanny. Show creator Joseph Pelling describes the series as "a kid's show for adults." Materially, the sets and puppets are constructed from felts and furs, with rounded corners and vibrant colors. The show's aesthetic and formal qualities are based on children's educational television, featuring didactic songs and editing techniques designed to retain attention. However, the content is adult in nature as puppet characters are shown repeatedly to feel physical and psychological pain - they bleed, die, and express fear. The lessons that they learn are oversimplified and misleading, and the environments and mentor figures that they encounter are hostile and dangerous. Through close examination of *DHMIS's* ambiguous materiality, its adoption of a children's format to narrate adult content, and its engagement with ontological uncertainty, this thesis presents an emerging contemporary horror genre, born of the digital age, defined by its engagement with childhood artifacts and locations that have been empowered with selfhood.
https://symposium.foragerone.com/2025-racas/presentations/73624

A Novel Combination of Discrete Computational Methods to Unlock the Structure-Function Relationship of the Insulin Secretory Protein Exophilin-2
Vikram Raju *Biomedical Sciences*
Mentor: Dr. Jefferson Knight

Abstract:
Computational modeling has become integral to the study of biomolecules. Combining discrete modeling approaches expands their utility greatly. Here, I demonstrate how three such approaches, namely evolutionary analysis, 3D-structure-prediction, and electrostatics can be combined to better understand a protein's structure/function in its biological niche. I studied exophilin-2, also called synaptotagmin-like-protein-4, which regulates dense-core-vesicle-exocytosis, especially insulin secretion. I hypothesized that the electropositive surface on exophilin-2's membrane-binding C2-domains (C2A/C2B) is conserved across vertebrates, implying it has evolved to function optimally and is important. Exophilin-2's electropositive face helps it dock dense-core vesicles to the negatively-charged outer cell membrane, also known as the plasma membrane, before calcium-stimulated insulin release. Studying it provides greater insight into exophilin-2's membrane-binding function. The human exophilin-2 C2A-C2B amino-acid sequence was aligned with 200 other vertebrate sequences, then split into 6 classes (Mammalia, Aves, Reptilia, Amphibia, Chondrichthyes, Osteichthyes). Overall representative consensus-sequences were calculated for each class, with 3D-structures and electrostatic surface maps created for each. The positively-charged membrane-binding surface is ~100% conserved for both C2-domains, supporting exophilin-2's crucial role in insulin secretion. Exophilin-2 can provide insights into the secretion of insulin and other important neurotransmitters/hormones. Along with exophilin-2, this novel computational approach demonstrated above can be applied to study any existing protein.
https://symposium.foragerone.com/2025-racas/presentations/73660

A novel combination of methods to interrogate superior colliculus activity during active vision
Joe Barreto *Biomedical Sciences*
Mentor: Benjamin Scholl

Abstract:
The insight provided by two-photon *in vivo* calcium recordings and CRISPR/Cas9 gene editing can allow us to more deeply probe the mechanisms behind sensory processing. These methods have been used together in various brain regions, but not yet in the superior colliculus (SC), a region of the brain that plays a key role in sensory processing and motor control. As a midbrain structure situated in close proximity with the transverse sinus, typical methods for performing a cranial implant for two-photon imaging result in excessive blood loss and neuroinflammation. To further investigate the role of the SC within the visual system, we have developed a novel cranial microsurgical protocol involving cranial microinjections and implantation of an optically clear window that enables us to image neurons within the SC as well as projections of the retina to the SC. Additionally, we have begun analyzing the effects of CRISPR/Cas9-mediate grin1 knockout (KO) in the SC of neonate mouse pups using neuropixel probes to record local field potentials and eye-movement recordings to captures saccades and optokinetic reflexes. This combination of methods to capture the effects of grin1 KO will allow us to assess the developmental effects of disrupted NMDA signaling on visual processing. In the future, our goal is to combine these methods to use two-photon microscopy to observe the activity of SC neurons following gene edits in awake mice.

https://symposium.foragerone.com/2025-racas/presentations/74017

A RAD Search: Identification of antiphage defense systems using a conserved serine recombinase
Navtej Singh *Natural & Physical Sciences*
Mentor: Shelby E. Andersen

Abstract:
The emergence of multidrug-resistant (MDR) infections has sparked interest in bacteriophage (phage) therapy. However, bacteria have also developed defense mechanisms against phages that allow them to evade infection, hence threatening the success of phage therapy. The research effort herein is intended to discover and describe new antiphage systems by means of a bioinformatics platform called Recombinase Associated Defense Search (RADS). RADS employs a conserved serine recombinase as a genetic "bait" that searches for bacterial antiphage defense systems linked with these recombinases. RADS was run on genomes from the Bacillota phylum. Using co-transcription prediction combined with statistical methods, genes that are likely co-transcribed with the serine recombinase and contain domains that are enriched in the RADS contigs were selected to test for antiphage activity. Using this method, we discovered a KAP P-loop NTPase domain-containing protein that is a potent antiphage defense system. This protein contains an N-terminal KAP P-loop NTPase, followed by a putative effector region with no known domains or characterized homologues. Using reverse genetic experiments including gene deletion, truncations, and phage infection assays, we aim to determine the mechanism by which this protein suppresses phage replication. In addition, we will investigate whether inactivation of this ORF its native context of the *Enterococcus faecalis* 661 plasmid p661b, restores phage sensitivity. This study will show phage defense strategies in bacteria. Using computational prediction followed by experimental validation, the project bridges microbiology with bioinformatics, providing insights that can be utilized to drive more effective development of phage therapies targeting multidrug-resistant infections.
https://symposium.foragerone.com/2025-racas/presentations/73671

A Strategy for Urban Heat Island Mitigation: Schlieren Visualization of Swirling Convection
Natan William Schultz Gomes *Natural & Physical Sciences*
Mentor: Dr. Randall Tagg

Abstract:
This thesis attempts to mitigate the Urban Heat Island problem in cities, exploring the relationship of fluid motion and temperature, in stagnant air pockets. This study tests the hypothesis that a swirl induced convection motion has more penetrating capacity into the upper layers of atmosphere, increasing air flow in the city. A 3D printed tube with internal vanes was used to induce swirl on top of a coffee warmer. A Schlieren imaging system, an optics technique that allows the visualization of temperature gradients, was used to analyze fluid motion. In natural convection, hot air plumes dissipate quickly. A laminar structured flow travels faster and penetrates further, as observed using the Schlieren system. These results highlight a different approach to the Urban Heat Island problem by using disturbed convection to enhance air flow in the city. It also expands on flow manipulation and imaging optical systems in fluid dynamics research.
https://symposium.foragerone.com/2025-racas/presentations/73717

A-SIMA/A-MAP: A Comprehensive Methodology for NMR-based Metabolomics
Abigail Chiu *Biomedical Sciences*
Mentor: Dr. Woonghee Lee

Abstract:
In any organism, a complex network of chemical compounds is necessary to maintain balance in its ecosystem and environment response. Signals such as changes in biochemical pathways can be produced to indicate underlying issues. These biochemical pathways are driven by metabolites, the small molecules that serve as intermediates and products of cellular process. Studying these metabolites can give insights into the relationship of an organism's genetics and its environment. This field, **metabolomics,** applies beyond **disease research**, such as **identifying drug targets, and advancing cancer research**. As metabolomics grows, advancing metabolomics research requires tools that not only enhance analytical capabilities, but also prioritize user-friendly features. Thus, we introduce two cutting-edge tools integrated in the POKY suite, **A-SIMA: Advanced-Software for Interactive Metabolite Analysis and A-MAP: A Multivariate Analysis Program.** A-SIMA features an intuitive graphical user interface that enables metabolite identification from 1D and 2D NMR. A-SIMA offers two identification modes: "Computer-Assisted" for software-assisted identification and "User-Based" for manual direct identification. A-MAP, the second program, supports multivariate and univariate analysis, including Principal Component Analysis (PCA) and Orthogonal Partial Least Squares-Discriminant

Analysis (OPLS-DA), on 1D or 2D metabolite data. Users can define regions of interest and apply preprocessing techniques. Together, A-SIMA and A-MAP provide powerful and user-friendly solutions for metabolomics research.
https://symposium.foragerone.com/2025-racas/presentations/73820

An Assessment of the Auraria Library as a Space for Learning
Aayjah Royston *Social Sciences & Humanities*
Mentor: Rachel Gross

Abstract:
There is a breadth of literature on campus planning, the architecture and function of academic libraries, and modern design. Specifically, scholarship discusses the changing definitions of libraries, away from houses for books and print information and towards facilitators of learning and knowledge access. The American Library Association's 2016 campaign, Libraries Transform, reflects a great deal of optimism about the ways libraries are navigating these changes. However, some scholars reflect anxiety about the losses incurred in these paradigm shifts, or raise criticisms about the changes libraries have made to their physical spaces. Comparatively little literature is dedicated to evaluative case studies of academic libraries. The Auraria Library, then named the Auraria Learning Resources Center, was constructed in 1976, designed to serve a student body of 15,000. Since then, Auraria's student population has grown to 38,000. Technological breakthroughs, such as the popularization of the personal computer or the copy machine, required the modification of the library space to accommodate new uses. As a result, the Auraria Library has been updated and renovated several times. This research will study motivations (regarding design, purpose and intended function) for the Auraria Library's construction in 1976, and evaluate and examine the shifts that the building has undergone since, both to update failing facilities and to serve a changing user population with changing needs. This research will provide the library's users with an opportunity to reflect on the building's service and the efficacy of recent renovation work, and provide a framework for broader evaluation of changes to academic library spaces in the future.
https://symposium.foragerone.com/2025-racas/presentations/73625

An exploration of the role of attention in Mindfulness and Mind Wandering
Melanie Edwards *Social Sciences & Humanities*
Mentor: Carly Leonard

Abstract:
Attention is a topic in cognitive research that provides connections to many aspects of human behavior, some of which can be seen when comparing time spent in mind wandering and time spent in mindful states. This presentation aims to explore some of the research being done using EEG readings to potentially elucidate the similarities and difference between attentional states in mind wandering and mindfulness. The concept that alpha wave activation seen in EEG readings relates to mind wandering has allowed for more research to be done between these topics (da Silva, et al., 2022). Mind wandering has indeed proven to be an interesting phenomenon to study, but difficult at times to categorize. By using EEG data, some studies suggest that alpha band power relates to these attentive states (Compton, et al., 2019). In addition, by using a combination of self-report measures taken from participants and EEG readings, researchers are able to observe differences between states of mindfulness and states of mind wandering (Dong et al., 2021). Research shows that mindfulness requires conscious attention, and training can be done that can impact our ability to tap in to these mindsets (Compton, et al., 2019). This type of mindfulness training and state activation can be seen correlating to lower alpha power, whereas higher alpha power can be seen in states of mind wandering (Conrad & Newman, 2021). With this research in mind, this presentation aims to connect some of the mindfulness research and neuronal readings like those from EEG data together to better predict human behavior, and potentially see how we can increase our ability to manipulate or control our attention using mindfulness.
https://symposium.foragerone.com/2025-racas/presentations/73858

An investigation of reading-while-listening on eye movement behaviors and comprehension
Mia Jannika Lim *Social Sciences & Humanities*
Mentor: Carly J. Leonard, Ph. D.

Abstract:
Audio-assisted reading, also known as reading-while-listening (RWL), is frequently used both in and out of the classroom. For example, the practice is often adopted in educational settings for young readers or for second-language English learners. While some previous research has shown that there may be benefits of RWL on comprehension, not all studies support this. To better understand how these reading modes may differ, my study employs eye tracking, which is often used to measure the ongoing cognitive mechanisms during reading. The most common eye movements that occur during

reading tasks are fixations (brief pauses or stops), saccades (ballistic movements to fixate new locations), and regressions (looking back at previous words within the text). My study examines the effect that audio speed during RWL has on these different types of eye movements, as well as comprehension of the passages being read. I hypothesize that participant comprehension may be better during RWL compared to reading-only, although increased audio speed may lead to decreases in performance. Additionally, I hypothesize that participants may try to align their eye movements to match the audio speed in RWL, leading to changes in measures such as fixation duration and number of regressions in comparison to reading-only. This experiment runs undergraduate psychology students through a within-subjects design, comparing RWL at three different audio speeds (135, 180, and 225 words per minute) and reading-only. Eye movement data will be collected while participants read passages, followed by a short, 4-question quiz to assess comprehension. I am currently in the process of collecting data and intend to have a near-complete dataset collected and analyzed by the conference. Ultimately, the results of my study can provide better insights into the importance of considering audio speed during RWL, which may help maximize potential benefits for young readers and second-language English learners.
https://symposium.foragerone.com/2025-racas/presentations/73789

Analyzing for correlation between air quality metrics and socioeconomic conditions in census block groups of West Denver Area
Patrick Kaltenbacher, Taylor DuPree, Sarah Blais, Bonnie Wolgamot, Melane Camarillo *Natural & Physical Sciences*
Mentor: Dr. Ben Crawford

Abstract:
Individuals and communities with lower socioeconomic status are more likely to be impacted by negative environmental factors, including poor air quality. However, relatively few studies have attempted to observe highly granular correlations between air pollution and socioeconomic conditions in Denver. The goal of this study is to understand the link, if any, between air quality metrics and socioeconomic status of census blocks near downtown Denver. To accomplish this, a mobile monitoring electric vehicle was used to measure air quality (PM2.5, CO2, CH4) along a pre-determined route through various census blocks in Denver, west of the Auraria campus, partially located along West 32nd Ave and Colfax Avenue. The route was selected to include a diversity of census block socioeconomic statuses and be completed in approximately 1 hour so that environmental conditions remained relatively constant during the drive. We expect our results to show correlations between socioeconomic status and air quality metrics. Findings from this research would allow policymakers to tailor air quality policies to their localized areas of influence, while also allowing citizens to make informed inferences about their living conditions when choosing a home in Denver. In addition, this research supports the need for further air pollution mitigation in areas experiencing higher health risks.
https://symposium.foragerone.com/2025-racas/presentations/73632

Angel of Envy
Savannah Brassell *Arts & Media*
Mentor: Eric Jewett

Abstract:
Angel of Envy is a short student film that follows an art project that turns bloody after the school diva steals her best friend's concept. The team researched storytelling techniques, women's portrayal in horror stories, and modern bullying to create a well-rounded, truthful, and captivating story. The project is a personal journey reflecting on being the victim and the bully in a unique and dramatized setting. The team worked tirelessly to create this film and cannot wait to share the full short in May 2025.
https://symposium.foragerone.com/2025-racas/presentations/73681

Another Sacrifice
Flint Holmes *Arts & Media*
Mentor: Rian Kerrane

Abstract:
Last year, as a part of my Three-Dimensional Design class taught by my mentor Professor Kerrane, I performed in Performance Art Week XII at the Emmanuel Gallery. For my performance, I slaughtered a 4ft tall origami effigy of a bull in front of an audience. I wanted to explore ideas of innocence, grief, and cruelty in a controlled environment. The experience made me want to perform again, and so for Performance Art Week XIII I (planned to) put together a second, further developed version of my performance from last year. I crafted a mixed media sculpture of a bull using cardboard, armature wire, and a lot of hot glue. I used a plastic bag to place fake blood inside the sculpture to be cut open later. I then sculpted the eyes, horns, and hooves from oven bake clay, and finally, covered the sculpture in white faux fur fabric. On the day of the performance I placed the sculpture in the center of the staging space at Emmanuel with a tarp beneath it. I

then let the audience interact with the piece for 10 minutes before asking them to step back. I brought out a carving knife and a bucket and placed the bucket under the neck of the sculpture before cutting into it and letting the fake blood flow out. I placed a handprint of fake blood on the neck of the sculpture and then briefly held it before encouraging the audience to paint cathartically on the sculpture using paint brushes or their hands and the bucket of fake blood. I find that this performance can be very special to the audience that experiences it. It gives them a controlled way to process sudden grief, it is invaluable to have a space to do that in the unpredictable world we live in.
https://symposium.foragerone.com/2025-racas/presentations/73739

Applications of Nanoparticles in Cancer Imaging
Ryan Ha, Anh Gia Le, Roberto Jacobo *Biomedical Sciences*
Mentor: Dr. Jung Jae Lee

Abstract:
This project explores a different approach to traditional cancer imaging techniques, because of the limitations in current cancer imaging techniques, specifically bioluminescent techniques. The current issues with bioluminescent techniques is the oxygen dependency of the illuminating compund, especially in an environment with little oxygen availiable such as deep tissue tumors. To address this, we have been assigned the responsibility to evaluate the efficacy of a compound and its ability to control the slow and gradual release of oxygen. The slow and gradual release of the oxygen is so that it is more readily available to the BLI over a longer period of time. This properly ensures accurate and prolonged imaging of various tumors. We are specifically investigating a compound called N-methyl-2-pyridone which is able to trap molecular oxygen within its bonds through a Diels Alder reaction. The reversal reaction releases the oxygen and occurs at the same temperature as the internals of the human body. We will be conducting the Diels Alder reaction, then measuring the rate at which the reverse reaction occurs through Nuclear Magnetic Resonance and the rate at which the oxygen is released. We will then compare the results of this compound to the other compounds that the lab has tested to evaluate its proficiency in the slow and gradual release of molecular oxygen.
https://symposium.foragerone.com/2025-racas/presentations/73733

Arduino-Based Control of a Three-Phase Brushless DC Motor
Richie Smith *Natural & Physical Sciences, Tech, Engineering, & Math*
Mentor: Dr. Randy Tagg

Abstract:
The original goal of this project was to build a DIY spin coater to support a carbon nanotube experiment led by Dr. Randy Tagg and collaborators. The device would apply thin layers of masking material as part of a microfabrication process for creating electrodes and fluid wells. These structures are used to manipulate nanoparticle suspensions with electric fields.
To keep costs low, I salvaged a high-quality spindle motor from a discarded hard disk drive. I paired it with a SparkFun TMC6300 three-phase BLDC motor driver and controlled it using PWM signals from an Arduino R3. The Arduino sent timed voltage pulses to the driver to control the polarity of the motor's stator coils.
As the semester progressed, my focus shifted: instead of a complete spin coater, I worked toward just getting stable motor control using open-loop techniques and serial monitor input through the Arduino IDE. Despite challenges, Dr. Randy Tagg and I were able to get a working prototype near the end of the semester.
https://symposium.foragerone.com/2025-racas/presentations/73738

Artificial Harmonies: The Ongoing Discussions and Ethics of AI and Music
Austin Zuber *Arts & Media*
Mentor: Dr. Greg Haris

Abstract:
As artificial intelligence advances, its role in music creation raises important ethical debates. AI-generated music challenges concepts of originality, authorship, and the evolving relationship between musicians and AI. This research conducts a comparative analysis of expert perspectives from AI researchers, musicians, and industry professionals, drawing from a variety of sources, including the 2025 Association for Advancement of Artificial Intelligence (AAAI) conference and affiliated workshop titled "Artificial Intelligence and Music," and the testing of new music AI tools. This project examines different perspectives on a variety of ethical concerns. Key questions explored in this research include:
Originality:

Do AI-composed works demonstrate true creativity, or do they lack the characteristics that make art dynamic like the difficulty of its creation and the artist that made it? How does this pairing with “intelligent” technology shift our approaches to creativity and creation?
Authorship:
Who should receive credit for AI-generated music—developers, artists, the AI itself, or something different? Does the concept of authorship fully capture AI-assisted music creation, or should new frameworks be considered?
Impact on Musicians:
Will AI replace artists, or create new opportunities for collaboration and innovation? What are some of the current approaches being utilized between artists and AI?
Using a comparative framework, key topic areas are highlighted to capture areas of agreement, conflict and emerging discussions. This research will contribute to the broader discussion of how AI can ethically enhance music while preserving human creativity.
https://symposium.foragerone.com/2025-racas/presentations/73825

Assessing Differences in Adverse Maternal Outcomes by Zip Code and Social Vulnerability in a Low-Risk Obstetric Cohort
Gabriella Mayne *Biomedical Sciences*
Mentor: Ivan Ramirez

Abstract:
Maternal health is characterized by substantial disparities observed across spatial boundaries. Anti-racist clinical initiatives seek to identify and ameliorate disparities through evidence-based quality care improvements. Assessing differences in patient outcomes by zip code may inform targeted initiatives in vulnerable populations. We examined associations between adverse maternal outcomes (AMO) and patient zip code in a low-risk obstetric cohort from a Denver-metro Colorado hospital (N=7,691). AMO is a composite variable including severe maternal morbidity and mortality, postpartum hemorrhage, intra-amniotic infection, obstetric anal sphincter injury, and unplanned cesarean section. We hypothesized zip codes with higher percentage AMO would associate with higher social vulnerability, comprised of indicators such as per-capita income, percent without health insurance, poverty, and unemployment. We included patients 18-50 years old with a live, singleton, full term fetus. We excluded patients with baseline risks that precluded low-risk management. We selected zip codes populated by thirty or more participants and compared the first and third tertiles for percentage AMO by zip code-level social vulnerability indicators. We used Mann-Whitney to compare tertiles and visualized spatial patterns of AMO and social vulnerability using Geographic Information Systems. I will present preliminary results.
https://symposium.foragerone.com/2025-racas/presentations/73862

Assessing novel PI3K inhibitors for efficacy in the dorsal and ventral hippocampus.
Thomas Asefa *Biomedical Sciences*
Mentor: DR. Britton Barbee

Abstract:
Phosphoinositide 3-kinase (PI3K) signaling is essential for neuronal development and synaptic plasticity, and disruptions in this pathway have been linked to neuropsychiatric disorders such as schizophrenia. Specifically, the p110δ isoform of PI3K has been found to be upregulated in individuals with schizophrenia, and its inhibition has been shown to reduce schizophrenia-associated behaviors in animal models. However, the efficacy of next-generation p110δ inhibitors—Zandelisib and Parsaclisib—within the brain, especially across different sexes and brain regions, remains largely unexplored.
This project investigated the effects of Zandelisib and Parsaclisib on downstream PI3K signaling by examining the phosphorylation of Akt and mTOR in the dorsal and ventral hippocampus of male and female mice. Using Western blotting, we assessed protein expression changes in response to drug treatment in order to determine the compounds’ activity and potential for crossing the blood-brain barrier.
We found that PI3K/Akt/mTOR signaling was unchanged in the ventral hippocampus of both sexes. Interestingly, Zandelisib treatment led to elevated mTOR expression in the dorsal hippocampus of female mice, suggesting a region- and sex-specific effect. These findings indicate that female brain tissue may respond differently to targeted PI3K inhibition, and they underscore the importance of including sex as a biological variable in neuropsychiatric drug research. This work contributes to a growing body of literature exploring molecular pathways in schizophrenia and could guide the future development of more precise, sex-specific therapeutic strategies.
https://symposium.foragerone.com/2025-racas/presentations/73631

Assessing Quality of Life Disparities in Rheumatoid Arthritis: The Impact of SexDifferences & Reproductive Factors
Tsenaat Hadgu *Biomedical Sciences*
Mentor: Kristin Strum

Abstract:
Rheumatoid arthritis (RA) is a chronic autoimmune disease that is characterized by joint inflammation causing painful swelling that interferes with daily activities. The chronic nature of RA induces a psychological burden that consequently impacts quality of life (QoL), making it an important factor in RA management. RA disproportionately affects women, with a female-to-male ratio of approximately 3:1, a disparity attributed to hormonal, psychosocial, and genetic factors. Previous research has identified sex differences in the presentation, progression, and management of RA, further contributing to disparities in QoL. Women experience a greater disease burden, including increased fatigue, higher pain perception, and reduced psychological well-being. These findings highlight the need for sex-specific treatment strategies to enhance QoL and optimize RA management. Our study aims to further examine these disparities by analyzing patient-reported outcomes from the Multidimensional Health Assessment Questionnaire (MDHAQ), a self-report tool used to assess pain, psychological distress, and physical functioning. We will use data from the Studies of Etiology of Rheumatoid Arthritis (SERA) project, which has been ongoing since 2004, allowing us access to a robust dataset for exploring sex differences in RA-related QoL.
https://symposium.foragerone.com/2025-racas/presentations/73808

Assessing the Impact of Urban Heat Islands on Bumble Bee Populations in the Greater Denver Metro Area
Casey Jenson, Michaela Blaché, Lennon Jobin *Natural & Physical Sciences*
Mentor: Dr. Christy Briles

Abstract:
Urban Heat Islands (UHIs) pose a significant threat to pollinators, particularly bumblebees, whose populations are already in decline due to habitat loss and climate change. This study explores the impact of urban heat on bumblebee abundance, diversity, and resilience in the Denver Metro Area, spanning from Littleton to Boulder. Despite the availability of valuable data sets - iNaturalist- these resources remain largely disconnected from urban heat mapping efforts. This project aims to integrate geospatial data on urban heat with bumblebee occurrence records to identify spatial correlations and inform conservation strategies.
The research framework involves three key tasks: First, reviewing existing literature on the relationship between UHIs and pollinator ecology with a focus on bumblebees; Second, compiling and analyzing urban heat maps alongside pollinator datasets using GIS tools to assess trends, spatial overlap, and data gaps; and Third, to develop a conservation framework to evaluate bumblebee vulnerability to urban heat and propose targeted interventions, such as habitat connectivity and pollinator-friendly urban planning.
This project's findings hopes to provide urban planners, ecologists, and policy makers with actionable insights into mitigating urban heat stress on this keystone species. Additionally, by identifying high-risk areas and potential refuge, this work hopes to guide conservation priorities and adaptive management strategies. Ultimately, this framework will serve as a foundation for evidence-based conservation planning, supporting pollinator biodiversity and ecological sustainability within urban landscapes.
https://symposium.foragerone.com/2025-racas/presentations/73683

Assessing the Priming Effect of Environmental Safety on Criminality Judgments
Christiana Smith *Social Sciences & Humanities*
Mentor: Dr. Carly Leonard

Abstract:
From a young age, we are instilled with a fundamental understanding of what constitutes safety versus danger, whether avoiding entering a stranger's car or refraining from walking alone at night. Consistent with this lifetime of conditioning, research has shown that certain qualities within an environment can increase or decrease people's likelihood of determining it as safe. In the perception literature, it is well known that many aspects of an environment can be processed with only a brief exposure. Studies have shown that these brief exposures can influence subsequent judgments and perceptions. This is a phenomenon known as priming. The profound influence of priming on subsequent judgments is extensively documented, with one notable facet being its effect on face judgments. Additionally, research has shown that priming can influence anti-minority sentiments. Despite this, the effect of priming on evaluations of criminality and recidivism judgments and its interaction with race remains largely unexplored. To address this gap, we conducted an experiment to investigate whether using safe and unsafe environmental scenes as a prime can impact how participants rate subsequently presented faces in terms of their likelihood of committing a crime. As predicted, unsafe primes led to higher criminality and recidivism ratings. Counter to the literature, we found the opposite race effect, with minority faces

being rated lower in criminality than white faces. Further research is needed to investigate the unique race effects found in our study.
https://symposium.foragerone.com/2025-racas/presentations/73745

Assessment of an Injectable Carbon Nanotube-Functionalized Reverse Thermal Gel as a Tool for Sex-Specific Cardiac Tissue Engineering
Sara Musani *Biomedical Sciences*
Mentor: Dr.Brisa Peña

Abstract:
Although human microRNAs (miRNAs) have shown promise in promoting regeneration after myocardial damage, current methods of miRNA delivery, such as lipid formulations, have toxicity limitations. Thus, a miRNA delivery system that offers a non-toxic delivery approach is still needed. Over the last 8 years, we have engineered a reverse thermal gel functionalized with carbon nanotubes (RTG-CNT hydrogel) that permits small-gauge needle delivery of miRNAs directly into the heart wall. The liquid-to-gel transition of the RTG-CNT upon exposure to body temperature allows for liquid-based injection-delivery followed rapidly by a gel-based localization at the tissue target, which localizes miRNAs to a confined area. Our first studies demonstrated that the RTG-CNT hydrogel was able to successfully downregulate miRNA-199a target genes (HOMER1 and Click5) and improve myocardial structure and rescue function in a myocardial infarction mouse model (adult c57BL6 male). Here we expand our studies to investigate the effect of the RTG-CNT-miRNA 199 in female mice. Injection of miRNA-199 was achieved by performing a left Thoracotomy followed by immediate injection of 3, 10ul doses using the RTG-CNT hydrogel. Lipofectamine RNAiMAx and saline were used as controls. Surviving Males and females both showed improved tissue regeneration and improved muscle stiffness with the delivery of miRNA, but males had lower mortality in all the treatments (lipofectamine, saline and RTG-CNT hydrogel), whereas females showed higher mortality to the treatments and better tissue regeneration results in RTG-CNT-miRNA-199a injections. Our results demonstrate the importance of doing sex-specific studies when engineering therapeutic approaches.
https://symposium.foragerone.com/2025-racas/presentations/73925

"At Fifty, It Stops": Gendered Beauty Standards and Aging in *The Substance*
Lillian Fuglei *Social Sciences & Humanities*
Mentor: Katy Mohrman

Abstract:
This poster presentation examines the impact of sexist gendered beauty standards in Coralie Fargeat's *The Substance* (2024). *The Substance* is a body horror film focused on the experience of an aging celebrity as she is pushed out of Hollywood and towards cosmetic surgery. Body horror is a genre of horror that utilizes the graphic destruction of the physical body to create terror in viewers, thus offering a site of analysis to understand the emotional realities of cosmetic surgery. By examining Fargeat's use of body horror to portray cosmetic surgery, I seek to develop a greater understanding of media's representation of the physical and emotional impact of cosmetic surgeries on women. Drawing on feminist film studies and sociology to analyze the film's narrative within real-world context, I read *The Substance* through Melanie Rapoport's lens of elevation—arguing that Fargeat's film elevates women's experiences of sexism through body horror. My analysis finds Fargeat's film to be a compelling reflection of the lengths that women are willing to go to pursue beauty, if they are taught that beauty is all they will be valued for. By elevating emotional experiences into bloody terrors, body horror films such as *The Substance* bring sexism to the spotlight—and tear it to shreds.
https://symposium.foragerone.com/2025-racas/presentations/73670

Attention Re-Engagement and Oculomotor Dynamics Exhibit Temporal Coupling
Simon Ruland *Social Sciences & Humanities*
Mentor: Dr. Carly Leonard

Abstract:
In this pilot study, four participants completed a thirty-minute free-viewing meditation task while oculomotor dynamics were recorded. Eye movement, pupil dilation, and blink rate exhibited conditional temporal coupling with attention re-engagement in the meditation task. A long short-term memory (LSTM) neural network successfully predicted engagement from these oculomotor dynamics. The success of the model despite variance in temporal coupling across participants hints at an obscured generative mechanism underlying attention during mind-wandering and oculomotor dynamics during free-viewing.
https://symposium.foragerone.com/2025-racas/presentations/73675

Bacteria Species Viability and Biofilm Growth Patterns Based on Microscopy Methods Aid in Bioremediation of Contaminated Groundwater.
Wilshekiah Evans *Natural & Physical Sciences*
Mentor: Dr.Timberley Roane

Abstract:
Microbial biofilms are an important part of the bacterially facilitated 1,4-dioxane degradation that occurs at the Lowry Superfund Site bioreactors. Methods designed to examine the biofilm structure and cell viability on support media, such as that used in the bioreactors, are currently unavailable. The purpose of this study was to review the literature for an appropriate method for biofilm examination. Microscopy-based approaches will be presented: Approach 1 uses stains to determine cell viability and Approach 2 uses a tape method for biofilm collection while maintaining structure. Approach 1 uses phosphotungstic acid (PTA) to stain viable bacteria due to its ability to interact with electron density and polysaccharides within bacteria cell membranes. Next, with the use of a scanning electron microscope viable cells stain with a dark center and bright edge, while dead cells stain with a bright center (Zmerli O. et al., 2023). For collection and elucidation of biofilm structure, the support media samples taken from the site are rolled onto tape to take off layers of the biofilm one by one, then when coupled with DNA sequencing methods can determine which bacteria is present at each layer. Understanding the structure of these biofilms helps us determine if a certain pattern exists among them. If so, we can use this information to discover the bacteria that use 1,4-dioxane, by knowing which layer they prefer to grow on, how fast they can reproduce onto the following layer, and their overall community role. Overall, these approaches allow us to provide the bacteria with growth conditions necessary to expedite their reproduction, improve viability, and therefore increase 1,4-dioxane degradation.
https://symposium.foragerone.com/2025-racas/presentations/73634

Before We Were Auraria: Reclaiming Histories of Displacement on Denver's Old Westside
Sophia Imperioli, Justin Porcelo, Krista Marks, Bri Matson *Social Sciences & Humanities*
Mentor: Dr. Rachel Gross, Assistant Professor, Department of History

Abstract:
In this poster, five new public history professionals will discuss the complex history of displacement that shapes Downtown Denver's Auraria Campus and students' contributions to efforts to rewrite campus history narratives. Student projects include working on the construction of a peace garden to honor those who were displaced, delivering a walking tour, and refining both a digital walking tour and a guided tour for students and faculty to gain a better understanding of the campus' origins. Additionally, students will produce a short documentary about life in the Auraria neighborhood before its demolition and the community's reactions to the displacement in the following decades. We aim to demonstrate how students and faculty have shared authority with community members to help reclaim their rightful place on the Auraria Campus.
Public history students have collaborated with faculty and the Auraria Historical Advocacy Council, a community of Displaced Aurarians, to expand awareness of the campus's complex history. The university sits on the former site of Denver's Old Westside, a mixed-use neighborhood that housed more than three hundred Mexican-American families. The City of Denver demolished most of the neighborhood to build the Auraria Campus, though preservation efforts saved 14 houses on Historic 9th Street Park and the community's churches. Residents negotiated compensation, including the establishment of a scholarship fund that covers the full tuition for Displaced Aurarians and their descendants. Recently, the passage of a resolution has also allowed former residents direct oversight over Historic 9th Street Park and Saint Cajetan's Church. The campus stands out in Critical University Study discourse because it is one of the few campuses built as part of an urban renewal project that still preserves historic structures from the original community it displaced.
https://symposium.foragerone.com/2025-racas/presentations/73583

Benchmarking of data analysis tools in metatranscriptomics
Analuisa Larson *Natural & Physical Sciences*
Mentor: Chris Miller

Abstract:
Metatranscriptomics (MTX) is a powerful approach that uses RNA-seq data to measure gene expression in microbial communities. In contrast to metagenomics, which reveal genomic metabolic potential, MTX enables direct observation of the genes microbes are actively transcribing. Differential expression (DE) methods can then measure how transcription levels adjust to changes in the environment. Despite the growing popularity of this approach, however, there is still no "gold standard" of computational tools for biologists to use in MTX experiments. In addition, many tools are not built for

complex communities, where measured changes in gene expression can be confounded by changes in relative abundance of individual community members. As a result, the barrier of entry for new MTX research is high, and existing studies may report misleading results.
This study aims to provide an unbiased review of the state of MTX and DE methodology based on current literature. The MetaPro pipeline (Taj et al., 2023 Microbiome), one of the few specifically designed for MTX data, as well as select DE models (Zhang et al., 2021 Bioinformatics) will be benchmarked using a standardized dataset.
We modified a published MTX dataset from a microbial community sampled from a mouse gut. We are processing this MTX data 1) without modification, 2) as subsets of the data for sensitivity analysis, and 3) with artificially spiked-in reads from a different microbial community with low anticipated community membership overlap. If the MTX tools work as intended, the expression levels from individual microbes in the mouse gut transcripts should remain the same in all three experiments, despite different sequencing effort and the artificial changes in relative abundance introduced by the spike-in experiment.
Together, our literature review and benchmarking experiments will provide objective data for researchers to make informed decisions about how best to design MTX experiments and analysis.
https://symposium.foragerone.com/2025-racas/presentations/73768

Beyond the Canvas: Xu Beihong's Legacy in Art, Education, and Cultural Diplomacy
JoAnna Cordell *Arts & Media*
Mentor: Dr. Yang Wang

Abstract:
Xu Beihong (1895-1953) was a critical individual in the timeline of China's artistic evolution and is commonly regarded by scholars as one of the most accomplished painters of the twentieth century. His knowledge and interpretation of western academic techniques combined with traditional Chinese aesthetics created an oeuvre that is celebrated globally. Most research on Xu Beihong has focused on his artistic output, while his broader influence as an educator and intercultural advocate remains underexplored.
This paper explores a gap in scholarship by first detailing Xu Beihong's own non-traditional art education under his father, Xu Dazhang, and his tenacity in developing his artistic career. Coming from humble beginnings in China, Xu had the profound and formative opportunity to study at the École Nationale Supérieure des Beaux-Arts in Paris, which exposed him to western academic realism and classical techniques. The paper then shifts to his return to a war-laden China, where he sought to reform art education on the basis of realism. Additionally, his diplomatic efforts, particularly his engagements with foreign artists and institutions, helped position Chinese art within a global discourse, reinforcing China's cultural autonomy amid political upheavals.
Through an analysis of Xu Beihong's creative work, philanthropic efforts, institutional reforms, and commitment to cultural modernization, this research will explore his role "beyond the canvas." As a result, this analysis sheds new light on Xu Beihong's role in shaping Chinese twentieth-century culture, thus contributing to a more comprehensive understanding of his historical significance.
https://symposium.foragerone.com/2025-racas/presentations/73720

Beyond the Fear: Reclaiming the Narrative of Muslim Americans
Lauren O'Brien *Arts & Media*
Mentor: Hans Rosenwinkel

Abstract:
Nearly 40% of Americans are scared of Muslims. After decades of Hollywood films and media narratives painting Islam and Muslims as objects of fear, there remains a serious lack of authentic stories about Muslim American life. This absence fuels misunderstanding and prejudice and makes it clear that a film to shatter these damaging stereotypes is needed. Our project is about sharing genuine stories that show Muslim Americans, when they come here, are truly one of us.
To tackle the stigma directly, we conducted in-depth interviews with community leaders, examined media history, and employed digital ethnography along with sentiment analysis to gauge public perception. We also spoke with policymakers in Washington, D.C. to better understand the political context influencing these views. In our film, we will interview a Muslim American journalist originally from Kenya, an American who converted to Islam, and representatives from the Muslim Public Affairs Council. This hands-on approach exposes the misrepresentations in mainstream media and paves the way for raising awareness, building empathy, and ultimately changing minds.
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Biomimicry in Urban Design and Planning: Harnessing Nature's Design for Resilient and Regenerative Cities.

Bahar Nabiyar *Natural & Physical Sciences*
Mentor: Kirsten Christensen

Abstract:
Biomimicry in urban planning and design is the art of utilizing nature's semiotics as inspiration for regenerative and resilient infrastructure. Derived From the Greek root words Bio, meaning life, and mimesis, meaning imitation; Biomimicry takes many forms as the inspiration translates across disciplines differently but ultimately embodies the emulation of nature. In the textile industry, designs for sleeker wet suits were inspired by, and designed after the skin of a shark, decreasing drag and improving performance (Das 2015). Modern approaches of Biomimicry have been achieved by the quantification of inputs and outputs within an ecosystem- which is then utilized as a metric that then sets the standard and expectations of the project's design. The process demands interdisciplinary collaboration, and transdisciplinary traditional knowledge from the area of interest. It is important for biologists, researchers, planners, engineers, and designers to understand that these metrics cannot always be accomplished to the same extent to which they exist in nature. This paper intends to highlight external factors that influence biomimicry parameters, such as market challenges. Biomimicry differentiates from other bio-related topics such as biophilia, bioclimatic engineering, and bioinspiration because it catalogs nature, not just as a supply, but as an engine for innovative ideas. As the global population increases, 70% will reside in cities by 2050 (UN, 2018). Environmental illiteracy continues to increase as cities grow, and the disconnect between nature and people has already impacted on at least one generation and threatens the loss of critical traditional knowledge for future generations. Biomimicry in urban planning highlights dynamic traits of a system, in which relationships and interactions between various components simultaneously affect and are shaped by the system; urban design implements system components on a human scale. This paper intends to investigate various frameworks and guidelines of biomimicry urban planning by analyzing real-life cases.
https://symposium.foragerone.com/2025-racas/presentations/73763

BIPOC Perspectives on Legal Psychedelics in Colorado
Keira Zito *Social Sciences & Humanities*
Mentor: Dr. Marty Otañez

Abstract:
A presenter in the Perspectives on Psychedelics: BIPOC Speaker Series in Denver in 2024 suggested that individuals who sit with psilocybin mushrooms need to trust the medicine and the path that appears when taking them. These insights are reflective of some of the issues BIPOC raise when discussing the decriminalization and legalization of psychedelics in Colorado. Some BIPOC are dissatisfied with movements to regulate natural substances such as fungal medicine, because their voices and knowledge have been virtually ignored by policymakers and members of the dominant culture who use sacred substances for individual wellness or leisure-time activities. As Indigenous people and other social groups seek to protect natural substances and sacred practices, industry representatives seek to medicalize and corporatize them for profit-making purposes. Applying videography and critical medical anthropology, we highlight interview excerpts from five individuals who shared their knowledge and experiences as part of a series of public presentations to raise public awareness of BIPOC-related concerns about psychedelics in the state. Ten different presentations were organized by my faculty mentor Dr. Otañez (Anthropology), and video recorded. Transcriptions were created as part of a broader goal to produce a co-authored book involving the presenters and their concerns about legalized psychedelics. We selected interview excerpts based on their consistency with project themes and community priorities, producing a video montage on Indigenous practices related to sacred substances, and BIPOC perspectives on the use of natural plant medicines. Our project decenters dominant (white) cultural members in discussions and policymaking processes to forefront the voices of Indigenous and other people of color in environments where psychedelics are regulated.
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Blockchain-Based Performance Art
Asher Hoffman *Arts & Media, Tech, Engineering, & Math*
Mentor: Dr. Yang Wang

Abstract:
In 2024, major museums such as MoMA and Tate Modern held dedicated digital art exhibitions. Although these exhibitions brought new attention to digital art history, there is still a lack of research on the intersection of blockchain-based digital art and performance art. Skirting the traditional pathways of selling and exhibiting art, the blockchain allows for decentralized and open access to artists, artworks, and the collector network for anyone with internet access. Scholars like Christiane Paul, Amy Whitaker, and Tina Rivers Ryan have led the recent scholarly research into blockchain-based digital art. Still, the intersection of blockchain-based digital art and performance art remains understudied, leaving a

critical gap in understanding their implications for performance art and the digital art landscape. This thesis addresses that gap by analyzing how blockchain's decentralized nature reinvigorates old modes and facilitates new modes of performative expression and participation.
This thesis examines works by performance artists such as Alpha Centauri Kid, who created a blockchain-enabled mimetic experience and distribution system, and Operator, who uses blockchain technologies to distribute and house the digital art. Leveraging the decentralized nature of blockchain, these artists push back against the normative expectations of digital and performance art. By exploring the historical context of performance art alongside twenty-first-century digital art and tokenization, this thesis demonstrates how these technologies expand the boundaries of accessibility, ownership, viewership, and interaction in the art world.
I argue that tokenized performance art not only challenges traditional institutional frameworks but also creates a new art economy centered on decentralization and digital interaction. This paper situates blockchain-based performance art within the broader history of performance art and digital art, showing how it represents a distinct subcategory that redefines digital performance art. In conclusion, by shedding light on this emerging ecosystem, this thesis contributes to the recognition of blockchain-based performance art as a development in contemporary art.
https://symposium.foragerone.com/2025-racas/presentations/73617

Blood and Phantoms on my Typewriter.
Gale Khayut *Arts & Media, Social Sciences & Humanities*
Mentor: Eliot Wilson.

Abstract:
"He's not over it," they whisper when they think he's out of earshot. "She's not over it," they say to explain her behavior. America (American culture, American peoples) has a problem: To be labeled as not "over," something—someone—carries connotations of childishness; it implies an immaturity that would otherwise be absent if one hopped the fence, improved, got "over it."
I refuse.
People can experience an event, a person, obtain all the knowledge that can be obtained from it and still choose—for whatever reason—to hold on. A progressive culture should allow people to deal with their past in the various ways they choose, as long as they're not hurting themselves or others. Yet, choosing not to move on comes at a cost in our cultural lens. This project will provide space—build words into pillars, stretch them over like arches, cultivate havens—for everyone who still isn't over it. This is an anthology of fictional short stories exploring how people's past has a way of manifesting into their present if repressed. In exploring this theme, this project portrays the utter normalcy of holding on to one's past even in a culture that disapproves of it so strongly, there's a slang term to prove it.
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Bloody Intercession: The Abject as a Bridge between Mortal, Infernal, and Divine
Zachary Lacy *Arts & Media*
Mentor: Professor Yang Wang

Abstract:
Christian devotional practices in the late medieval period of Europe are as diverse as they are nuanced, yet they often share a notable common goal of materializing the presence of the divine within a terrestrial framework, enabling practitioners to better interact and "touch" what is innately incorporeal. Scholars have frequently emphasized the physical senses, principal among them touch, facilitated by tactility and haptics, as an oft-used way for medieval Christian worshipers to manifest the intangible other-worldly, at the expense of accounting for an almost extra-sensory interaction with the spiritual that is fundamentally experiential in nature. This thesis will analyze how encounters with the divine and infernal for mortal, medieval Christian devotees were made possible not only through the employment of the senses, but also through confrontation with the abject, particularly the fluid of blood. Julia Kristeva's theory of abjection, as outlined in *Powers of Horror: An Essay on Abjection* (1980), will serve as the primary foundation for this examination of a proposed "abject" devotional worship as exemplified in the later Middle Ages. Kristeva's contemporary philosophy will be supplemented by contemporaneous Christian mystical teachings and literary sources to elucidate how contact with the "other," be it part of the celestial or infernal spheres, was manifested in the lives of Christian followers. This thesis argues that sensory contact with blood, one of the quintessential mediums of the abject and prevalent within Christian literary, doctrinal, and visual culture, was a powerful force in confronting the medieval Christian worshiper with their own mortality, and thus their prospective salvation. This thesis will reevaluate medieval devotional practices, proffering a more holistic sensory approach rooted in confrontation with the abject as a primary method of connecting with the afterlife.
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Bound States of Krypton between 22-32 eV determined by the Dirac B-Spline Atomic R-Matrix suite of codes
Jessica Paredes Saltijeral *Natural & Physical Sciences*
Mentor: Dr. Kathryn R. Hamilton

Abstract:
Krypton is a noble gas that has shown to be an energy efficient material. It is used in long-lasting, low-wattage LED bulbs and in between window panes to provide insulation. Both of these applications reduce the amount of energy used in a home or a building. Krypton could potentially have other energy-efficient applications, but identifying these depends on its chemical and physical properties. These properties are determined by the internal structure of the Krypton atom. However, the electron energy states of Krypton between energies of 22-32 eV, and especially at 26.85 eV, are unknown at the moment. These high energy states have been observed experimentally and are known to typically take the form of $4s4p^6np$ or $4s^24p^4nln'l'$, which correspond to a single electron transition from the 4s subshell or a two electron transition from the 4p subshell, respectively. Bound state calculations are performed to identify both types of energy states in the 22-32 eV range using the Dirac B-Spline Atomic R-Matrix (DBSR) suite of codes. A description of Kr+ is made with electron states $4s^24p^5$, $4s4p^6$, $4s^24p^45s$, and $4s^24p^45p$. DBSR then models the capture of a free electron by Kr+ and solves the Time Independent Schrödinger Equation to determine Krypton's bound electron states and their associated energy value. DBSR bound state calculations determined 207 energy states of Krypton in the 22-32 eV range, with 8 of these being possible candidates for the state at 26.85 eV. The 207 energy states form a clearer image of the internal structure of Krypton leading to a better understanding of its chemical and physical properties. This will ultimately guide future energy-efficient applications of Krypton.
https://symposium.foragerone.com/2025-racas/presentations/73770

Bridging The Gap: Addressing Racial Disparities In Advanced High School Programs
Adriana Fierro Mena *Social Sciences & Humanities*
Mentor: Christina Maxine Sigala

Abstract:
Despite efforts to promote educational equity, racial disparities in advanced high school coursework remain pervasive. Honors, Advanced Placement (AP) and International Baccalaureate (IB) programs offer significant academic and long-term career benefits, yet students from underrepresented racial backgrounds continue to be disproportionately excluded from these opportunities. Studies on school segregation and systemic barriers have demonstrated that schools with predominantly marginalized student populations face lower achievement rates, fewer resources, and higher disciplinary actions are factors that contribute to racial gaps in academic success. Research on Denver Public Schools highlights severe racial and socioeconomic segregation, leading to some of the widest achievement gaps in the state. (Campbell, 2018) However, while existing literature has identified disparities, it has not sufficiently examined the root causes of exclusion from AP/IB programs and advanced courses or the specific interventions that can bridge these gaps.
This study aims to address these gaps by investigating the structural and cultural barriers that prevent racially marginalized students from enrolling and succeeding in advanced coursework. Through qualitative and quantitative analysis, this research will examine the institutional biases on student participation and success. It will also explore the role of society and segregated school environments in shaping student access to advanced learning opportunities.
The research is guided by the following questions: (1) What are the primary barriers preventing students of color from accessing and excelling in AP and IB programs? (2) What strategies can be implemented to create a more equitable and inclusive advanced education system? By addressing these questions, this study aims to provide actionable insights for educators, policymakers, and community leaders seeking to dismantle systemic inequities in high school education.
https://symposium.foragerone.com/2025-racas/presentations/73584

Cañon City Convict Cemetery
Sean Dean, Madison Revier, Trinity Sison *Social Sciences & Humanities*
Mentor: Dr. James Walsh

Abstract:
We conducted extensive research using a wide-range of primary historical sources including cemetery records, census data, and newspaper archives. Over the past year we have meticulously compiled biographical information into structured data sets that offer insight into the lives of socio economically marginalized communities. These data sets not only serve as a blueprint for future articles but also help to shape a more comprehensive historical narrative. Beyond quantitative data we have also gathered personal narratives uncovering the human experiences behind the records. By connecting these stories to the individuals buried at Woodpecker Hill we aim to go beyond their status as inmates shedding light on their struggles, circumstances, and the factors that shift their lives and eventual incarceration. This work seeks to restore a sense of dignity to those who were buried with nothing more than a prisoner number to mark their

resting place ensuring that their lives are remembered with nuance and humanity rather than being reduced to mere statistics.
https://symposium.foragerone.com/2025-racas/presentations/73647

Characterization of a Cryogenic Preamplifier System for Nanosquid Fabrication and Development
Sarah Anderson *Natural & Physical Sciences*
Mentor: Martin E. Huber

Abstract:
We are characterizing a cryostat that contains a superconducting quantum interference device (SQUID) series array amplifier (SSAA). SQUIDs are quantum sensors that can measure magnetic fields with quantum-limited sensitivity. In our current research, we are engaged in a project to develop nanoscale SQUIDS, also called SQUIDs on tip (SOTs), each of which are unique and require individual characterizations. These nanoSQUIDs are fabricated by depositing lead on the sides and tip of a quartz pipette. They have sufficient sensitivity to measure magnetic fields from individual electron spins. These SOTs will be utilized in a scanning system to study magnetic topology for materials science.
Our cryostat comprises a cryogenic instrumentation package, a room temperature electronic manifold, and a long metal tube that connects the two. The room temperature portion of the cryostat houses valves and connectors that allow us to send and receive signals from the SOT and SSAA.
The cryogenic end of the tube, with the SQUID array and SOT will be placed in liquid helium to enable superconductivity in the devices. The SOT will be mounted on the end of the cryostat. Just above that, we have placed an SSAA, which will serve to amplify the output of the SOT. The outer shell of the instrumentation package is brass vacuum can around which we have wound a superconducting magnet.
We will measure the electrical noise performance of a SQUID array in a vacuum environment.
Successful design and characterization of our cryostat and performance of our SSAA will enable us to test SQUIDs in other environments, such as dry cryocoolers.
https://symposium.foragerone.com/2025-racas/presentations/73948

Civic Engagement in the CU System from the years 1960-Present
cesar rodriguez *Arts & Media*
Mentor: Kelsi Dew

Abstract:
Civic engagement has played a pivotal role in shaping the University of Colorado (CU) system, with students historically advocating for social change, institutional accountability, and community involvement. This project explores the history of civic engagement across CU campuses while juxtaposing it with contemporary student experiences, particularly my own as an active participant in student government and advocacy. Using a multimedia approach, this research will compile archival images and modern-day photos edited to reflect a retro aesthetic, visually connecting past and present activism. Additionally, I will document my experiences through short camcorder clips, offering a personal perspective on student engagement today. By merging historical research with creative visual storytelling, this project aims to highlight the evolution of student activism and its ongoing significance within the CU system.
https://symposium.foragerone.com/2025-racas/presentations/73855

Community & Career Readiness: What a Needs Analysis Revealed about the Silent Tenets of Successful Postsecondary Language Programs
Larry Blackshear *Social Sciences & Humanities*
Mentor: Alyssa Martoccio

Abstract:
Enrollment in postsecondary language programs, particularly in the Spanish section of CU Denver's Department of Modern Languages (DOML), is on the decline, especially in the aftermath of the COVID-19 pandemic. An issue sparking concerns on the longevity of postsecondary linguistic education, the present study explores these concerns by reporting on phase 1 of a larger Program Evaluation and Needs Analysis, which has been an established research area in applied linguistics for decades **(Long, 2005)**. The main research questions were: 1) What are student needs and desires for the program; 2) What are the primary barriers to their Spanish education; 3) What are students' general attitudes toward the Spanish program?
The study employed a mixed-methods approach, grounded in investigating both qualitative and quantitative student data via the dissemination of an online questionnaire that included both an open-study and 5-point Likert-scale, followed by focus group interviews with participants. Numbering 117 in total, participant population demographics comprised of

current Spanish majors, minors, graduate students, and alumni who completed the questionnaire. Focus groups were comprised of groups of 3-4 and were analyzed for themes based in Grounded Theory.
Results of the qualitative and quantitative data together revealed significant praise of the program with key areas for growth: community-building and career readiness. Moreover, within those areas of growth, the present study determined that issues related to language anxiety, disconnection with peers, and financial hardship are all pervasive contributors. These findings fundamentally highlight the need for a holistic approach to community and career readiness in postsecondary language programs, and explores how these are the "silent pillars" necessary for long-term success in student academic outcomes and workforce readiness.
https://symposium.foragerone.com/2025-racas/presentations/74022

Computational Investigation of Halogen Bonding in X-Br···Nucleophile(X=F,Cl,Br) Complexes
Zane Youssef, Blake Bui, Richard Nguyen *Natural & Physical Sciences*
Mentor: Dr. Emilie Guidez

Abstract:
Noncovalent interactions govern molecular assembly, recognition, and reactivity in chemical and biological systems. While hydrogen bonds have long been the main driver for molecular assembly, σ-hole interactions have opened new routes for the synthesis of versatile materials with desired physical and chemical properties. In particular, halogen bonding has gained attention for its applications in materials science, catalysis, and drug design. Halogen bonds arise from a donor-acceptor interaction between a nucleophile N, and the σ-hole (surface of positive charge) of a covalently bonded halogen atom X to a substituent R, resulting in the N--X-R bonding pattern. Halogen bonds are highly directional and can be tuned by modifying the nucleophile N, the halogen atom X and/or the covalently bonded substituent R. However, the electronic interactions driving the formation of halogen bonds remain elusive. In particular, the covalent character of the N--X interaction and how it is affected by the different components N, X and R, are still subject to debate. This study investigates halogen bonding interactions between the dimers Br-X (X=F, Cl and Br) and the nucleophiles (NCH, PCH, NH_3, OCH_2) through computational quantum chemistry methods. Geometries, interaction energies, electrostatic potential maps, and dipole moment are analyzed. A quasi-atomic orbital (QUAO) analysis provides a quantitative measure of the covalent character of the N--X bond. This analysis provides valuable insight into the electronic interactions driving the formation of the halogen bonds, and how each component of the system (N, X and R) affects the covalent character of the bond.
https://symposium.foragerone.com/2025-racas/presentations/73752

Continuing Development of a LHe3 Neutron Detector for Measuring Stellar Nuclear Reactions
Tim Comstock *Natural & Physical Sciences*
Mentor: Dr. Anthony Villano

Abstract:
The continuing development of a liquid helium-3 scintillation detector to measure free neutron energies relevant to stellar neutron-capture processes is discussed. Neutron capture reactions such as the s-process are believed to be the source of the majority of the Universe's abundance of elements heavier than iron which cannot be produced during stellar fusion. One of the main purposes of this proposed detector is to measure neutrons produced by the 22Ne(alpha,n)25Mg reaction which has been identified as being the main neutron source for the weak s-process and remains an active area of interest in the field of nuclear astrophysics. Because neutrons do not possess a net electric charge, their detection presents logistical issues that are not present with the detection of charged particles. Helium-3 is an efficient medium for neutron detection because of the 3He(n,p)3H process, this reaction has a large cross section for free neutrons and also allows for the measurement of the incident neutron energy levels. While helium-3 is a commonly used medium for neutron detection, it has only been used in its gaseous form. This prototype detector uses helium-3 in its liquid state which will result in a 64x improvement in efficiency over gaseous detectors.
https://symposium.foragerone.com/2025-racas/presentations/73692

Cooking in Silence: Food, Identity, and Widowhood in Bengal
Indira Saha *Social Sciences & Humanities*
Mentor: Steven Vose

Abstract:
In colonial and postcolonial Bengal, Hindu widowhood was characterised not only by symbolic rituals such as wearing white or renouncing adornment but also by a significant transformation of diet and domestic identity. In this presentation,

we will examine how Hindu Bengali widows were subject to strict dietary restrictions that prohibited the consumption of meat, fish, onions, garlic, and lentils, which were believed to arouse desire and compromise purity.
These food restrictions functioned as mechanisms of patriarchal control, reinforcing values of chastity, obedience, and seclusion following the death of a woman's husband. Yet, within these imposed boundaries, widows transformed scarcity into culinary innovation. Using simple, local, and foraged ingredients, these widows created a unique cuisine that became foundational to Bengali vegetarian cooking. This study will examine how "widow" cuisine, which originated from conditions of deprivation, evolved into a significant cultural contribution, despite the fact that those women remained largely invisible
The presentation will also discuss how the widows were portrayed in literature, folklore, and cinema, and examine how their identities were formed both within and beyond the kitchen. Lastly, we will reflect on widowhood in contemporary Bengal, where strict food taboos have faded, but the cultural memory and legacy of widow cuisine remain. We will situate these narratives within broader discussions of gender, caste, and domestic labor to highlight how marginalized women fought against subjugation and created their identity through food.
https://symposium.foragerone.com/2025-racas/presentations/73724

Cultivating Community: Understanding AANHPI Student Success Beyond the Model Minority Myth
Lucie Dao, Nhi Dang, Bertina Quach, My-Quynh Ta, Daranee Taychachaiwongse Teng *Social Sciences & Humanities*
Mentor: Dr. Tom Su

Abstract:
Asian Americans, Native Hawaiians, and Pacific Islanders (AANHPIs) face barriers to postsecondary access and success that are often overlooked due to the pervasive "model minority" stereotype. This harmful generalization obscures the distinct struggles of many members within the broad AANHPI umbrella, which is comprised of over 48 ethnicities and 300 languages spoken (APIA Scholars, 2022). Additionally, the unique needs of Native Hawaiian and Pacific Islander (NHPI) students are often invisibilized altogether. The goal of this ongoing action research project is to better understand factors that contribute to the postsecondary success of AANHPI students, particularly those who identify as first-generation college students. The proposed poster presentation will highlight the quantitative research aspects of a broader in-progress sequential mixed methods research design.
An AANHPI student-led action research team at University of Colorado ofDenver (CU Denver) analyzed survey data collected from CU Denver AANHPI undergraduate students to examine relationships between supportive peer relationships, engagement with the AANHPI campus community, utilization of campus resources, and academic success. The project engages a path analysis model informed by existing postsecondary success literature to investigate the following action research questions: (1) Do supportive peer relationships predict academic success? (2) Does use of campus resources mediate the relationship between supportive peer relationships and academic success? and (3) Does engagement with an AANHPI campus community mediate the relationship between supportive peer relationships and academic success?
Findings from this project will be used to develop culturally affirming resources and programs to foster an inclusive and supportive community for AANHPI students along their pathways to success.
https://symposium.foragerone.com/2025-racas/presentations/73628

Day of My Death
Jose Uribe-Lopez, Stefanie Olivan, Jada Hogg *Arts & Media*
Mentor: Andrew Bateman

Abstract:
What if A Christmas Carol collided with the Mexican holiday "Day of the Dead" to create a film that explores death, human connection, and mental health? A Junior film production titled Day of My Death brings that vision to life; it was awarded the EUReCA grant in Fall 2024 to help with its creation.
In this film, a suicidal man fails an attempt on his life, which leaves him on the edge between life and death. During this time, he's transported to the land of the dead and must make a choice, to remain dead or to live. The film is a dramatic fantasy, taking place mainly in the land of the dead, a barren place that changes as the story plays out, reflecting the mental state of the main character. The costumes, makeup, and production design invoke a gothic aesthetic while still being true to Mexican culture. The holiday and the Gothic aesthetic deal with death, heavy subjects, and contrasts of dark and light, so putting them together came naturally.
The story is dark, but so are the struggles Hispanic-Americans face when it comes to their mental health. Research conducted during the writing process revealed that Hispanic-Americans are among the most affected by mental health issues, compounded by stigma within the Hispanic-American community regarding mental health and limited access to resources.

This film seeks to raise awareness, encourage open dialogue, and reduce the stigma surrounding seeking help. Films can change attitudes and have been found to positively affect mental health. We're also looking to partner with non-profit organizations to help the message spread further. If even one person is inspired to seek the support they need, this project will have achieved its goal.
https://symposium.foragerone.com/2025-racas/presentations/73588

Decoding the Structure and Function of CHCHD10 in the mitochondria using NMR
Yukthika Boddeda *Biomedical Sciences*
Mentor: Dr. Woonghee Lee

Abstract:
CHCHD10, a protein found in the mitochondrial intermembrane space, plays a crucial role in maintaining mitochondrial stability and respiration, and mutations in this protein may lead to neurodegenerative diseases like ALS (Amyotrophic Lateral Sclerosis) and FTD (Frontotemporal Dementia). Mutations in proteins in this family often lead to the disassembly of the mitochondrial cristae, disruption in metabolic pathways, oxidative stress, and affect cellular respiration. The structure and function of this protein remain unknown and is an important part of our project. The project focuses on the purification of this protein using strains of *E. coli* and purification techniques like FPLC and dual-tag purification to determine its structure, which further aids in understanding its function and dynamic with other proteins. The specific mutation being studied is the S59L CHCHD10 mutation, which plays a significant role in the development of ALS-FTD. We will use recombinant DNA and stable isotope labelling technologies to produce CHCHD10 and conduct nuclear magnetic resonance (NMR) spectroscopy to obtain 2D 1H, 15N-HSQC NMR data for the structural fingerprinting of CHCHD10. The POKY suite is used to analyze the obtained NMR spectra and to determine chemical shifts, peak intensities, coupling constants and other information required to lay the foundation for structural analysis of the protein. By actively disseminating research findings, this project aims to contribute to the collective effort to improve the well-being of individuals affected by neurobiological conditions, especially ALS-FTD, and to promote scientific inquiry.
https://symposium.foragerone.com/2025-racas/presentations/73737

Detection of 1,4-Dioxane and Tetrahydrofuran in Bacterial Degradation using Gas Chromatography Mass Spectrometry
Jada Martinez *Natural & Physical Sciences*
Mentor: Timberley Roane

Abstract:
While bacterial degradation studies of 1,4-dioxane and tetrahydrofuran-common groundwater contaminants-are being performed by microbiologists at the University of Colorado Denver, an analytical method for the quantification of 1,4-dioxane and tetrahydrofuran within wastewater currently has no method from the Environmental Protection Agency. The work proposed here is the development of a 1,4-dioxane and tetrahydrofuran quantification assay using gas chromatography-mass spectrometry (GCMS) and activated carbon to quantify these chemicals from wastewater to better evaluate the microbial degradation of these chemicals. Modifications to the EPA method 522 made so far include, using acetone or chlorobenzenes as a solvent in place of dichloromethane due to an EPA ban the university must follow of the use of dichloromethane, use of loose activated carbon in place of carbon disks for budget reasons and using a vacuum to dry samples instead of anhydrous sodium sulfate for an easier method of drying. These differences are crucial to developing a new method for detecting 1,4-dioxane and tetrahydrofuran. To do this, experiments were done including (1) differences in drying techniques, (2) running concentration samples to observe how fast the analytes are evaporating, (3) volatility of acetone as a solvent. The development of the analytical method will help researchers confirm bacterial degradation of 1,4-dioxane and tetrahydrofuran in environmental remediation. This project shows the importance of learning common practices in analytical chemistry to understand how chemistry data is collected, analyzed, and ultimately used.
https://symposium.foragerone.com/2025-racas/presentations/73890

Determining the 3D structure of the hsACP-Zn-Ppant complex to advance the understanding of the Fe-S cluster.
Fatima Mustaffa *Biomedical Sciences*
Mentor:

Abstract:
Iron-sulfur (Fe-S) clusters are essential for biological systems, mediating electron transfer, gene expression, and enzyme activity. They play a crucial role in mitochondria, acting as key components of the electron transport chain. However, the Fe-S cluster pathway remains incompletely understood due to gaps in our knowledge of biogenesis and the presence of

unidentified proteins. Defects in Fe-S clusters can lead to severe diseases, including cancer, metabolic disorders, and hematological conditions, often with fatal consequences. To elucidate the role of the human acyl carrier protein complexed with zinc and phosphopantetheine (hsACP-Zn-Ppant) in Fe-S cluster biosynthesis, we aimed to determine its three-dimensional (3D) structure. The POKY software was used for backbone and sidechain chemical shift assignments, enabling the 3D structure determination of the hsACP holo-form[1]. I-PINE webserver, facilitated efficient chemical shift assignments[2]. Subsequently, AUDANA automation was employed to assign NOESY spectra, generate distance restraints, and refine the holo-form structure[3]. Finally, XPLOR-NIH was used to determine the structure of the hsACP-Zn-Ppant complex[4]. Successful completion of this project will provide critical insights into Fe-S cluster biosynthesis and the regulatory pathways governing these clusters. Furthermore, the resulting 3D structure will serve as a valuable template for structure-based drug design, potentially leading to novel therapies for cancer, metabolic, and hematological diseases.
https://symposium.foragerone.com/2025-racas/presentations/74046

Developing a Comprehensive Urban Heat Island Mitigation Framework for Denver: A Comparative Analysis of Climate Action Plans Across the United States

Caerwyn Hartten, Jibril Ahmed, Sidhartha Salagrama, Maha Sheikh *Natural & Physical Sciences*
Mentor: Christy Briles

Abstract:
The Urban Heat Island (UHI) Effect manifests as significantly elevated temperatures in urban areas compared to surrounding rural regions, primarily driven by infrastructure and reduced vegetation heat absorption. Urban surfaces absorb solar radiation through materials with high heat capacity, which retain thermal energy long after the sun sets, and diminished vegetation reduces evaporative cooling and shade provision, further exacerbating the UHI effect. UHIs have become a major environmental and public health issue in many American cities, as they exacerbate health and socioeconomic disparities, where vulnerable populations disproportionately endure heightened health risks, economic hardships, and limited access to cooling resources. While many cities have begun addressing these impacts, the City and County of Denver currently lacks a comprehensive framework to address the Urban Heat Island (UHI) effect, which is exacerbating rising temperatures in the city. This research aims to conduct an extensive literature review of climate action plans and heat mitigation plans across other jurisdictions in the US that are already working to combat the urban heat island effect. The collection of these plans will support the development of a Denver-specific UHI mitigation framework, as addressing the issue of urban heat in Denver requires a comprehensive intervention framework unique to the city, the residents, and their needs. It is imperative to prioritize actions based on their maximum potential net positive impacts, considering direct benefits, co-benefits, and unintended consequences. To accomplish this, individual urban heat interventions from the climate action plans will be evaluated to explore the maximum net positive impacts for Denver. The proposed urban heat intervention framework will guide the City and County of Denver in making more informed decisions that will enhance the city's resilience to climate change while improving the quality of life for its residents.
https://symposium.foragerone.com/2025-racas/presentations/73615

Development and Implementation of Multiscale Adaptive Partitioning Methods for the Determination of NarK Nitrate/Nitrite Antiporter's Mechanisms

Julia Clara Lourenco Roma, Faith Montemayor *Biomedical Sciences, Natural & Physical Sciences*
Mentor: Dr Emilie Guidez/Dr Hai Lain

Abstract:
The antiporter NarK operates in a wide variety of organisms by selectively transporting nitrate and nitrite ions across biological membranes, providing both a way for nitrogen sources to enter the cell and for expelling potentially toxic metabolites. Despite extensive biochemical investigations and crystal structure determinations, the exact nature of NarK's ion transport mechanism remains elusive. As such, a comprehensive understanding of this mechanism necessitates detailed insight into the interactions between the migrating nitrate/nitrite ions and NarK's pore residues and environment.
High accuracy quantum mechanical methods (QM) are necessary to accurately model these interactions and therefore the ion transport mechanism. However, the computational associated with full *ab initio* QM simulations is too high. In this work, we present an exploration of the interactions occurring within NarK's ion channel using a novel multi-scale many-body expansion (MMBE) method. The MMBE method is a fragment-based approach, where each fragment (e.g. pore residues) is reclassified *on the fly* to different levels of accuracy (e.g. *ab initio* QM, semi-empirical QM or molecular mechanics) based on its distance to the moving ion of interest (nitrate or nitrite in this case). With this method, interactions between the nitrate/nitrite ions and surrounding residues are computed at high levels of theory, while maintaining a reasonable computational cost. We have developed a Python-based software package which allows us to conduct molecular dynamics simulations with high levels of accuracy and linear computational costs. This work brings us

closer to identifying NarK's mechanism of operation as well as demonstrating the applicability of this method for the modeling of diffusion processes in large chemical systems.
https://symposium.foragerone.com/2025-racas/presentations/73607

Development of a Novel Classification System for Peroneal Tendon Disease Reveals Key Transcriptomic and Cellular Differences Across Disease Stages
Nicholas Austin *Biomedical Sciences, Natural & Physical Sciences*
Mentor: Julia Matthias

Abstract:
Introduction: Peroneal tendon disease (PTD) is a major cause of lateral ankle pain, encompassing tendinosis, tenosynovitis, tears, and instability. Despite its clinical significance, there is no consensus on a classification system that includes both the peroneal tendon (PT) and its surrounding tenosynovium (TS). Despite its essential role for tendon health, we still have a poor understanding of the cellular and transcriptomic characteristics of TS in PTD. Understanding the subcellular and cellular characteristics within the TS could uncover therapeutic targets and optimize treatment strategies.

Methods: We developed a five-stage PTD classification for surgical patients: Type 0 (healthy TS, normal PT); Type 1 (inflammatory TS, normal PT); Type 2 (50% PT tear, degenerative TS); Type 4 (near-complete rupture). Bulk RNA sequencing and Gene Ontology (GO) analysis identified transcriptomic differences. Histological analysis (n=12) included H&E staining and qualitative assessment. Results: Transcriptomic analysis revealed distinct molecular signatures across PTD stages. PTD types 1/2 were characterized by inflammation and tissue remodeling, whereas advanced PTD types 3/4 showed increased mitochondrial gene expression, altered fatty acid metabolism, and enhanced neutrophil degranulation in late-stage disease. Hemoglobin expression was upregulated up to 24-fold in late-stage disease. PTD 4 displayed reduced expression of Th2 immunity-related genes (GATA3, IL4, IL13). Histopathology showed progressive TS thickening, increased vascularity, and cellular infiltration with PTD severity. Discussion & Significance: Our novel PTD classification system highlights significant transcriptomic and structural tissue differences across disease stages, including histopathological markers, elevated TS hemoglobin levels, and altered energy metabolism pathways. Ongoing work aims to integrate transcriptomic and histopathological analyses to develop a meaningful classification of PTD, predict disease progression, and guide personalized treatment strategies.
https://symposium.foragerone.com/2025-racas/presentations/73742

Digital and Collaborative Resistance: How Food Delivery Drivers Use Digital Media to Challenge Exploitation
Ann Louise Chamoun *Social Sciences & Humanities*
Mentor: Hillary Quarles

Abstract:
Third-party food delivery is a rapidly expanding industry with over 32 million monthly active customers (DoorDash 2023). It depends on a readily available fleet of independent contractors who are 'just in place' to deliver food (Wells et al., 2021). Significant attention has been given to the exploitation of these drivers (E.g., Rahman and Thelen, 2019), but less so to their forms of resistance. This research examines how drivers use online engagement to resist exploitation and maximize performance. Using a media content analysis of YouTube shorts, our findings indicate that digital platforms give drivers a place to share their stories within the food delivery industry, offer a support network to those struggling, and promote a form of shared resistance against exploitative labor demands. We find that tips and shortcuts across platforms can help drivers improve efficiency by organizing, tracking, and augmenting their productivity. While the influencers who create online content are often unpaid, their labor can increase the earning potential of the paid drivers. Digital media also provides space for organized labor groups to help drivers to improve pay and gather support for driver rights. Overall, this study examines how online forums can facilitate efforts by gig-workers to challenge the algorithmic labor governance of food delivery platforms.
https://symposium.foragerone.com/2025-racas/presentations/73812

Diminishing Snowpack and Greenhouse Gas Fluxes: Investigating CO_2 Dynamics in Subalpine Ecosystems
Emma Tunks *Natural & Physical Sciences*
Mentor: Katharine Kelsey

Abstract:
Climate change is expected to reduce the depth and duration of snowpack in many mountain ecosystems. This change has implications for the greenhouse gas budgets that are partly controlled by snowpack. Snow can act as an insulating

blanket in cold temperatures, which can keep the ground temperature from falling much below freezing even when air temperatures can drop much lower. The loss of snowpack and resulting changes on soil temperature will likely impact carbon cycling in subalpine ecosystems. However, a current gap in our knowledge is how the changes in the timing of snow cover will affect land-atmosphere fluxes of carbon dioxide in and out of subalpine ecosystems. Our study addresses this question through a field experiment including removing snow from plots to simulate both postponed snow cover and a season without lasting snow and measuring the fluxes of CO_2 throughout the season. We hypothesize that summer season CO_2 flux to the atmosphere will decrease in the snow removal plots because without snow, the colder temperatures will limit the amount of soil and root respiration. Our results suggest that the postponed snow cover reduces CO_2 flux to less than 3 μmols m^{-2} s^{-1} compared to the control and removal plots which both saw over 4 μmols m^{-2} s^{-1}. This research is important because it will help us better understand how climate change will impact alpine ecosystems, and will help determine if subalpine ecosystems will contribute to positive and negative feedbacks within the carbon-climate system.
https://symposium.foragerone.com/2025-racas/presentations/73642

Disability Policies and the World Wars in Britain: The Evolution of Inclusive Strategies for the Employment of Disabled People
Presley Arnold *Social Sciences & Humanities*
Mentor: Marjorie Levine-Clark

Abstract:
Following both World Wars, Britain saw substantial increases in the number of people with disabilities, as a result of war injuries. People with disabilities struggled to reenter the labor force, even in the very different economic contexts of the 1920s and 1940s. Britain's Parliament took different approaches to unemployment policy for disabled people after the Second World War as opposed to the First. I am interested in the political, social, and economic factors that caused Britain to make changes to the way it handled the unemployment of disabled people. Understanding how Britain incorporated disability and employment into the welfare state is important for understanding how the idea of disability evolved over time and how different policies and perspectives affected disabled people. My project examines how, after the First World War, the British government struggled to address the employment of the many ex-servicemen with injuries and little workforce training in a context of recession and high levels of unemployment. During and following the Second World War, in the context of a labor shortage, British officials focused on the employment of disabled people through legislation such as the 1944 Disabled Persons (Employment) Act but also began to support all British citizens through the National Health Service (NHS) in 1948. The government centered the needs of disabled people regardless of their status as veterans or civilians. Following World War II, the British Parliament also paid attention to social stigmas and the ways that disability policy affected disabled people directly. Using Parliamentary minute sheets, newspapers, government acts, and government correspondence, I argue that the social, economic, and political conditions were ideal after World War II for Britain to create more opportunities for its disabled population. By closely examining the perspective of British government officials, this project sheds new light on the history of policies concerning the employment of disabled people.
https://symposium.foragerone.com/2025-racas/presentations/73506

Documenting Native American Petroglyph Art in Nevada using a suite of low and high-tech 3D scanners.
Christian Pitel *Natural & Physical Sciences*
Mentor: Dr. Michael Rogers

Abstract:
The White River Narrows Archaeological District in Lincoln County Nevada contains the largest concentration of prehistoric rock art in eastern Nevada. In collaboration with the Archaeological Research Group and the Bureau of Land Management a collaborative team from the physics and architecture departments spent a week during summer 2024 documenting rock art at a range of sites. An iPad with the app Scaniverse was used for close-up documentation, a DSLR was used for photogrammetric documentation for harder to reach art work, a Leica RTC360 3D laser scanner was used to document the cliff faces, and a Leica P40 long-distance laser scanner was used to document the larger context. The resulting 3D models will become part of a public database and available on the internet as a virtual tour.
https://symposium.foragerone.com/2025-racas/presentations/73716

Does relaxing anti-natalist policy increase fertility? An examination of the impact of the two-child policy in China on women's fertility behavior.
XIAOYAN ZHANG *Social Sciences & Humanities*
Mentor: Laura Argys

Abstract:
China's one-child policy was enacted in 1979 to address high fertility rates. After more than nearly 35 years, in 2012, Chinese total fertility rates reached 1.4 births per woman on average, according to National Bureau of Statistics of China (2012), well below the replacement rate. In response, the Chinese government implemented the selective two-child policy in 2012, followed by the universal two-child policy in 2016. In this paper, using data from the China Family Panel Studies between 2010 and 2020, we examine the impact of these policy changes on the probability that a woman gives birth between survey years. Specifically, we identify a woman's fertility restriction status based on the policies in effect under the one-child policy, the selective two-child policy and the universal two-child policy.
Using an individual fixed-effects framework, we examine the probability of an additional birth as restrictions are lifted. Our preliminary results suggest that relaxation of the one-child policy rules for any reason (i.e. under both the selective and universal two-child policy) increases the probability of an additional birth within the next 2 years by 2.31 percentage points. When restricting the sample to women whose fertility restrictions were relaxed under specific policy changes, the following effects are observed: the double-only-child policy (allowing the birth of a second child if both parents are only children) in 2010 led to a 1.6 percentage point increase in birth probability, the selective two-child policy resulted in a 3-percentage point increase, and the universal two-child policy was associated with a 1-percentage point increase. The effect of reduced fertility restrictions is most pronounced for women aged 30 to 40, less educated women and women living in rural areas.
https://symposium.foragerone.com/2025-racas/presentations/73622

Does Time of Day of Exercise Influence its Stress-Protective Effects?
Maliyah Gallien *Biomedical Sciences*
Mentor: Dr. Benjamin Greenwood

Abstract:

Exercise reduces the risk of stress-related mental health disorders in humans and prevents the behavioral consequences of stress in rodents, but whether the time of day at which exercise occurs influences its stress-protective effects is unknown. The goal of this project is to understand if the time of day at which exercise occurs influences the stress-protective effects of exercise in female rats. Adult, female, Sprague Dawley rats were assigned to either sedentary or exercising conditions. Rats in the exercise conditions were allowed to voluntarily run on wheels either during the first or the last 3 hours of their active cycle. After 3 weeks, rats were either not exposed to stress or were exposed to inescapable tail shock stress, because this stressor produces behaviors in rats that resemble symptoms of human stress-related mental health disorders. Rats allowed to exercise during the first, but not last, 3 hours of the active cycle were protected from the behavioral outcomes of the stressor. Results suggest that the development of stress resistance from exercise depends on the time of day at which exercise occurs.
https://symposium.foragerone.com/2025-racas/presentations/73859

Effect of Exercise on Experimental Pulmonary Hypertension: A Focus on Right Ventricular Biomechanics
Tristan Cobb *Biomedical Sciences*
Mentor: Dr. Brisa Peña Castellanos

Abstract:
Introduction. Pulmonary Hypertension (PH) is a disease in which elevated pulmonary pressures lead to right ventricle (RV) failure and death. Previous preclinical studies showed that high intensity interval training (HIIT) in a rat model of mild monocrotaline PH improved RV function and decreased fibrosis. We hypothesize that implementing HIIT in rats with severe experimental PH would prevent development of RV fibrosis resulting in decreased RV stiffness.
Methods. Male and female adult rats were induced with Sugen hypoxia PH (SuHx) with injection of Sugen (SU5416, inhibitor of vascular endothelial growth factor (VEGF)) followed by whole body hypoxia for 3 weeks, plus 3 weeks of normoxia. Rats were randomized to undergo HIIT 4 days a week for 5 weeks or remain sedentary. After 6 weeks, rats underwent invasive RV and LV hemodynamics under anesthesia. The RV was harvested, embedded in OCT, and sliced at 5 micron thickness and placed on glass slides. Slides were stained for collagen with picrosirius red and the percent collagen was calculated using a propriety code in Matlab. Atomic Force Microscopy (AFM) to assess tissue stiffness.
Results. SuHx animals developed severe PH, however HIIT had no effect on severity of PH, contractility, or cardiac output, but resulted in decreased RV/PA coupling (the ratio of end-systolic elastance to arterial elastance). AFM analysis showed no statistically significant differences in RV stiffness across conditions. Collagen analysis showed a trend in increase of collagen/fibrosis within SuHx which decreased with HIIT, however this was not statistically significant.

Conclusion. HIIT does not significantly reduce RV fibrosis or stiffness in animals with SuHX-PH. This may be attributed to the severity of the PH in this model. A future direction will involve exercise experiments with healthy mice and rats to observe the effects of exercise on the RV without the presence of severe disease.
https://symposium.foragerone.com/2025-racas/presentations/73762

Effect of Small Molecule Inhibition of FTO on the Pluripotency of Embryonic Stem Cells
Thomas Cooper *Natural & Physical Sciences*
Mentor: Dr. Christopher Phiel

Abstract:
Embryonic stem cells (ESCs) are an invaluable tool in both research and in medicine, by providing cellular models to study genetic disease, drug testing, and cancer, as well as for tissue regeneration therapy. The emerging field of epitranscriptomics, the study of post-transcriptional mRNA modifications, is shedding light on an important layer of regulation for gene expression and other cellular processes, including pluripotency. The most abundant mRNA modification is N6-methyladenosine (m6A), which is reversible. Importantly, the levels of m6A abundance correlate with ESC pluripotency – low levels of m6A are found in more pluripotent ESCs (termed naïve), while high levels of m6A are found in less pluripotent ESCS (termed primed). The demethylation of RNA is controlled by the enzyme FTO. Since lower levels of m6A correlate with enhanced pluripotency, we sought to examine the effects of blocking FTO activity. ESCs overexpressing FTO were treated with a selective small molecule inhibitor of FTO, FB23-2, and the effects of the inhibitor on ESC pluripotency were assessed by measuring the abundance of Nanog and Fgf5 mRNAs that serve as markers of the pluripotent state. Nanog is higher and Fgf5 lower in naïve ESCs, while Nanog is lower and Fgf5 higher in primed ESCs. The experiments performed in this project will help characterize the function of FTO in regulating ESC pluripotency, and will establish a new tool for the study of FTO and m6A modified RNA.
https://symposium.foragerone.com/2025-racas/presentations/73771

Effectiveness of Boron for Thermal Neutron Capture
Anton Kucera *Natural & Physical Sciences*
Mentor: Anthony Villano

Abstract:
Boron is known to capture thermal neutrons; or free neutrons that contain a kinetic energy approximate to their surroundings. When boron captures a thermal neutron, it undergoes the process of alpha and gamma decay. During this process, the interaction between a thermal neutron and a B-10 nucleus results in an alpha particle (or He-4 nucleus), a Li-7 atom, and a gamma photon with a 478 keV energy. While this process is understood to occur, the question remains how efficient boron is at this process. One way to determine the efficiency of thermal neutron capture in boron is through spectral subtraction where the background counts are subtracted by the counts measured as the boron shield covers the detector. In this case, a NaI (or sodium-iodide) detector is used. When a particle enters the detector it interacts with the scintillation material (or the NaI crystal in this case). As particles interact with the material, photons are released through three processes: the Photo-electric effect, Beta-decay, and Compton Scattering. While scattering is part of the process, the addition of thermal neutrons create noise within the detector. As neutrons carry no charge and penetrate most materials, shielding is a difficult task. The addition of thermal neutrons in a detector causes unintended interactions with the scintillation material creating noise that is present in the recorded data and signals from lower energy particles are lost. In calculating the efficiency of boron as a neutron shield, this information can be used to reduce the noise in detector signals and for the search of incident particles from unknown sources.
https://symposium.foragerone.com/2025-racas/presentations/73857

Effects of Innate Immune Activation on Myelin Development
Manna Morris *Biomedical Sciences*
Mentor: Bruce Appel

Abstract:
Myelin, a specialized membrane created by glial cells called oligodendrocytes, wraps axons to enhance conduction of electrical impulses and support neuronal health. Myelin disorders result in cognitive and motor dysfunction and are often associated with inflammatory states. For example, maternal and newborn infections are often associated with myelin deficits, but the molecular and cellular mechanisms contributing to these myelin deficits are unknown. Previously, we have shown that microglia, the resident immune cell of the central nervous system, phagocytose myelin during development. Therefore, I predicted that microglia excessively phagocytose myelin in response to infection. To test this prediction, I injected poly-(I:C), a double-stranded RNA viral mimetic that stimulates the type 1 interferon response to

infection, into zebrafish embryos. First, to assess myelin formation, I co-injected poly-(I:C) with a reporter gene that marks myelin sheaths with a membrane-tethered fluorescent protein and measured sheath number and length using confocal microscopy. At 3 dpf, the poly-(I:C)-injected larvae had more but shorter sheaths per oligodendrocyte than the control larvae. However, at 5 dpf, there was no difference in myelin sheath length or number between control larvae and poly-(I:C)-injected larvae. Next, to assess whether microglia were activated, I injected poly-(I:C) into transgenic larvae that marked microglia and, at 3 dpf, look at the microglia morphology. I found that the microglia in the poly-(I:C) larvae were smaller in volume than the microglia in the control larvae, and there was a trend towards rounder microglia in the poly-(I:C) larvae. The changes in myelin sheaths at early larval stage also raise the possibility that poly-(I:C) disrupts oligodendrocyte differentiation or possibly alters microglia interaction with myelin sheaths. I am doing more experiments to determine whether the change in microglia morphology means those microglia are activated, and investigating whether the microglia have different morphology in different parts of the central nervous system. Our future experiments will utilize in vivo time lapse imaging to assess microglia interaction with oligodendrocytes in order to determine whether the microglia are directly interacting with myelin or indirectly impacting myelin.
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Effects of Pre-habilitative Physical Therapy on the Management of Femoroacetabular Impingement
Matthew Hagos *Biomedical Sciences*
Mentor: James Genuario, MD

Abstract:
Anterior pelvic tilt exacerbates femoroacetabular impingement (FAI) severity, leading to abnormal hip mechanics, increased bony impingement, and greater labral damage. This study aims to determine the influence of pre-habilitative physical therapy (PT), focusing on posterior gluteal chain strengthening, on pelvic tilt, hip range of motion (ROM), and patient-reported outcomes (PROs). We hypothesized that following PT, patients with anterior pelvic tilt will have greater symptomatology improvements than patients with neutral or posterior tilt.
Participant demographics including age, sex, height, BMI, and weight were collected. PT efficacy for FAI was assessed by examining therapy failure rates, surgery progression, and secondary outcomes using validated PROs. Pelvic tilt was quantified using standing anteroposterior X-ray radiographs by measuring the vertical distance from the pubic symphysis to the sacrococcygeal junction (PSCD), utilizing a previously validated method. PSCD measurements were then used to calculate pelvic tilt in degrees with sex-specific conversion equations. Patients were categorized by pelvic tilt into anterior, posterior, and neutral groups for outcome comparison. Statistical analysis evaluated significant differences in PROs using linear mixed models, categorical variables with chi-square tests, and time to surgery with Kaplan-Meier survival analysis.
The average anterior tilt was 66.1±1.4°, neutral tilt 52.5±1.6°, and posterior tilt 41.5±1.4°. iHot12, PROMIS, and LEFS scores were evaluated monthly for 6 months, with no significant differences between tilt categories. The average time to surgery was 177.1±15.9 days for the anterior group, 163.2±15.6 days for neutral, and 111.7±24.3 days for posterior, with no significant differences between groups.
This preliminary analysis suggests that pre-habilitative PT targeting anterior pelvic tilt may not significantly improve pain relief, function, or time to surgery for FAI. Therefore, pelvic tilt may not be a crucial factor in the decision to undergo surgery, further research should consider individual responses to PT, including the number of pre-surgery visits and prior PT treatment history.
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Enhancement of Effector CD8 T Cell Motility by IL-21 Through Mitochondrial STAT3
Fahiima Abdullahi *Biomedical Sciences*
Mentor: Mercedes Rincon

Abstract:
Across multiple cancer types, tumor infiltration of CD8 T cells is associated with improved patient survival, providing a rationale for adoptive T cell immunotherapies as a cancer treatment. Furthermore, metabolic fitness is crucial for the success of adoptive T cell therapies, as metabolic changes are required for T cell proliferation, cytotoxicity, and persistence. Basal cell motility, defined as a random walk and exploratory spread, is essential for effector CD8 T cells to search for and engage with their cell targets within a solid tumor microenvironment. While studies have investigated T cell migration, research on intratumoral T cell motility is lacking. The purpose of this project is to investigate the impact of IL-21, a cytokine, on effector CD8 T cell motility.
Compared to effector CD8 T cells expanded in the presence of IL-2 alone, those expanded with both IL-2 and IL-21 exhibit increased cell motility. In addition, we observe enhanced mitochondrial membrane potential (MMP), mitochondrial respiration, mitochondrial calcium, and mitochondrial STAT3 (mitoSTAT3), for effector CD8 T cells expanded in the presence of IL-2 and IL-21. We also found that the presence of both IL-2 and IL-21 results in a superior killing efficacy of

B16 (cancer) cells. This is highly impactful, especially for the potential improvement of T cell therapies against solid cancers. Thus, we propose that mitoSTAT3 promotes CD8 T cell motility through increasing mitochondrial calcium. Our findings suggest that IL-21 may play an important role in effector CD8 T cell mitochondrial fitness.
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Enhancing Chemistry Performance: The Use of a Diagnostic and Follow-Up Study Plan to Improve Foundational Math Skills in General Chemistry
Kyley Stalker *Natural & Physical Sciences*
Mentor: Dr. Priscilla Burrow

Abstract:
Introductory chemistry courses are notoriously challenging, with studies reporting an average DFWI rate of 29.4% across various institutions. A major obstacle for students is the lack of foundational math skills, which are essential for problem-solving in chemistry. The goal of our project is to assess the impact of a math diagnostic and study plan on student performance in General Chemistry I labs. Aktiv Chemistry is an interactive platform that assesses students' proficiency in key math concepts like algebra, graphing, and unit conversions. It provides a personalized study plan to strengthen weak areas identified in the diagnostic. In our study, students enrolled in General Chemistry I labs in the fall of 2024 had access to the diagnostic tool. Among the 229 students who took the final exam, those who completed both the diagnostic and study plan scored significantly higher on the exam (71.58%) than those who engaged with neither (59.81%). These results highlight the importance of math preparation in chemistry success and support prior research linking strong foundational math skills to improved success in introductory chemistry courses. Implementing targeted math diagnostics and interventions could be a key strategy for reducing failure rates and improving student achievement in general chemistry.
https://symposium.foragerone.com/2025-racas/presentations/73356

Enhancing Photogrammetric Accuracy with Environmental Reference Points Using Metashape
Maria Elisavet Papavasiliou *Natural & Physical Sciences*
Mentor: Michael "Bodhi" Rogers

Abstract:
Photogrammetry is increasingly used for creating detailed 3D models in medical, engineering, and forensic applications. However, the quality of these reconstructions is highly dependent on the surface characteristics of the subject and the visual complexity of the environment in which images are captured. This study evaluates the impact of background reference points and visual characteristics on the accuracy and clarity of 3D models generated using Metashape photogrammetry software. A synthetic arm model was used to simulate human anatomical features. Images were captured using a borescope, Canon DSLR, and iPhone under consistent lighting conditions. The study compared models of a synthetic arm with varying visual complexity of the background. All images were processed in Metashape and evaluated for point cloud density, mesh consistency, and surface detail. The results show that images captured with the iPhone - despite lower resolution - produced more accurate 3D models due to richer textural information. The combination of iPhone and borescope images yielded the highest quality reconstructions. However, integrating images from all three devices sometimes challenged Metashape's alignment process. Most notably, the arm with strong visual references consistently resulted in higher-quality models, confirming that unique patterns significantly enhance photogrammetric performance. While the context involved anatomical modeling, the focus of this research was not surgical planning but optimizing conditions for 3D reconstruction. These findings offer practical guidelines for improving photogrammetry workflows, especially when modeling smooth, low-texture surfaces.
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Evaluating Bicycle Counting TechnologiesSupporting Active Transportation with Smarter Data Collection Tools
Jesus Rodriguez Ruiz *Tech, Engineering, & Math*
Mentor: Aditi Misra, Ph.D.

Abstract:
Data collection is essential for enhancing transportation options and safety, particularly in areas with limited services. Building on a foundation of existing literature and successful national strategies, this project aims to advance data-driven transportation planning by identifying optimal locations in the Denver region for installing automated pedestrian and bicycle counters. This study develops a comprehensive database with detailed location, evaluates potential monitoring sites and highlights regions with inadequate monitoring coverage. An initial pilot study at the Auraria campus will assess the accuracy of automated traffic counters by cross-referencing their data with video footage for validation. The findings will provide recommendations for strategic traffic counter placements. Additionally, this project will enrich my

professional development in transportation engineering by strengthening my skills in data analysis, research, and fieldwork execution.
https://symposium.foragerone.com/2025-racas/presentations/73646

Evaluating Growth and Viability of potentially 1,4-Dioxane degrading Bacterial Isolates from the Lowry Landfill Site
Citclali-Aimee Tizcareno *Natural & Physical Sciences*
Mentor: Dr. Timberley Roane

Abstract:
This study explores the growth and metabolic activity of unknown bacterial isolates sourced from the Lowry Landfill Superfund site, with a focus on their potential to degrade 1,4-dioxane—a persistent groundwater contaminant. Using a combination of plating, spectrophotometry, and microscopy, we monitored bacterial response to 1,4-dioxane at 48-hour intervals. A general growth control (*Staphylococcus aurelius*) was included to validate the media and experimental setup. Preliminary results highlight the difficulty of cultivating these isolates under laboratory conditions, underscoring the complexity of isolating effective degraders. These findings contribute to broader efforts in optimizing microbial screening techniques for bioremediation research.
https://symposium.foragerone.com/2025-racas/presentations/73708

Examining Climate and Food Justice through a Syndemic Lens: Addressing Complex Health and Environmental Intersections
Sarah Le *Social Sciences & Humanities*
Mentor: Ivan Ramirez

Abstract:
This project builds upon existing research in food justice by examining the intersection of climate change and food systems through a syndemic lens. A syndemic involves the simultaneous occurrence of multiple interrelated epidemics or health conditions within a population, each intensifying the others and compounding the overall health burden. While syndemics traditionally emphasize overlapping health variables, this study adopts an expanded view that includes social, economic, and environmental factors influencing health outcomes. By developing a research question focused on climate and food justice, this project seeks to highlight the interconnectedness of these issues, advocating for integrated approaches to address the complex challenges facing marginalized communities. Ultimately, this research aims to contribute to a deeper understanding of how systemic inequities and environmental changes impact food justice, emphasizing the need to address these issues collectively rather than as isolated problems.
https://symposium.foragerone.com/2025-racas/presentations/73844

Examining the Impact of Perceived Campus Resilience on Academic Success and Well-Being
Danielle You, Alana Blanford, Nikolai Langille, Brooklyn Thompson, Isabella Edmonds, Juan Diaz *Social Sciences & Humanities*
Mentor: Courtney Leapley

Abstract:
This study is part of a larger study that examines the impact of undergraduate students' perceptions of campus safety and resilience on student success and well-being outcomes. A survey was administered to undergraduate students on CU Denver's campus. The questions measured four areas, including student perceptions of campus safety, individual safety, campus resilience, and individual resilience, as well as demographic characteristics and student success and well-being outcomes. This project focuses on the impact of student perceptions of campus resilience on student success and well-being.
This study was conducted for use and dissemination by the University of Colorado Denver School of Public Affairs' Center for Community Safety and Resilience to highlight potential policy implications that may increase student success outcomes.
https://symposium.foragerone.com/2025-racas/presentations/73602

Examining the Impact of Perceived Campus Safety on Academic Success
Emily Davis, Reem Al-Zaidi, Alexa Guzman *Social Sciences & Humanities*
Mentor: Courtney Leapley

Abstract:

This study is part of a larger study that examines the impact of undergraduate students' perceptions of campus safety and resilience on student success and well-being outcomes. A survey was administered to undergraduate students on the CU Denver campus. The questions measured four areas, including student perceptions of campus safety, individual safety, campus resilience, and individual resilience, as well as demographic characteristics (e.g., race, ethnicity, age, gender, etc.) and student success and well-being outcomes. This project focuses on student perceptions of campus safety and the impacts on student success and well-being.
This study was conducted for use and dissemination by the University of Colorado Denver School of Public Affairs' Center for Community Safety and Resilience to highlight potential policy implications that may aid in increasing student success outcomes.
https://symposium.foragerone.com/2025-racas/presentations/73579

Examining the Impact of Perceived Student Resilienceon Academic Success and Well-Being
Sahira Silva, Halary Nguyen *Social Sciences & Humanities*
Mentor: Courtney Leapley

Abstract:
This study is part of a larger study that examines the impact of undergraduate students' perceptions of campus safety and resilience on student success and well-being outcomes. A survey was administered to undergraduate students on CU Denver's campus. The questions measured four areas, including student perceptions of campus safety, individual safety, campus resilience, and individual resilience, as well as demographic characteristics and student success and well-being measures. This research focused on the impact of students' perceptions of individual resilience on their success and well-being.
This study was conducted for use and dissemination by the University of Colorado Denver School of Public Affairs' Center for Community Safety and Resilience to highlight potential policy implications that may aid in increasing student success outcomes.
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Examining the Impact of Perceptions of Individual Safety on CampusOn Academic Success and Well-Being
Angela Ladislao, Siren Layle, Selena Strasheim, Roman Mora, Mae Velie *Social Sciences & Humanities*
Mentor: Courtney Leapley

Abstract:
This study is part of a larger project that examines the impact of undergraduate students' perceptions of campus safety and resilience on student success outcomes. A survey was administered to undergraduate students on CU Denver's campus. The questions measured four areas, including student perceptions of campus safety, individual safety, campus resilience, and individual resilience, as well as demographic characteristics and student success and well-being outcomes. This research focuses on the impact of student perceptions of individual safety on student success and well-being.
This study was conducted for use and dissemination by the University of Colorado Denver School of Public Affairs' Center for Community Safety and Resilience to highlight potential policy implications that may aid in increasing student success outcomes.
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Exhibit Design Methods in Small Spaceswith the CU Collection of Human Organ Plastinates
Sam Freese *Biomedical Sciences*
Mentor: Dr. Maureen Stabio

Abstract:
I wanted to take classic exhibit design principles normally applied to large, public spaces and see if we could apply them to CU Anschutz's Modern Human Anatomy's collection of 70 plastinated human organs. First, what is plastination? Plastination is a tissue preservation technique in which water and fat get replaced with a polymer, usually silicone, via vacuum infusion. This transforms fragile, degradable organs into dry and durable organs, which can be used without special ventilation, gloves, or lab equipment. We have a plastinated brain right here that you can look at! If you have heard of the Body Worlds Museum, you've experienced plastination! These organs come from human body donors and this was a consideration we took to heart during this design. We want to increase the dignity of the donors by furthering the educational value of these precious specimens. In museum and exhibit design, important aspects that contribute to a visitor's experience include collaboration, space, flow, interactive elements, and storytelling. These design elements are

often applied to large public museums. However, less is known with regards to the design of small, non-commercial, exhibit spaces, such as a university collection
We are improving the exhibit based on data received from surveys conducted before the changes and we will measure changes using the same survey afterwards. This is a work in progress, and we are expecting to find that by simply applying a few basic exhibit design principles like improved signage and storytelling, we will significantly improve the educational quality of the exhibit and, in doing so, further the dignity of the donors and their organs.
https://symposium.foragerone.com/2025-racas/presentations/73641

Exploration of Alternative Noninvasive Therapy for Parkinson's Disease
Blanca Duenas-Huizar *Biomedical Sciences*
Mentor: Anthony Lee

Abstract:
Parkinson's disease (PD) is a progressive neurodegenerative disorder that affects the nervous system, leading to motor impairments such as tremors, muscle stiffness, bradykinesia (slowness of movement), and early non-motor symptoms like loss of smell. The disease is associated with the degeneration of dopamine-producing neurons in the substantia nigra. We pursued a study focused on the effects of alternative PD therapies on the beta frequency band recorded from PD patients' subthalamic nucleus, as beta frequency is an indicator of motor symptoms. The research combines vibrotactile therapy with deep brain stimulator DBS. Participants with the implant were recruited to record the local field potentials, which permits us to assess whether vibrotactile therapy alters beta-power activity in the brain. Although beta power is known to be a biomarker, it is unclear how noninvasive treatments are used. Our aim was to measure and understand the changes in beta power before and after the application of vibrotactile treatment. Moreover, vibrotactile therapy is a noninvasive alternative that works by delivering timed vibrations through a motor worn on the fingertips. The combination of DBS and vibrotactile therapy allows direct observation of the beta power. We hypothesize that beta readings significantly changed in the majority of patients after exposure to vibrotactile therapy. Our next objective is to determine how vibrotactile treatment affects participants' symptoms using a standardized score and to assay whether vibrotactile therapy can be considered an effective intervention to decrease symptom severity. If successful, this research could offer an alternative to reduce the symptoms of PD in an accessible and noninvasive way.
https://symposium.foragerone.com/2025-racas/presentations/73596

Exploring Factors Related to Parent-child Relational Stress and Response to Brief, Virtual Behavioral Parent Training
Valerie Rebeles *Social Sciences & Humanities*
Mentor: Jacob Holzman, PhD

Abstract:
Prior research supports behavioral parent training (BPT) programs' effectiveness in improving parent outcomes and dyadic improvements (e.g., reduction in parent-child relational stress). However, there remain significant gaps in access and engagement with BPT. Logistical barriers, financial stressors, and family stress are known barriers to access and engagement in BPT. To increase accessibility of BPT, we adapted a BPT intervention to be brief (i.e., 6, 1-hour sessions) and delivered through telehealth. However, it is unclear if reductions in parent-child relational stress from pre- to post-BPT will be evident in this accessible BPT format. This study aims to examine whether there are reductions in parent-child relational stress from a pre- to post- brief, group-based BPT intervention delivered via telehealth to caregivers (n=43) of 3- to 7-year-olds at an outpatient behavioral health clinic and a Head Start program. We hypothesize that there will be a significant reduction in parent-child relational stress from pre- to post-BPT. Additionally, we will explore parent-level factors related to parent-child relational stress (e.g., parenting self-efficacy, general parent stress), which are understudied in BPT clinical trials. Primary caregivers completed the Parenting Stress Index – Short Form to assess parent-child relational stress; the Depression, Anxiety, and Stress scale to measure general parent stress; and the Parenting Sense of Competence – Self Efficacy measure to assess parenting self-efficacy. Preliminary correlations between parent-child relational stress, general parent stress, and parenting self-efficacy revealed that higher parent-child relational stress was related to lower levels of parenting self-efficacy (r = -.43; p =.011) and higher levels of general parent stress (r = .43; p = .011). Paired samples t-test revealed a significant reduction in parent-child relational stress from pre- to post-BPT $t(29)$ = 3.08, p = .005 with a mean reduction of 2.87. These preliminary findings suggest brief, telehealth BPT continues to be effective in reducing parent-child relational stress. Future research could explore the dissemination and implementation of BPT programs adapted to be more accessible. Clinical implications will be discussed in the poster.
https://symposium.foragerone.com/2025-racas/presentations/73905

Exploring Non-Traditional Student Support Systems at CU Denver

Sosy Kokozian *Social Sciences & Humanities*
Mentor: Emily Wortman-Wunder

Abstract:
Non-traditional students tend to be older, have an outside-of-school job, and could be veterans or parents. Non-traditional students can either feel supported or not enough by the university's support resources. It is critical to ensure non-traditional students are supported the same level of support that traditional students have. At the University of Colorado Denver, it is not a well-discussed topic, which needs to be addressed. Through an electronic survey, non-traditional students answered questions to determine whether or not they feel supported by the current resources the university has to offer and to provide feedback. The results of the survey show that non-traditional students feel supported by the current resources available through the university, but also identified areas for improvement in the short response area of the survey. The support that non-traditional students experience needs to be addressed so we can continue to support them in our forever changing environment.
https://symposium.foragerone.com/2025-racas/presentations/73630

Exploring the Relationship Between Nature Connectedness and Levels of Depression and Self-Rated Physical Health Among College Students
Zaira Villalobos *Social Sciences & Humanities*
Mentor: Dr. Shaffer (PhD)

Abstract:
Recently, modern life, urbanization, and technology have weakened humanity's evolutionary bond with nature. The biophilia hypothesis suggests an innate tendency to connect with nature, a trait that can help support well-being. While previous research links nature connectedness (i.e., a person's subjective sense of their relationship with the natural world) to psychological well-being, less is known about the relationship between nature connectedness and other indicators of mental and physical health. Thus, this study examines the association between nature connectedness, depression levels, and self-rated physical health among CU Denver college students.
Baseline data were collected from 307 undergraduate students in Denver, Colorado, as part of a larger daily diary study. Participants reported levels of nature connectedness, depression, and self-rated physical health, using the Connectedness to Nature Scale (CNS), the Patient Health Questionnaire-2 (PHQ-2), and one item from the Global Health Questionnaire, respectively. Linear regression models were used to examine associations between nature connectedness and both depression and self-rated health, with age, sex, race, and socioeconomic status included as covariates.
Results indicated a significant positive association between nature connectedness and self-rated health (B(SE) = .24(.09), p = .009), suggesting that individuals who feel more connected to nature report having better physical health. However, no significant relationship was found between nature connectedness and depression (B(SE) = .24(16), p = .144). These findings highlight the potential role of nature connectedness in shaping physical health perceptions but suggest that its influence on mental health may be more complex. Future research should explore additional factors that may mediate this relationship and utilize longitudinal designs to better understand the long-term effects of nature connectedness on well-being.
https://symposium.foragerone.com/2025-racas/presentations/73594

Exploring the Use of Lens Extenders for Photogrammetry to Create Higher Resolution 3D Models of Cadaveric Wrist Joint Surfaces
Aidan Garcia St. George *Biomedical Sciences, Natural & Physical Sciences, Tech, Engineering, & Math*
Mentor: Bodhi

Abstract:
Photogrammetry is emerging as a powerful tool for three-dimensional analysis of surface areas, enabling the creation of precise three-dimensional models from two-dimensional photographs. For this study a Canon EOS 6D was used to capture high-resolution images of fake wrist bone joint surfaces. Agisoft Metashape software was then used to generate three-dimensional models of the bone joint surface area. The methodology involved a systematic sequence of photographs taken from multiple angles with and without a lens extender, the HDR (High Dynamic Range) setting enabled on the camera and a LED ring light. This process produced a high-resolution model with 450,000 to 650,000 tie points, ensuring a detailed and accurate reconstruction of the joint surface. Stabilized camera positions were optimized using a bracketed desktop camera mount to minimize distortions and enhance model quality, consistency, and repeatability. A ring light was used for photography so each photo could obtain more information. An analysis of visual and numerical values of each joint surface was conducted to establish a standardized approach for evaluating different photogrammetry techniques and devices. This method provided a normalized way to compare joint surface topology across different lens

extenders and cameras. The findings demonstrate that photogrammetry offers a non-invasive, highly accurate, cost-effective, and repeatable alternative for quantifying surface areas, particularly in high contrast or low-light environments. By providing a reliable method for analyzing joint surfaces, photogrammetry continues to advance surgical research and medical imaging. This research highlights the adaptability of photogrammetry for medical applications, reinforcing its role as a valuable tool in anatomical and biomechanical investigations as well as applications in archaeological and forensic settings.
https://symposium.foragerone.com/2025-racas/presentations/73551

Exploring Under-Threshold RABBITT Ionization
Hamza Mekuria *Natural & Physical Sciences*
Mentor: Dr. Kathryn R. Hamilton

Abstract:
The process of light interacting with matter is essential to understanding everyday phenomena. A significant amount of chemical reactions is caused by light, but how do we explain why light triggers these reactions? Understanding this requires us to know more things that occur at the atomic level which is where physicists come into play. Explaining what happens at the atomic level required us to develop a new set of rules that reflected the interactions and dynamics of particles which is what led us into developing Quantum Mechanics. This novel framework has the capability of predicting electron behavior based on energy through the Time-Dependent Schrodinger Equation (TDSE) however, there is a flaw to this. Calculating the TDSE becomes a monumental task for atoms beyond hydrogen due to the electrons influencing one another. For this reason High-Performance Computing becomes a powerful tool in calculating the TDSE as we can obtain the solutions in hours compared to months on a standard computer. In this work I seek to explain the distinct behavior that occurs between 0.5 and 1 eV of Neon. We believe that gaining knowledge from this study would help to explain other light-matter interactions as they can be applied to various fields of science such as explaining the process behind photons hitting our eyes and understanding more about skin cancer caused by UV radiation to improving the structure of nanocircuits.
https://symposium.foragerone.com/2025-racas/presentations/73746

Femoral Strength estimated from Finite Modelling is unaffected among people with long-standing type 1 Diabetes
Jake Tinsley, Jacqueline Sammel *Tech, Engineering, & Math*
Mentor: Dr. Dana Carpenter

Abstract:
Background: The risk of hip fracture is higher in adults with type 1 diabetes (T1D); however, bone mineral density alone does not fully explain this increased risk. Little is known about the in vivo bone quality in adults with long-term T1D.
Objective: To predict and analyze the differences in bone strength and quality between adults with long-term T1D and healthy adults without diabetes.
Methods: A total of 116 adults with long-term T1D and 95 adults without diabetes underwent axial quantitative CT scans were calibrated and used to calculate densitometric and cortical data. The left femur was segmented into 3-dimensional finite-element models oriented in falling and standing configurations. Finite element analysis was performed to estimate the fracture force at each position. The results were compared between the groups using robust linear models controlled for age, sex, and body mass index.
Results: There were no significant differences in the estimated fracture force at the hip in either standing or falling configurations between adults with T1D and the controls.
Conclusion: Our results indicate potential limitations of the current finite element modeling methodology for bony structures in individuals with T1D. Further research is required to elucidate the mechanisms underlying the increased risk of fractures in this population.
https://symposium.foragerone.com/2025-racas/presentations/73781

Flow-Structure Interactions of Transmission Cables
Gabriel Elftman-Hanson *Tech, Engineering, & Math*
Mentor: Linyue Gao

Abstract:
Transmission lines experience forces that can induce vibrations and structural fatigue. This study examines the flow-structure interaction of transmission cables by testing vibrating cylinders with varying cross-sectional geometries to simulate iced lines in atmospheric flow. Experiments were conducted in a suction wind tunnel, where 120 second trials recorded cylinder displacement, upstream and downstream air velocities at increasing wind speeds ranging from 0.5-12.5

m/s. Cylinder motion exhibited sinusoidal oscillations, and oscillation frequencies were determined using Fast Fourier Transform and Power Spectral Density techniques. Vortex shedding frequencies in the downstream flow were identified for insight into potential resonance effects. This study enhances understanding of instabilities in iced transmission lines by analyzing the relationship between oscillation and vortex shedding frequencies.
https://symposium.foragerone.com/2025-racas/presentations/73741

Free Electron Collisions with Neutral Gold
Lo Bailey Laboda *Natural & Physical Sciences*
Mentor:

Abstract:
We seek to determine electron-impact excitation cross sections of neutral gold atoms using the Dirac B-Spline atomic R-Matrix (DBSR) suite of codes. These calculations are performed on the Texas Advanced Computing Center's Frontera and Stampede3 supercomputers. Electron-impact excitation cross sections describe the likelihood that the impacting electron will transfer energy to the copper atom and excite the atom's electrons to a higher energy state. This data provides useful insight into how gold atoms behave during collisions with other particles. The electron-impact excitation cross sections of neutral gold are valuable for astrophysical applications, including modeling binary neutron star mergers. Accurate cross sections for the higher energy state transitions are difficult to obtain experimentally due to weak signal, and theoretical calculations are challenging because some electron orbitals change depending on the energy state. Multiple experimental and theoretical studies spanning the past few decades have sought to determine accurate electron-impact excitation cross sections, however agreement between experiment and theory remains poor. The DBSR suite offers many computational advantages that reduce error and difficulty when performing relativistic calculations. We will present preliminary results from our electron-impact excitation calculations, comment on comparison with previous theoretical and experimental studies, and describe future directions for this work. Relevant copper atomic structure data, which can be used as input for DBSR calculations, will be made available on national databases where interested parties can perform their own cross-section calculations.
https://symposium.foragerone.com/2025-racas/presentations/73714

From Lung to Lab: Enhancing Sputum Quality for Rheumatoid Arthritis Research
Shrostina Magar, Bertina Quach *Biomedical Sciences*
Mentor: Kristin Sturm

Abstract:
The Studies of Etiology of Rheumatoid Arthritis (SERA) Project is an ongoing research study conducted by the Division of Rheumatology at the Anschutz Medical Campus (AMC). The SERA project aims to identify biomarkers and prevention strategies associated with Rheumatoid Arthritis (RA). RA is a chronic autoimmune disease where the immune system sends antibodies to attack the healthy tissues surrounding the joint. This leads to inflammation, destruction of cartilage, as well as bone damage and deformities.
The SERA project looks at sputum samples, particularly immune cells such as neutrophils and macrophages that can indicate RA related antibodies in the lungs. Participants provide sputum samples through an induced cough procedure using saline mist in a ventilated booth. Sample quality is assessed by measuring cell viability—the percentage of live immune cells—and performing a squamous epithelial cell count, which indicates contamination from saliva.
This study investigates whether specific factors—homogenization speed, recent food intake, and sample transfer method—affect sputum quality. By analyzing changes and contamination levels across these variables, we aim to optimize collection protocols. Improving sample quality is critical to advancing biomarker discovery efforts and ensuring the reliability of lung-based indicators of RA.
https://symposium.foragerone.com/2025-racas/presentations/73662

From Policy to Plate: An Exploration of Colorado School Foodscapes
Ashlyn Lange *Social Sciences & Humanities*
Mentor: Dr. Hyeyoung Oh Nelson

Abstract:
Despite policies meant to ensure quality school food for all K-12 public school students, school food disparities between Colorado districts are stark. Based on participant observation, archival analysis, semi-structured relational interviews, and focus groups, I identify the interconnected forces that inform school food. I draw on the concept 'foodscapes' to describe and analyze multiple structural, social, economic, and historical factors that constitute the school food

experience. I leverage the concept of foodscapes, the distinct but interrelated aspects of our world that contribute to a food environment, to offer a nuanced and in-depth examination of the school food landscape in Colorado.
https://symposium.foragerone.com/2025-racas/presentations/73655

From Raindrops to Recycling: Educating Young Learners About Urban Ecohydrology with Lowry
Nakita Locklear *Arts & Media, Natural & Physical Sciences, Social Sciences & Humanities*
Mentor: Dr. Timberely Roane

Abstract:
Are children's picture books an effective method for teaching microbiological water ecology concepts to younger students? This project seeks to explore the concept that an illustrative approach to disseminating scientific information will help 5th to 8th grade students better retain their lessons. The chosen medium, children's books, present a familiar form through which microbiology and ecology can be explored. By collaborating with the Lowry Landfill via CU: Denver's CIRCLES program, this project will help local middle school students understand the important work scientists and engineers undertake to keep our water safe. An expected result is the fostering and motivation of future environmental advocates that have a clear understanding of microbiology and ecology. If this result is achieved, then children's books can become an effective tool in future teaching repertoires.
https://symposium.foragerone.com/2025-racas/presentations/73772

From Ruins to Reality: Comparing the Leica RTC360 and ScanStation P40
Fernando Ramirez *Natural & Physical Sciences*
Mentor:

Abstract:
This research compares the precision and accuracy of the Leica RTC360 to the Leica ScanStation P40 3D laser scanners used for historic preservation and equivalent accessibility. 3D laser scanners send a laser pulse from the scanner to the object and back allowing for determination of distance. High precision angular measuring tools on the scanners allow for the computation of a 3D location. Pulsing one million times per second and taking a dome of readings spaced every 5 mm or better allows for the creation of a high fidelity digital record of the building being scanned. The purpose of comparing the two instruments is to determine if the Leica RTC360 (~90 scans per day) is a viable replacement for the Leica ScanStation P40 (~20 scans per day) for scanning out to a maximum of 20 meters. Both scanners were deployed at the ruins of the cloister garth of Bective Abbey in Ireland with a single scan taken from both scanners at the same location. Scanning from the same location facilitates a direct comparison of how the two scanners document the abbey ruins. The Leica Cyclone software (version 2023) was used to conduct my analysis. Objects and distances between objects were measured at 4, 8, 12, and 20 meters from the scanner to assess both distance accuracy and detail accuracy. The results indicated the Leica RTC360 is a viable replacement for the Leica ScanStation P40 up to a 20 meter spherical range. The RTC360 also offers the advantage of obtaining four times as many scans per day compared to the Leica ScanStation P40, reducing the cost for digitally preserving these important historic sites. The resulting point cloud data is then taken through a processing workflow to display the historic site through a Web-based LiDAR viewer and augmented reality.
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Gel Chromatography and Kinetic Modeling of Single-Chirality Single Walled Carbon Nanotube Purification
Dominik Fedorowicz *Natural & Physical Sciences*
Mentor: Randall Tagg, Ph.D.

Abstract:
Single-walled carbon nanotubes (SWNTs) possess exceptional mechanical, electrical, and optical properties, making them valuable for applications in nanoelectronics, energy storage, and composite materials. These properties are fundamentally determined by chirality, which dictate whether an SWNT is metallic or semiconducting. Since chirality affects electronic, optical, and mechanical characteristics, precise separation of SWNTs is crucial for their effective use in advanced technologies. However, charity-selective separation remains a major challenge due to the subtle physical and chemical differences among nanotubes. Traditional separation methods, such as density gradient ultracentrifugation and electrophoresis, suffer from limitations in scalability and purity, making them inadequate for large-scale applications. In contrast, gel-based chromatography has emerged as a promising alternative by enabling scalable, high-purity separation based on the selective interactions between SWNTs and gel media. This technique relies on differential adsorption and elution, governed by nanotube diameter, surface energy, and surfactant coatings, allowing for precise separation through optimized conditions. With the introduction of a kinetic model that provides a deterministic framework for understanding gel-based SWNT separation, describing the dynamics of chirality-selective adsorption and enabling

precise control over the process. By offering a quantitative rather than purely empirical approach, this model enhances predictability, reproducibility, and efficiency in SWNT sorting. Beyond laboratory-scale applications, the scalability of gel-based chromatography has significant industrial implications, as it allows for high-throughput separation without compromising purity or efficiency. Furthermore, integrating automation and real-time monitoring based on kinetic modeling further optimizes production, making the large-scale manufacturing of chirality-pure SWNTs economically viable. This advancement supports breakthroughs in electronics, photonics, and nanotechnology, facilitating the widespread commercial application of SWNTs in high-performance devices and materials.
https://symposium.foragerone.com/2025-racas/presentations/73705

Genetic Characterization of Human Leukocyte Antigen (HLA) Alleles and Complement C4 Genes in Juvenile Dermatomyositis
Heran Russom *Biomedical Sciences*
Mentor: Paul Norman

Abstract:
Juvenile dermatomyositis (JDM) is an autoimmune disease that affects the skin and muscles of more than two million children in the U.S. Though this debilitating condition can cause muscle weakness and skin rashes that affect daily life, its underlying genetic mechanisms are not fully understood. Human Leukocyte Antigen (HLA) gene variability is closely linked to an increased susceptibility to JDM. The complement system's C4 A and B genes recognize and remove pathogens, and their irregular activation is a risk factor for this condition. The viral sequence of human endogenous retrovirus (HERV) influences C4 gene length in different individuals, which causes structural variation. This project will investigate the HLA and C4 genes of 556 sequenced JDM samples. We will use GenDX's NGSengine software to evaluate our sample's next-generation sequencing data for allele variants, read coverage and quality, and the percentage of genes mapped to an HLA reference. The bioinformatics tool C4Investigator will report C4 A and B gene copies, structural variation from the HERV insertion, gene coverage, and quality. These results will improve our understanding of the HLA alleles and C4 gene variations predisposing to JDM and inform the development of therapies tailored to these variations.
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Guided Assembly of Carbon-Based Nanoparticles via Electrokineticsand Lab-on-Chip Fabrication
Piper Malczewski *Natural & Physical Sciences*
Mentor: Randall Tagg, PhD.

Abstract:
The extreme, unpredictable effects of climate change are emphasized in industrially underdeveloped, low-middle income regions of the world. These effects will continue to grow unless special care is given to the climate resilience and energy poverty of such regions. This demonstrates the global demand for research in industrial energy consumption and efficiency. Low-cost energy systems, which apply natural, regionally abundant sources of carbon into devices that harvest or store energy, could both directly mitigate climate change and strengthen the resilience of regions vulnerable to its effects. Self-assembling nanomaterials have potential applications in industrial energy because they have demonstrated unique electrical and thermal conductivity, energy density, and malleability. These materials organize into definite nanostructures in response to an applied, non-uniform electric field. In application, this "guided assembly" into unique nanostructures presents the possibility of improved efficiency in energy harvest or increased energy storage in renewable energy devices or supercapacitors. This project has examined the effects of varied AC frequencies, voltages, and electrode geometries on the morphology of self-assembled, carbon-based nanostructures. We have tested colloidal suspensions of carbon black particles as a low-cost alternative to carbon nanotubes. The samples have been electrically characterized using voltage and current measurements to find impedance in response to the applied parameters. For each experimental geometry, imaging of particle accumulation has been compared to electric field modeling in COMSOL Multiphysics. The results have generated characteristic themes in electrokinetic phenomena observed at the applied parameters. These identifications will contribute to ongoing work in guided assembly of carbon-based nanoparticles via electrokinetics for applications in energy solutions. A novel technique using AutoCAD and CNC Milling for “Lab-On-Chip" fabrication is also presented here. This device has been designed to integrate unique experimental parameters, such as geometry-specific electrodes and a sample well for in-situ observation of colloidal samples.
https://symposium.foragerone.com/2025-racas/presentations/73755

HANA: Integrating Experimental Data and AI Predictions for Homodimer Structure Determination
Karen Pham *Biomedical Sciences*
Mentor: Woonghee Lee

Abstract:
Structure determination of homodimer proteins can lend invaluable insight on their functions and biological mechanisms. Due to the characteristics and symmetry of these proteins, it poses a great challenge to accurately determine their structure and confirmations. With the recent advancements of using neural networks and machine learning to predict protein structure, we can utilize these tools to aid in determining protein structure via nuclear magnetic resonance (NMR) spectroscopy. Here we present HANA, an open-source tool that integrates the structures generated from AI predictions with the experimental distance restraints to accurately determine the homodimer protein structure. HANA can produce models within a few clicks and validate with RMSD values. HANA can be accessed through Google Collaboratory Notebooks in the POKY suite, https://poky.clas.ucdenver.edu.
https://symposium.foragerone.com/2025-racas/presentations/73743

Heme and Macrophage Ferroptosis in an Iron-rich Environment
Faiz Minhajuddin *Biomedical Sciences*
Mentor: Joseph Onyiah

Abstract:
Macrophages' ability to recycle iron is important in maintaining homeostasis and iron levels in various animals and humans. The importance of iron recycling is highlighted in conditions like hemochromatosis (iron overload), atherosclerosis (plaque buildup in the arteries), and increased erythrophagocytosis (e.g. sickle cell disease). In recent years, many studies have examined a newly discovered form of cell death known as ferroptosis that is caused by iron-dependent accumulation of reactive oxygen species leading to damaging lipid peroxidation in the cell. How macrophages protect themselves from ferroptosis is not fully understood. Heme oxygenase-1(HO-1) is an anti-inflammatory, anti-oxidative enzyme responsible for catabolizing the molecule heme (an iron-containing molecule that helps transport oxygen throughout the bloodstream) into biliverdin, carbon monoxide, and iron. This enzyme is known for influencing the phenotype of macrophages typically heavily involved in iron recycling and clearance. This project aims to examine the effect of an iron-rich environment on macrophages and the influence of HO-1 on macrophage susceptibility to ferroptosis. This is to be studied in WT bone marrow-derived macrophages (BMDMs) as well as Hmox1 floxed/LysmCre(+/-) BMDMs that are deficient in HO-1. We will use flow cytometry to analyze the viability and phenotype of the macrophages, and qPCR to examine genes related to iron metabolism, macrophage proliferation, and ferroptosis. Our preliminary data in vitro suggests that an excess iron environment may influence the viability of macrophages, particularly HO-1 deficient macrophages. We hypothesize that in excess iron environments, HO-1 deficient macrophages are more susceptible to ferroptosis compared to WT macrophages. We hope that our work improves our understanding of mechanisms by which macrophages improve survival in the setting of various pathologies associated with increased iron metabolism.
https://symposium.foragerone.com/2025-racas/presentations/73754

Hidden Diversity of Fungi: Bankeraceae of CO and the Pacific Northwest
Matt Johnson *Natural & Physical Sciences*
Mentor: Andy Wilson

Abstract:
DNA sequence data and phylogenetic analysis is used to characterize mycorrhizal fungi diversity of the PNW. We aim to compare mycorrhizal fungi diversity between PNW and CO high elevation mixed conifer forest regions. **What mycorrhizal fungi are shared or exclusive between these regions?** How can multiple DNA regions help us characterize mycorrhizal fungi?
https://symposium.foragerone.com/2025-racas/presentations/73773

How does time of day impact the stress-protective effects of exercise?
Aaliyah Valdez *Biomedical Sciences*
Mentor: Dr. Benjamin Greenwood

Abstract:
It has been well established that exercise lowers the likelihood of developing stress-related mental health disorders in humans. Similarly, rodent studies have shown that exercise can mitigate stress-related behaviors that are similar to human stress-related disorders. The mechanisms through which exercise enables stress resistance, have strong circadian rhythms, suggesting that the development of stress resistance might depend on the time of day that exercise occurs. Indeed, prior studies in female rats show that the time of day can impact the stress-protective effects of exercise. However, it is still unclear if the same is true in males. The goal of this experiment is to examine whether time of day of exercise impacts the stress-protective effects of exercise in male rats. Adult male rats were randomly assigned to either

sedentary or exercise groups. Over 6 weeks, the rats in the exercise group were able to voluntarily run on wheels for the first three hours of their active cycle. The rats in the sedentary group were not allowed to run on wheels. After 6 weeks, rats in both conditions were either exposed to stress by inescapable tail shock or not exposed to inescapable stress. We found that stress protection is still effective when limited to the first three hours of the active cycle. Further experimentation is being conducted to determine if exercise during the last three hours of the active cycle can similarly produce stress-protective effects. Together with the female data, results indicate that the time of day at which exercise occurs influences the development of stress resistance, and that morning exercise may be more beneficial to mental health compared to exercise in the evening.
https://symposium.foragerone.com/2025-racas/presentations/73574

How Has The Current Political Climate Impacted Student Engagement and Participation on Campus?
Melany Hoover, Brooke Emken , Josh Purcupile, Kristin Fairorth *Social Sciences & Humanities*
Mentor: Jae Tsyitee

Abstract:
The political atmosphere within the United States has become increasingly divided, raising concerns about its potential impact on student academic well-being, engagement, and participation on campus. This research seeks to explore the ways in which the political landscape is influencing Colorado students in terms of their involvement in academic and social activities, extracurricular engagement, and interpersonal relationships with peers, faculty, and instructors. By implementing a mixed-methods approach, our study utilizes quantitative and qualitative survey questions to assess how students perceive and respond to political discourse within their campus. The quantitative component uses a Likert-like scale to respond to questions regarding students' stress levels, anxiety, frustration, inclusion, and motivation concerning the political climate and whether they feel supported by their university. The qualitative component includes open-ended survey questions that allow respondents to eloborate on their experiences and share insights on how political discussions, on and off campus, influence student engagement, whether it is impacting their sense of belonging and willingness to participate in campus life, how they support themselves, and how they feel the university supports them. Our research intends to gain a better understanding of how issues of politics impact student experiences and engagement and how universities can support students by fostering environments that encourage open conversations, enhance mental well-being, and promote civic engagement without magnifying political polarization.
https://symposium.foragerone.com/2025-racas/presentations/73736

Human Pulmonary Arterial dECM Extraction and Functionalization for Use in 3D Bio-printed PAH Models
Layla Blair *Tech, Engineering, & Math*
Mentor: Chelsea Magin

Abstract:
Pulmonary arterial hypertension (PAH) is a devastating incurable fibrotic disease which leads to damage to the heart due to scarring and stiffening of the blood vessels in the lung. It is four times more likely to impact women than men. These sex differences are not fully understood and are not consistently recapitulated in rodent studies or current *in vitro* models; therefore, previous studies have rarely translated to effective treatment results in human clinical trials. An unmet need remains to bridge the gap between current pre-clinical models and human clinical trial outcomes. To build sex-specific *in vitro* models, we compared two methods of incorporating decellularized extracellular matrix (dECM) from female or male patients into dynamic 3D bio-printed hybrid-hydrogels to engineer better 3D models of PAH. Our first protocol involved extracting and decellularizing ECM from human pulmonary arteries through a series of detergent, salt, and DNase washes followed by a pepsin digestion to solubilize and reduce protein fragment size. Our second method involved growing ECM using human pulmonary artery adventitial fibroblasts (HPAAFs), decellularizing the matrix, and incorporating a guanidine-based solution to solubilize the proteins. Assays for residual DNA, total protein content, and total primary amine concentration were performed on the dECM to analyze the effectiveness of both methods. Future directions for this project include functionalizing the dECM obtained from both methods using a Traut's Reagent reaction to thiolate free amine groups for incorporation into 3D cell-laden bioprintable inks to create sex-specific 3D constructs that can be used to simulate PAH disease progression and study cell activation.
https://symposium.foragerone.com/2025-racas/presentations/73676

Identification of novel drugs to treat alcohol use disorder
Remla Abdul *Biomedical Sciences*
Mentor: Dr. Benjamin Greenwood

Abstract:

Alcohol-dependent people can experience withdrawal syndrome when alcohol consumption is stopped or significantly reduced, making them more sensitive to relapse. Animal models are used to mimic alcohol dependence and relapse in humans because they have been known to voluntarily consume alcohol in laboratory settings. Significant improvement from alcohol-dependent behavior by 12-step programs and inpatient treatments typically takes considerable time and persistence. However, a novel drug that can reduce the alcohol craving in alcohol-dependent people can be a faster and more attainable solution. To explore this, oral gavaging was used to administer the drug in rats. The identity of the drug or its target cannot be disclosed because of the Non-Disclosure Agreement that has been put into effect. The goal of this study is to investigate how we can potentially avoid/prevent relapse in alcohol-dependent rats. The rats will be made alcohol-dependent using 15% Ethanol before the drug is administered to potentially block relapse. This will allow us to test a drug's ability to remove the alcohol craving in alcohol-dependent rats, even in the presence of alcohol. The rats will then be perfused and their brains, liver, and blood samples will be tested for the presence of the drug which will give information on if the drug bypassed the blood-brain-barrier, if the drug was effectively being metabolized by the liver or if there are any signs of liver disease caused by the excessive drinking, and drug alcohol concentration in the blood to see if rats metabolized the drug and alcohol through their bloodstream. So far, we found that the drug reduced relapse in a dose-responsive manner. A high dose of 30 mg/kg significantly reduced relapse, a lower dose of 10 mg/kg did not significantly reduce relapse, and the lowest dose of 3 mg/kg had no effect on relapse.
https://symposium.foragerone.com/2025-racas/presentations/73760

Identification of Single-Scattering Interactions in SuperCDMS Dark Matter Detectors
James Amidei *Natural & Physical Sciences*
Mentor: Amy Roberts

Abstract:
The Super Cryogenic Dark Matter Search (SuperCDMS) experiment aims to detect weakly interacting massive particles (WIMPs) using cryogenic semiconductor detectors and superconducting sensors. WIMPs are expected to scatter elastically from atomic nuclei and are defined in large part by their incredibly small interaction probability. Since the chance of even a single scattering event is exquisitely small, the chance of a WIMP scattering multiple times is vanishingly small by comparison. This makes the ability to identify and filter out cases of multiple scattering events vital for accurate event reconstruction and the elimination of background from the detector signal. This presentation explores possible methods which may be used to identify multiple scattering events using detector geometry and phonon and ionization signal patterns to improve event classification. Improved event classification of this kind will help ensure a more accurate dark matter search and refine our understanding of detector response.
https://symposium.foragerone.com/2025-racas/presentations/73677

Identifying novel intramolecular protein crosslinks formed by oxidative stress compounds
Katherine Schultz *Natural & Physical Sciences*
Mentor: Jefferson Knight

Abstract:
Many processes involved in health and disease involve modifications of biological molecules. During periods of oxidative stress for example, lipid peroxidation in cell and organelle membranes results in the formation of reactive lipid aldehydes including 4-hydroxy-2-nonenal (4-HNE), which can irreversibly modify proteins at Cys, His and Lys residues. The Knight lab is interested in studying the role of these modifications on insulin secretion during the onset of Type I Diabetes (T1D) by conducting proteomic analysis on secretory pathway proteins in insulin-secreting β-cells. Modifications on key amino acid residues can alter the affinity of protein binding and reactive sites, resulting in reduced or complete loss of protein function through single-amino acid modifications (monolinks) or intramolecular crosslinks between two amino acid residues within the same protein. While most current proteomics analysis methods can identify monolinks, they do not search for crosslinks. In order to test for crosslinks in particular proteins, we treated purified secretory pathway proteins with 4-HNE, digested with trypsin, and performed tandem mass spectrometry (LC/MS/MS) proteomics analysis. Employing a software package designed to detect crosslinks, we observe masses corresponding to 4-HNE crosslinking between two Lys residues in a site crucial for membrane binding. Because this Lys cluster is highly conserved across the membrane binding regions of many secretory pathway proteins, our results suggest that these other proteins may also experience crosslinking by lipid aldehydes during oxidative stress; further analysis of proteomic data is needed. More broadly, this novel discovery of intramolecular 4-HNE crosslinks may provide insight into the mechanism by which oxidative stress leads to secretory pathway dysfunction in β-cells and the onset of T1D.
https://symposium.foragerone.com/2025-racas/presentations/73740

IGSF3 Requirement for Repair of Human Lung Endothelial Cell Injury

courtney Moeder *Biomedical Sciences*
Mentor: Dr. Irina Petrache

Abstract:
Rationale: By altering cell migration, the tetraspannin interacting protein Immunoglobulin superfamily 3 (IGSF3) impairs lung epithelial wound repair and barrier function during cigarette smoke exposure (Schweitzer et al., JCI insight 2020) and contributes to cancer metastases (Guo et al., Cancer sci. 2024). Although both known IGSF3 isoforms (IGSF3-1 and IGSF3-2) are expressed in lung endothelial cells, their role in lung endothelial cell function is less defined. We hypothesized that IGSF3 is required for endothelial cell migration and barrier function in both homeostatic conditions and during injury. **Methods:** Gain- and loss of function of IGSF3 in transformed human lung microvascular endothelial cells (HULEC) were achieved via lentivirus transduction of IGSF3 overexpressing stable cell lines (isoforms 1 and 2, each C-terminally or N-terminally V5-tagged) and via targeting CRISPR-Cas9, respectively. Electric Cell-substrate Impedance sensing (ECIS) was used for measuring cell proliferation rates (transcellular capacitance) as well as monolayer barrier function and repair (trans-endothelial cell resistance, TER) following electrical heat-induced wounding and electrical fencing. Cell proliferation was measured by CCK8 assay. **Results:** After confirming overexpression by western blotting, trans-endothelial capacitance measurements for 24 hours indicated that overexpression of both IGSF3 isoforms significantly decreased cellular proliferation, from 1.3-fold (N-tagged isoforms -1 and -2, p=0.004 and 0.01, respectively) to 3.7-fold (C- tagged isoforms -1 and -2, p Monolayer formation in the IGSF3-overexpressing cells was achieved at a higher, isoform-dependent capacitance, suggesting these contact-inhibited monolayers were more permeable than control cell monolayers. Wound healing of the monolayer was decreased in cells that overexpressed IGSF3 compared to control (N-tagged isoforms 1.3-1.7 fold from control; C-tagged isoforms 3.5-5.0 fold from control). **Conclusion:** IGSF3 overexpression inhibited cell proliferation, robust monolayer formation, and inhibited wounding healing response in endothelial cells in an isoform-specific manner. These results suggest that IGSF3 has an important role in the permeability, angiogenesis, and remodeling of the microvascular endothelium. Its plasma membrane localization in tetraspanin-enriched microdomains may play a critical role in cell-cell and cell-matrix interactions and subsequent signaling that regulates endothelial cell functions. Funding source: DOD W81XWH-22-1-0255
https://symposium.foragerone.com/2025-racas/presentations/73684

"I'm going to embody what you need": Exploring the Social Identities of First-Born Latinas
Isabella Luna *Social Sciences & Humanities*
Mentor: Dr. Edelina Burciaga

Abstract:
The current state of mental health and counseling services often disregards the cultural nuances of Latinas' social experiences, perpetuating systemic inequality by employing a one-size-fits-all model. This study focuses on answering the research question: how does Latino familial socio-culturalization influence the identity formation, roles, romantic relationships, and mental health of first-born Latinas? Utilizing sociocultural analyses of Latino morals/values, feminist theory, and childhood development models, I developed a semi-structured interview guide. Eleven interviews have taken place with first-born Latinas who are between the ages of 18-35 years old, identify as cisgender women, and who are currently in or have been in a serious romantic relationship. The study fills a gap in Latina/o sociology by bringing together the literature on the sociology of family and gender, Latino culture, and identity formation. Following the coding of 9 hours of interview transcription, themes from the findings included: Exploration of the Latino familial dynamics, Latino culture's role in either establishing a community or contributing to isolation, the process/interaction with various coping mechanisms, and–arguably our most important theme–the formation and influence of an "Eldest Daughter Identity" across various spheres of life. Further phases of the study will focus on further understanding of an "Eldest Daughter Identity" among a more diverse group of Latinas.
https://symposium.foragerone.com/2025-racas/presentations/73616

Impact of Prehospital Language Barriers on Stroke Care and Patient Outcomes
Ian Espinoza *Biomedical Sciences*
Mentor: Dr. Layne Dylla

Abstract:
Background: Language barriers in emergency medical settings may contribute to disparities in care delivery and outcomes for patients experiencing acute stroke symptoms. This study aimed to evaluate differences in compliance with American Heart Association (AHA) – recommended prehospital stroke metrics and assess their impact on door-to-CT times and patient disposition.
Methods: We conducted a retrospective observational analysis of 1,546 EMS encounters with suspected stroke. Patients were categorized by the presence or absence of a documented language barrier. We assessed compliance with

prehospital stroke metrics, including stroke scale documentation, blood glucose level (BGL) testing, last known well (LKW) documentation, and on-scene time. Multivariable regression models evaluated associations between language barriers, EMS performance metrics, and outcomes, including discharge disposition and door-to-CT times. Comparative analyses were conducted using national data from the National EMS Information System (NEMSIS).
Results: Only 4.9% of patients (n=76) had a documented language barrier. Compared to patients without language barriers, those with a barrier had lower rates of stroke scale documentation (46.1% vs. 72.2%, p **Conclusion:** Language barriers were associated with inconsistent EMS performance in critical prehospital stroke metrics, including stroke scale documentation and BGL testing. Although patients with language barriers had shorter on-scene times and more favorable discharge dispositions, these metrics alone are insufficient to ensure optimal care. Standardizing EMS assessment protocols and expanding access to interpreter services may reduce and improve the quality and timeliness of stroke care for all patients.
https://symposium.foragerone.com/2025-racas/presentations/73636

Imposter Phenomenon Among College Students
Rylen Hershey, Jensen Harry, Marit Loessl, Danielle Yancey, Aaron Valdez *Social Sciences & Humanities*
Mentor: Joanna Tsyitee, MSc

Abstract:
There is a hidden phenomenon that affects students worldwide. It is known as imposter phenomenon, and is particularly prevalent in academic settings, where students may feel unqualified despite their achievements. Our study defines imposter phenomenon as the intrusive fear that one is unqualified and incompetent in comparison to their actual abilities. We aim to explore how imposter phenomenon affects college students and whether these feelings intensify throughout one's academic career.

To investigate this phenomenon, we conducted a survey of CU Denver students using Qualtrics to assess levels of imposter phenomenon across different academic years and identify potential demographic or cultural patterns. Additionally, we conducted a literature review to examine existing research on the impact of imposter phenomenon on student well-being and academic performance. By analyzing survey data and scholarly perspectives, we seek to determine whether imposter phenomenon worsens over time and whether intervention strategies should be integrated into college curricula to help students recognize and manage these feelings.
Understanding the trajectory of imposter phenomenon in higher education is crucial for promoting student success and mental well-being. If our findings confirm that imposter phenomenon intensifies as students progress through college, it brings to light the need for universities to implement intervention strategies, such as mentorship programs, awareness, and educational resources. Through this research, we contribute to the broader conversation on imposter phenomenon's psychological and cultural roots, and highlight the importance of promoting confidence and resilience in academic environments as one prepares to graduate.
https://symposium.foragerone.com/2025-racas/presentations/73776

Improvements to Imaging of Carbon Nanoparticles
Kate Tucker *Natural & Physical Sciences*
Mentor:

Abstract:
Several research studies have focused on visually tracking the motion of carbon nanoparticles in response to electric fields. However, nanoparticles placed in a colloidal suspension are too small to be individually visible using conventional bright-field optical microscopy. Richard Zsigmondy developed a method for side-illumination to make colloidal particles visible nearly a century ago. Methods for creating such illumination with thin light sheets have improved since 2007. This study proposed implementation of a cylindrical lens and spatial filter to achieve light-sheet illumination as a means to enhance contrast and resolve nanoparticles more effectively. This technique induced scattering from a thin layer of the sample to reduce out-of-focus light to be captured by a Raspberry-Pi-computer camera. Three types of samples were used: pure water, a dilute transparent colloidal suspension, and a concentrated opaque colloidal suspension. Imaging of each sample was captured by passing a single laser beam through a cylindrical lens to focus the beam in one dimension in the objective's focal region. The laser sheet passed through the sample perpendicularly to the microscope viewing axis. The resolution of images and videos demonstrated enhanced particle visibility and improved tracking of their motion within the observed field. The improvements suggest the application of light-sheet illumination when placing carbon nanoparticles in an electric field will facilitate prediction and control of their motion. Manipulation of nanoparticles enables controlled assembly of carbon nanotubes with tailored strength, flexibility, and conductivity characteristics for application in technical devices like sensors and energy transducers.
https://symposium.foragerone.com/2025-racas/presentations/73753

Inhibition of Insulin Secretion Induced by Oxidative Stress Compounds
Isaiah Lowe *Biomedical Sciences, Natural & Physical Sciences*
Mentor: Jefferson Knight

Abstract:
In Type 1 Diabetes (T1D), immune cells release inflammatory agents that target pancreatic cells, resulting in the overproduction of toxic reactive oxygen species (ROS) and the eventual death of the β-cells that normally produce insulin. Due to a lack of key antioxidant enzymes, β-cells are especially prone to protein damage caused by ROS and reactive aldehydes. It is known that proteins become permanently modified by ROS during oxidative stress, but which proteins are targeted in β-cells during early T1D and the effects of this protein damage on insulin secretion are poorly understood. In order to probe the connection between oxidative stress, protein damage, and insulin secretion, our lab has induced oxidative stress in insulin-secreting cell lines by treating them with either pro-inflammatory cytokines or the reactive aldehyde species 4-hydroxynonenal (4HNE). We measured insulin secretion following treatment with both ELISA assays and by counting individual secretion events in real time using total internal reflection fluorescence (TIRF) microscopy of cultured cells. From both ELISA and microscopy data, we observe that 4HNE inhibits insulin secretion within 5 minutes, to baseline levels as low as that of unstimulated cells. Treating β-cells with cytokines for >24h also leads to oxidative damage. We observe a 50% decrease in insulin secretion in cells treated with cytokines for 72 hours. To compare the profiles of damaged proteins between these two models of oxidative stress, we used mass spectrometry to detect and identify modified proteins from 4HNE- and cytokine-treated β-cells. We find that the two treatments lead to different sets of proteins becoming modified, with some overlap between the two sets. These findings suggest that multiple stressors contribute to oxidative damage in early T1D and offer important insight into how these complex stressors inhibit insulin secretion.
https://symposium.foragerone.com/2025-racas/presentations/73682

Integrating Social Work into Geriatric Dental Education: A Patient-Centered Approach to ADRD through the CU GeriCare Everywhere Fellowship
Saeideh Dadras, Steffany Chamut *Social Sciences & Humanities*
Mentor: Dr. Sarah Dirks

Abstract:
Age-related disparities in oral health are worsening among older adults, particularly those affected by Alzheimer's Disease and Related Dementias (ADRD). Barriers such as limited mobility, cognitive decline, lack of integration between dental and healthcare services, and lack of caregiver support further exacerbate these inequities. The *CU GeriCare Everywhere Fellowship*, launched in alignment with Colorado Senate Bill SB23-031, addresses this critical public health challenge by integrating social work into geriatric dental education, emphasizing patient-centered care and the social determinants of health (SDoH).
Social workers play a pivotal role in coordinating care, navigating complex health systems, and advocating for underserved populations, especially older adults living with or at risk for ADRD. By training dental providers to work alongside social workers, the program creates an interdisciplinary framework grounded in real-world applications such as case-based learning, community-engaged training, and clinical simulations. Further, clinical application efforts are informed by evidence from the *Health and Aging Brain Study–Health Disparities (HABS-HD)*, a large, longitudinal study that identifies socioeconomic, neurological, and behavioral indicators of ADRD risk across diverse populations. Integrating insights from HABS-HD enables tailored care models that recognize oral health as both a risk factor and indicator for cognitive decline.
The CU GeriCare Everywhere Fellowship aims to train the next generation of geriatric dental providers and integrate it with social workers' expertise into integrated patient-centered-based care models. By embedding social work into geriatric dental education, the CU GeriCare Everywhere Fellowship advances a scalable, interdisciplinary model to reduce ADRD-related oral health disparities. It empowers future providers to address aging-related complexity with compassion, equity, and innovation, and ultimately supporting older adults to age with dignity while supporting caregivers to access comprehensive care for their loved ones.
https://symposium.foragerone.com/2025-racas/presentations/73649

Integrating Social Work into Geriatric Dental Education: A Patient-Centered Approach to Alzheimer's Disease and Related Dementias
Steffany Chamut, Saeideh Dadras, Eryka Kalunta *Social Sciences & Humanities*
Mentor: Bruce Dye, DDS, MPH

Abstract:
Age-related disparities in oral health are worsening among older adults, particularly those affected by Alzheimer's Disease and Related Dementias (ADRD). Barriers such as limited mobility, cognitive decline, lack of integration between dental and healthcare services, and lack of caregiver support further exacerbate these inequities. The *CU GeriCare Everywhere Fellowship*, launched in alignment with Colorado Senate Bill SB23-031, addresses this critical public health challenge by integrating social work into geriatric dental education, emphasizing patient-centered care and the social determinants of health (SDoH).
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https://symposium.foragerone.com/2025-racas/presentations/73612

Intermittent Fasting Improves Bone Fracture Healing in Obese/T2D Mice
Aaron Tran *Biomedical Sciences*
Mentor: Dr. Honey Hendesi

Abstract:
Obesity is a risk factor for delayed fracture healing and nonunion, causing pain, disability, and increased medical costs. Intermittent fasting (IF) is a dietary regimen with metabolic benefits that has been shown to alleviate obesity-related pathologies. This study aims to investigate whether IF can mitigate the negative effects of obesity/type 2 diabetes (T2D) on fracture healing by enhancing the callus cartilage and bone content while reducing callus fat content.
For this study, 18-week-old high-fat diet (HFD) fed obese male mice were divided into two groups: 1) continued free access to HFD (HFD-Adlib), and 2) subjected to every-other-day access to HFD (HFD-IF). After four weeks, mice underwent unilateral tibial fracture surgery. Changes in body mass were monitored during the study, and a glucose tolerance test was performed after four weeks of IF regimen prior to the fracture surgeries. At 21 days post-fracture, calluses were assessed using micro-CT and histology. Micro-CT scans were performed using a Scanco scanner, and Scanco software was used for manual segmentation to measure bone volume/total volume of the calluses. Tissue segmentation and measurement of cartilage and fat area within the calluses were performed using Qu Path software. Results were compared among HFD-Adlib, HFD-IF, and a group of non-obese mice on a control diet.
Results indicate that IF reduced weight and improved glucose tolerance in HFD-IF mice. Micro-C and histology analyses revealed that HFD mice had reduced callus mineralization and cartilage content, while fat content was increased in the callus. Notably, IF could increase callus BV/TV and cartilage content and reduce fat accumulation in the callus. Collectively, our study confirms that IF can enhance impaired fracture healing in obese mice and warrants further investigation as a potential strategy to mitigate the risk of fracture nonunion in obese patients.
https://symposium.foragerone.com/2025-racas/presentations/73680

Interobserver error analysis of dorsal canting and longitudinal shaft curvature of Pan paniscus and and Macaca mulatta
Morgan Hunsinger *Natural & Physical Sciences*
Mentor: Dr. Caley M. Orr

Abstract:
Anthropologists measure phalangeal form to inform locomotor behavior in fossil primates. Comparisons to bones in the fossil record are difficult without a reliable procedure that can be easily applied. This study aims to investigate the reliability of two commonly used variables: longitudinal shaft curvature (measured as the included angle of a best-fit circle) and the dorsal inclination of the proximal metacarpophalangeal joint surface (measured as a dorsal canting angle). An inter-observer error study was conducted to test the reliability these metrics on the fifth proximal phalanx in bonobos (*Pan paniscus*) and rhesus macaques (*Macaca mulatta*). The study was designed to maximize potential chance of error as

macaques and bonobos are significantly different in body size and locomotor behavior, while the 5th phalanx is the most variable in shape. Utilizing data from 36 individuals of *P. paniscus* and *M. mulatta*, two observers input a series of 8 landmarks for each phalanx, generating two data sets using the 3D modeling software Amira. Data was run through MATLAB using established calculations and two sets of measurements compared using a paired t-test. Though dorsal canting showed a statically significant effect of observer, the average difference was 2.2° – a small effect that does not swamp the observed differences between. Included angle was not statistically significant (0.05 > p), which validates the reliability of the procedure used. In examination of the fossil record, these methods may be applied to reliably assess the locomotor behavior and distinguish between different species.
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Introducing Neutron Beam Resolution into AZURE
Brie Clarke *Natural & Physical Sciences*
Mentor: Dr. Amy Roberts

Abstract:
In the early 1990s, a man named J.A. Harvey performed a total cross section experiment for a beam of neutrons and Nitrogen-14 (14N). Cross sections are a measurement of how probable a reaction is to occur, and a total cross section looks at all possible reactions. He found that at around 433 keV, the reaction could be fit with a 7/2 spin level. This experiment was repeated by R.J. deBoer in the early 2020s, with different results. He found that the reaction was fit with a different spin level, 5/2. This means that the two results were fitted with different energy levels and needed to be looked at to see why. The purpose of this project is to introduce neutron beam resolution into the nuclear physics program AZURE to fit the 14N(n, total) cross section data to compare Harvey's and deBoer's experimental results. This code convolves the theoretical beam data with the experimental beam data, providing a more accurate fit for the reaction. To introduce the neutron beam resolution into the AZURE program, I edited the convolution code that it uses to do its calculations. These edits introduced an energy dependent convolution, which allowed AZURE to fit the 14N(n, total) data over the specified energy range. After the implementation, I put in the 14N(n, total) data into the program and ran the calculations. These calculations produced a plot that showed that the 5/2+ fit was the proper fit for deBoer's data, while the 7/2+ fit was still the one that matched Harvey's data. This agrees with deBoer's findings and indicates that incorporating beam resolution was not the answer to the disagreement.
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Investigating Rotational Dynamics in Motor Control: The Interplay of Sensory Feedback and Neural Intrinsic Connectivity
Elyas Larfi *Natural & Physical Sciences, Tech, Engineering, & Math*
Mentor: Dr. Mazen Al Borno

Abstract:
Neuroscientific studies have identified rotational dynamics in the motor cortex during reaching movements, suggesting an underlying low-dimensional structure in motor control. However, a key question arises regarding whether these dynamics are driven by sensory information or intrinsic neural connections. In this work, we investigate these dynamics using the MuJoCo simulation environment and the state-of-the-art MyoSuite musculoskeletal model with 26 degrees of freedom (DoF) in a center-out reaching task trained via deep reinforcement learning. We first analyze whether single-unit neural activity exhibits periodicity and confirm that it does. Using jPCA, we observe that population-level dynamics exhibit structured rotational activity across neural activity and joint/fiber movements, but not muscle activations, suggesting that the rotational structure is more closely related to neural and joint/fiber interactions. Comparing artificial networks trained on the same task, we find that RNNs capture rotational dynamics more effectively than FNNs and exhibit greater robustness to noise perturbations. Our findings suggest that previous research may have overlooked sensory feedback as a key component of motor cortex (MC) activation, primarily due to the reliance on EMG signals rather than complex sensory feedback from joints and fibers. We propose that both intrinsic neural connections and sensory feedback are crucial elements in MC activation.
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Investigating Sex Differences in Dilated Cardiomyopathies caused by Titin Mutations
Maydha Kumar *Biomedical Sciences, Tech, Engineering, & Math*
Mentor: Brisa Peña

Abstract:

Heart failure is the leading cause of death worldwide. Dilated cardiomyopathy (DCM) is one of the most common forms of heart failure, characterized by left ventricular dilation and contractile dysfunction. Genetically, roughly 20% of DCM cases are caused by gene truncations to the protein titin (TTN) which is involved with muscle contraction and elasticity. Women presenting with DCM with the TTN mutation are less likely to develop disease symptoms, have better systolic function, and have low rates of atrial fibrillation compared to men. These comparatively better symptoms could be a cause for the late diagnosis of women with heart failure. Furthermore, Women with TTN mutations are more likely to get DCM shortly before, during, or after giving birth (peripartum). Despite sex differences being known, there is less representation of women in epidemiology studies of DCM. Heart failure, and specifically DCM caused by TTN truncation, is known to impact sexes differently, but both sexes are given the same treatments. To allow future research to create sex-specific or sex-inclusive diagnosis and treatment of TTN truncated DCM, there is a need to determine pathophysiology of the mutation on the tissue level. To begin analysis, heart tissue will be analyzed to determine if the mutation caused a tissue level measurable difference. Human heart samples will be collected from a TOPMED databank (with ~700 hearts), where small portions were sectioned. Heart sections were then stained with H&E to confirm correct tissue isolation and view basic structures, followed by Masson Trichrome to determine muscle vs collagen deposition. Representative samples will then be sent for atomic force microscopy (AFM) to examine stiffness. Finally, all images generated from stains and microscopy will be analyzed via digital image processing to create a standardization for image analysis and quantify data from the image.
https://symposium.foragerone.com/2025-racas/presentations/74082

Investigating the role of Irisin in exercise-induced stress resistance
Juliet Freund *Biomedical Sciences*
Mentor: Dr. Benjamin Greenwood

Abstract:
Traumatic experiences and adverse life events result in negative impacts for both mental and physical health. In rodents, inescapable stress (IS) reduces social exploration and increases fear responses that mimic behaviors associated with depression and anxiety in humans. Exercise has long been understood to be a way to foster stress resistance and voluntary wheel running (VWR) in rodents prevents the negative effects of IS. Stress resistance from exercise involves constraint over stress-induced activation of serotonin neurons in the dorsal raphe nucleus (DRN), but how the experience of exercise is communicated to the DRN to result in stress resistance is unknown. Irisin, a hormone secreted by skeletal muscle during exercise, has the ability to cross the blood brain barrier and has been implicated in the mood modulation and cognitive benefits of exercise. The goal of this experiment is to determine whether peripheral administration of Irisin is sufficient for generating the stress-protective effects of exercise and if so, if DRN serotonin neurons express the receptor for Irisin. Adult male C57/BI6 mice received a peripheral injection of either control virus (AAV8-GFP) or a virus encoding for Irisin (AAV8-Irisin). After six weeks, subjects were assigned to either inescapable stress or no shock. All subjects were tested for juvenile social exploration and shock-elicited freezing twenty-four hours later. Tissue samples were collected one week later to test for levels of Irisin-Flag in blood . Expression of the Irisin receptor mRNA expression on DRN neurons was quantified with RNAscope. We hypothesize that AAV8-Irisin will prevent the anxiety-like behavioral effects of stress and that Irisin receptor will be present in the DRN. If results confirm the hypothesis, this will support the theory that muscle – to – brain communication through Irisin is important for the stress-protective effects of exercise and could be a therapeutic target for stress-related disorders.
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Investigating the Role of NLRP3 Activation in Modulating Tumor-Associated Macrophages During PDAC Treatment
Migachelle Romano *Biomedical Sciences*
Mentor: Dr. Carlo Marchetti

Abstract:
PDAC is one of the most lethal cancers that invariably presents at an advanced stage and is refractory to most treatment modalities. For patients with unresectable disease (80-85% patients at diagnosis), chemotherapy is the main treatment option but has shown to be highly debilitating, only limited effective and patients are at high risk for progression. Defining feature of PDAC that participate in the high mortality rate and chemotherapy resistance is the immune tolerant and desmoplastic tumor microenvironment (TME) which enables tumor to progress unabated by adaptive immunity. Thus, identification of new targetable factors that drive immune suppression are imperative.
Using an orthotopic PDAC mouse model, we discovered that the combination of gemcitabine (GEM), a commonly used chemotherapy agent, and NLRP3 inhibition significantly reduced tumor size compared to the single agent treatments. Notably, GEM has shown to increase the expression of NLRP3 in the primary tumor and that NLRP3 localizes with mitochondria. Single cell RNA sequencing (sc-RNA seq) analysis revealed a significant change in the expression profile of tumor-associated macrophages (TAMs) from NLPR3 deficient mice (*nlrp3*$^{-/-}$) treated with GEM when compared to wild-

type mice treated with the same chemotherapy. Specifically, TAMs from *nlrp3*$^{-/-}$ mice treated with GEM exhibited significant downregulation of gene associated with mitochondrial function and metabolism, including the oxidative phosphorylation (OXPHOS) pathways when compared to the control mice. Phenotypical analysis of TAMs from *nlrp3*$^{-/-}$ mice also showed reduction in the expression levels of CD163 when compared to the control groups. This is particularly relevant in PDAC because increased level of CD163 expressing TAMs that relies on OXPHOS correlate with worse prognosis and reduced response to chemotherapy in PDAC patients.
In conclusion, these studies demonstrate that NLRP3 plays a pivotal role in shaping the immune landscape of the TME in PDAC following chemotherapy. Further, the data suggest a possible link between NLRP3 activation and chemotherapy response, at least in murine models.
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Invisible Scars: The Impact of Discrimination in Medical Settings on Allostatic Load
William Navarrete Moreno *Biomedical Sciences, Social Sciences & Humanities*
Mentor: Frank Degruy, MD

Abstract:
This study examines how perceived discrimination in medical settings (measured via the Discrimination in Medical Settings scale) relates to physiological stress, as captured by allostatic load biomarkers. In a cross-sectional sample of 7,350 All of Us participants, higher DMS scores were associated with a 16 % increase in the odds of high allostatic load (OR = 1.16, p
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It's In The Details - Interdisciplinary Design Agency
Gabriel Herrada *Arts & Media*
Mentor: Alex Yueyan Li

Abstract:
Our research examines the role design plays at the most minute detail. Contemporary architecture practice has shifted its paradigm away from this mode of thought and has thus caused the details of a design project to fall out of the hands of the designer.
We've begun to reclaim this agency as designers through the exploration of 3 projects, all of which rigorously examine details not only in design, but also in the representation and fabrication that occurs within the scope of a design project.
'Rural Shed' examines the juxtaposition between rural structures, contemporary design and construction practices. Examining material expression, assembly logic, and the relationships between the designer and the fabricator. Challenging us to consider not only how we design something but how we represent this design in drawings and thus how the project is carried out by skilled laborers.
'Table Sets' juxtaposes traditional fabrication practices with uncommon materials. Honeycomb Aluminum: Often used in aircraft is here reimagined as a robust lightweight sheet stock used to produce tables and stools. The project pushes us to explore unconventional methods of assembly and develop an intimate understanding of the material and its fabrication processes.
'Foundation House' Is a residential project that explores structural underpinning as a mode of interior expansion. This project tasks us with developing a close interdisciplinary relationship between the designer, the structural engineer and the contractor to navigate the unique circumstances of layered additions.
We believe that through rigorous design, precise representation and strong interdisciplinary communication we are able to regain our agency as designers down to the most seemingly insignificant detail, keeping the purity of our design intact throughout project development.
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Jewish Anti-Zionism, *Fin de Siècle* to Present: Towards a Pro-Semitic Anti-Zionist History
Lulu Joanis *Social Sciences & Humanities*
Mentor: Marjorie Levine-Clark

Abstract:
Zionists legitimize Zionism by equating anti-Zionism with antisemitism. I define a Zionist as someone who supports Israel's colonization of Palestine. Histories of Jewish opposition to Zionism throughout the late nineteenth and early twentieth centuries reveal that conflation between anti-Zionism and antisemitism cannot be assumed outright. While antisemitic anti-Zionism certainly exists, anti-Zionism also exists in forms deeply motivated by concerns for Jewish survival. The Jewish Labor Bund—the secular Jewish socialist parties of Lithuania, Poland, and Russia—reveals that the

coalition between Jews and non-Jewish workers in the region comprised a sizable strand of leftist opposition to Zionism. In occupied Palestine, Hebrew Canaanism competed with Zionism for legitimacy as a Jewish right-wing nationalist ideology. Radical Jewish Orthodoxy represents the intersection between religious traditionalism and anti-Zionism. Altogether, Jewish anti-Zionist histories challenge the Zionist notion that any critique of Israel must be antisemitic. In fact, Zionist philosophy has often led Zionist Jews to carry antisemitic sentiments. Zionism purported to provide a quick solution to a series of urgent problems facing European Jews. Even before the Holocaust, geopolitical events like the Russian Revolution and the British alliance with the Russian Whites—an anti-Bolshevik party that led an anti-Jewish campaign across Eastern Europe—added to the swelling current of antisemitism that closed national borders to most newly deported Jews. Desperation necessitated the exodus of many of these Jews to Israel, a nation-state that promised their protection. Zionism thus began as a flawed but—from the perspective of newly liberated Jews—moment-meeting philosophy that ultimately worked towards ensuring Jewish survival. I argue that, in the twenty-first century, Zionism has become obsolete. Israeli Zionist military actions have continually endangered Jews across the Middle East and the global diaspora.
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Justice-Involved Survivors: An Examination of Generational Trauma, Resources, and Resilience
Alana Blanford, Courtney Christman, Michelle Morales *Social Sciences & Humanities*
Mentor: Courtney Leapley

Abstract:
The body of research on IPV/DV survivor resilience is steadily growing, there is literature that addresses outcomes of preventative education programs, types of programs, as well as the impacts such trauma can have on all survivors. This specific study explores the complex and lasting impacts of generational trauma among survivors of domestic violence (DV) and intimate partner violence (IPV), using literature reviews and survey distribution methods to gather data. First, this study intends to identify key factors contributing to generational trauma in DV/IPV survivors and further examine how these factors influence resilience over time. Additionally, the study analyzes the effectiveness of youth DV prevention measures, providing insights into their role in preventing future instances of DV/IPV. Researchers also conducted an evaluation of post-incident resources to determine the significance of any impact on survivor resilience. The literature review highlights multiple different educational strategies, including social-emotional learning, healthy relationship programs, and bystander education, which have been shown to promote healthy relationships and reduce violence. Additional research should be done to examine the presence of educational programs and policies surrounding accessibility to survivors' resources.
https://symposium.foragerone.com/2025-racas/presentations/73595

Kittn: A new approach for noise reduction and signal preservation in NMR spectroscopy
Qingxuan Fei *Biomedical Sciences*
Mentor: Dr. Woonghee Lee

Abstract:
Nuclear magnetic resonance (NMR) is a crucial tool for studying the structure and interactions of biomolecules. However, obtaining high-quality spectra faces many challenges due to factors such as low protein concentration, sample aggregation, and the inherent instrumental limitations of NMR spectrometers in practice. In the case of low concentrations or complex samples, the spectra are often accompanied by significant noise, which can affect the subsequent interpretation of NMR spectra from biomolecules. Although existing NMR data processing tools such as NMRPipe and TopSpin offer zero filling and linear prediction tools for improving spectral resolution, they are limited in dealing with noises, especially in retaining weak signals and processing data with low signal-to-noise ratio. To resolve these challenges, I propose to develop a new type of NMR data processing tool that focuses on spectral denoising and signal enhancement, called Kittn: Kreative Imaging Techniques for NMR Spectra. This tool will be integrated into the POKY suite. It will use advanced signal processing algorithms to reduce noise interference while preserving key information in the spectra. The development of this tool will improve the accuracy of peak identification, which could contribute to the structural analysis of biomolecules, such as the viral protein Nsp9, for which obtaining high-resolution data is difficult due to low concentration and dynamic nature. Additionally, Kittn will not only benefit the study of biomolecules but also support other fields like material science and cosmetics by providing more reliable and high-quality spectral data.
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Latino Immigrants in Higher Education
Genessi HERNANDEZ *Social Sciences & Humanities*
Mentor: Vel Arellano

Abstract:
Immigrant and first-generation students are less likely to graduate with a bachelor's and master's degree due to limited guidance when transitioning and navigating higher education. They face many barriers when trying to take this next step such as financial and language barriers. Due to their background, there are various opportunities citizen students gain that are not accessible to immigrant students which can make a difference in their journeys when navigating higher education. Through my research, I hope to provide resources to this community of students, specifically at the University of Colorado Denver, to facilitate the college pursuit process. For instance, I aim to give help with financial aid, degree planning, contacting academic advisors, and many more challenging aspects of college. Throughout the progression of my project, I would like to add more information to the CU Denver websites that focus on this community and conduct interviews to learn about their personal experiences. I aspire to assist immigrant students in reaching success and find ways to motivate them to keep studying despite their obstacles. Every student deserves the chance to pursue their dreams and have the resources necessary every step of the way.
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Limb regulatory sequence evolution in the skink genera *Lerista* and *Brachymeles*
Harshini Ranjit *Natural & Physical Sciences*
Mentor: Carlos Infante

Abstract:
The evolution of vertebrate limbs has a long history of research in evolutionary biology, and while evolutionary patterns have been well studied, the molecular changes underlying limb evolution are just now being uncovered. Unique limb adaptations have evolved in many vertebrates, but within the evolutionary group of squamate reptiles (snakes/lizards), limb loss has occurred at least 25 times. Our research goal is to understand how limb gene regulatory regions, the regions in the genome that control the expression of genes that control and guide embryonic limb development, evolve and to discover what happens to them when they are no longer required by the organism when limbs are lost. Specifically, to identify whether regulatory regions that are essential for limb development have either decayed via deletion or are conserved and perhaps recruited for new functions in lizards with reduced limbs. To study these gene regulatory regions, we initially focused on a group of Australian skinks, (Scincidae) genus *Lerista* as they display a range of limb morphologies within their species. Recently we added to our analysis members of *Brachymeles*, a genus of skinks from Southeast Asia that exhibit extensive limb reduction and limb loss. *Brachymeles lukbani* and *Brachymeles miriamae* are known to be limbless but recent research may suggest the possibility of hidden limbs in *Brachymeles lukbani*. We have sequenced and assembled the complete genomes of ten limbed/limbless species of *Lerista* and two limbless species of *Brachymeles* using Pacific Biosciences HiFi long read sequences. These complete genomes assemblies were then aligned along with outgroups using the whole-genome aligner Progressive Cactus. By recording the presence of indels in known limb regulatory regions from literature, we can compare and analyze regions of the genome between the two genera to reveal genomic changes that may have contributed to limb reduction in these species.
https://symposium.foragerone.com/2025-racas/presentations/73621

Long Way Home - Junior Thesis Project
Angellina Fioretto *Arts & Media*
Mentor: Hans Rosenwinkle

Abstract:
Our film titled *'Long Way Home'* is about an alcoholic musician who reflects on how he became successful after he loses his girlfriend and violates the trust of his best friend and mentor. For this project, our goal is to redefine how alcoholism and addiction are portrayed in films, and to use film techniques to help viewers understand and sympathize with our character and have a better understanding of his addiction. American media has normalized the use of alcohol to the point where lots of films and television shows use addiction as a joke that isn't taken as the serious epidemic it is. Our film stands out against these stereotypes, as instead we are portraying our main characters as someone who is struggling and consistently getting impacted by this addiction in his life, pushing him to the point of realization that only he can fix the trajectory of his life. We allow him to sit with all of his consequences, and let him get to the realization that nobody else can make this life change for him, using his connection to music to guide him down a path of sobriety. We hope that through sharing this film with the communities around us, it will allow for a safer, less-hostile place to talk about alcoholism and addiction.
https://symposium.foragerone.com/2025-racas/presentations/73608

Lowry Lifeforms: Bacterial Diversity on Bioreactor Media Surfaces

Victoria Crane *Natural & Physical Sciences*
Mentor: Dr. Timberley Roane

Abstract:
The Lowry Landfill Superfund site, located in Arapahoe County, Colorado, is a regional landfill that accepted solid and industrial waste from the mid-1960s to 1980. In response to industrial waste, including the potentially carcinogenic 1,4-dioxane, contaminating the surrounding soil and groundwater, an onsite water treatment plant was installed to address the community's growing concerns. Plastic media was introduced to the water treatment plant reactors to provide a surface for microbial biofilms to form which allow researchers to conduct microbiological studies. Researchers gather specimens by sampling the plastic media and attempting to culture the microorganisms present while assuming that the microbial growth on the plastic media is uniform.
It is valuable to address the distribution and density of bacterial growth on these plastic media as they could have implications for past and future research endeavors since bacterial populations may differ on the plastic media's interior compared to its exterior. If there are inconsistencies in the distribution of bacteria over the plastic media's surface, significant errors could be introduced to studies about bacterial growth in the reactors. Additionally, the analysis and categorization of bacterial populations on the plastic media will contribute to our understanding of how bacteria degrade 1,4-dioxane, and other contaminants, in the water.
Characterizing microbial diversity within the Lowry water treatment plant reactors using DNA extraction, high-throughput sequencing, and computational analyses using QIIME 2 will enhance our understanding of the ability of microorganisms to degrade and remediate chemically impacted groundwater.
https://symposium.foragerone.com/2025-racas/presentations/73699

Measuring Attention Restoration Using Useful Field of View (UFOV) Test
Rayan Haloul *Social Sciences & Humanities*
Mentor: Dr. Carly Leonard

Abstract:
According to Kaplan's Attention Restoration Theory (ART), being in nature reduces mental fatigue, thus improving management of cognitive resources. In this framework, being in nature promotes "soft fascination," the idea that nature effortlessly captures attention, without depleting cognitive resources, therefore restoring cognitive capabilities. On the other hand, urban settings produce "hard fascination," which depletes cognitive resources due to features found in metropolitan settings, leading to cognitive fatigue.
This study design proposes that a relevant method of evaluating cognitive impacts of environmental exposure is through the Useful Field of View (UFOV) test, which gauges peripheral and attentional abilities through limiting head & eye movements, forcing participants to heavily rely on cognitive resources for accuracy. This design aims to investigate cognitive effects of viewing nature vs. urban scenes by using UFOV performance as a measure for cognitive efficiency. One way the UFOV has been implemented is to predict the likelihood of older adults getting into car accidents, due to its ability to assess peripheral attention. What makes UFOV intriguing as a measure for ART is that it serves as a direct and measurable indicator of spatial abilities, unlike other measures previously used to assess ART.
We hypothesize that soft fascination improves UFOV performance by lowering cognitive load, thus expanding attentional spread. This design will employ a within-subjects design where eye-tracking metrics, such as, blink rate, fixation time, pupil dilation, and saccades will be examined during the scene-viewing phase to gain a deeper understanding of potential effects found in UFOV results.
This study design is worth investigating since UFOV hasn't been applied in the context of ART and it may have practical implications to our understanding of how environmental cues influence cognitive performance. Additionally, the implications of this investigation could influence urban planning and cognitive health interventions for enhancing well-being in urban settings.
https://symposium.foragerone.com/2025-racas/presentations/73807

Mechanical Properties of Dual Wall 3D Printed Continuous Fiber Reinforced Polymers.
Nikola Hilderbrand *Tech, Engineering, & Math*
Mentor: Dr. Guoying Dong

Abstract:
Prior research done by the mechanical engineering department here at CU Denver shows that single wall continuous fiber structures did not have an adequate improvement in mechanical properties compared to their same structure made entirely out of polymer filament. This coupled with the fact that topology optimization can be used to adequately orient the fibers such that majority of the load a part takes is taken up by the fiber and not the polymer, provides sufficient justification to explore dual wall continuous fiber structures and how they compare to their polymer counterpart. In my

research the optimization of spacing of the fibers was investigated first. Samples were created and sent to a 3- point bend test to explore their stiffness, and max force able to be withstood by bending. It was found that the 1.5 mm spacing had the best results. From this test, dual wall cellular structures were constructed with the spacing of the fibers considered and tested to yield favorable results. Both stiffness and max force before yielding went up significantly. Thus, this concludes that dual wall cellular structures have better mechanical properties than single wall and just polymer cellular structures. However, there are improvements to be made specifically with the failure due to buckling along the layer lines of the part. This means that the strength between the fibers and the polymer is not adequate and leads to buckling of the part. This leads to future research opportunities to explore how to strengthen the bond through the manufacturing process to lead to less chances of a part to fail in buckling along the printed layers.
https://symposium.foragerone.com/2025-racas/presentations/73643

Mental Distress and Mild Cognitive Impairment Study
Mason Pearce *Social Sciences & Humanities*
Mentor: Dr. Ronica Rooks

Abstract:
Westrick et al. (2024) states that 15 million older adults aged 65+ face financial insecurity, with higher socioeconomic status linked to a reduced risk of conditions like heart disease, diabetes, cancer, stroke, and cognitive decline. Racial and ethnic disparities in health are significant, as Black and Hispanic individuals report poor health at twice the rate of White individuals (Adler & Stewart, 2010).
This study explores ways to reduce racial/ethnic disparities (e.g., Black, Latino, and White) in older adults with mild cognitive impairment (MCI) by supporting their cognitive, social, and physical well-being through paid employment. We hypothesize that work provides a sense of purpose, encourages physical activity, offers social support, and reduces the risk of cognitive decline and dementia.
We conducted qualitative interviews to examine the mental distress associated with employment and job cessation in older adults (55+) with MCI, investigating if these experiences vary by race/ethnicity and impact cognitive function over time. We utilized thematic analysis for our interviews using Atlas.ti, and quantitative secondary data analysis using data from the Health and Retirement Study (HRS). A literature review and gathering hiring practices from local employers were also completed.
Preliminary results indicate that individuals with MCI enjoy work but need support from family and colleagues to navigate their diagnosis. Our literature review found that physical activity has the most promise for improving cognitive function, but job complexity and social engagement also offer protective benefits. We found that employers in the Denver Metropolitan area are open to hiring individuals with cognitive decline.
This study aims to understand how paid employment can reduce cognitive decline and racial/ethnic health disparities in older adults with MCI. Despite recruitment challenges slowing data collection, we anticipate that future results will provide valuable insights into how employment can support cognitive, social, and physical well-being in this population.
https://symposium.foragerone.com/2025-racas/presentations/73810

Modeling Electron Collisions with Rubidium Atoms Using Dirac B-Spline R-Matrix Code
Ethan Ryan *Natural & Physical Sciences*
Mentor: Dr. Kathryn Hamilton

Abstract:
Plasma, commonly referred to as the fourth state of matter, is formed when a gas becomes so hot that electrons within the gas detach from their parent atoms, allowing electricity to move without hindrance. Plasmas are found in many places, including celestial bodies such as stars, and even in our homes in the form of lights and lightning. The study of plasma is a variant of atomic physics centering around atoms interacting with particles like light or electrons and the interactions are modeled as collisions. These collisions are analogous to a golf ball hitting a tree. In both instances, scientists are interested in the motion, mathematics, and transfer of energy between the moving object and target, known as cross-sections. With the technological revolution, scientists have since been able to create models of these situations through code which is now called computational physics.
The work of computational atomic physics aims to produce accurate data supporting the experimental results through the use of code repositories that will model electron collisions. In this study we strive to compute cross sections of Rubidium and ionized Rubidium using a suite of codes called Dirac B-Spline atomic R-Matrix (DBSR). An initial atomic structure description of Rubidium is generated using DBSR_HF, a B-Spline Dirac-Hartree-Fock program. Bound states of Rubidium, and subsequently the cross sections, are determined using the DBSR suite. The results of this study will determine if the DBSR code creates an accurate model of Rubidium atoms, and the cross-section data will be compared with experimental findings. Big picture, these results will contribute to the study of how high temperature clouds of gasses behave in space, and could lead to new applications for Rubidium plasma.

https://symposium.foragerone.com/2025-racas/presentations/73728

Modeling In Vitro Cardiac Exercise using Electrical Stimulation
Grace Spillers *Biomedical Sciences*
Mentor: Brisa Pena

Abstract:
Exercise is a mechanical stimulus that provides numerous health benefits to different organs. In many forms of disease, exercise can improve health and survival. However, the mechanisms driving pathological effects of exercise on the heart are largely unknown. Current animal models are not ideal for performing high impact exercise, as they are not receptive to prolonged and intense running. To overcome this, in vitro models for testing exercise at the cellular level will be employed. Our work will remain in 2D models, but it is the goal to eventually work in a 3D in vitro system using conductive reverse thermal gels (RTG) (U.S. patent 12012478). A stimulus generator machine will be used to deliver electrical stimulation to cells in 2D culture for extended periods of time. The induction of stress will be performed multiple times in certain samples to analyze the effects of repetitive exercise. The use of electrical stimulation on an immortalized cardiomyocyte cell line (AC16) and Neonatal Rat Ventricular Myocytes (NRVMs) has already been performed. From these preliminary tests it has been observed that cells which receive electrical stimulation appear enlarged compared to their control groups. Further analysis of in vitro cardiac exercise is necessary to interpret the results of the electrical stimulation trials; as well as examine cardiovascular predictors of health and potential risk factors of exercise.
https://symposium.foragerone.com/2025-racas/presentations/73757

Modulation of the Superior Colliculus and Pulvinar Thalamus in mice during visuomotor behaviors.
Jenna Banh *Biomedical Sciences*
Mentor: Gidon Felsen

Abstract:
Active vision is a process that involves movement, attention, and interaction with the environment. Aspects of active vision include rapid eye movements, called saccades, and orienting head movement, both of which produce a visual signal. However, it is not known how the visual system accounts for these signals to correctly interpret visual input. Saccades are initiated by the superior colliculus (SC). In primate models, evidence suggests that a projection from the SC to the pulvinar thalamic nucleus, plays a role in modulating visual representations during saccades. To examine the mechanistic role played by this pathway, we have developed a mouse model in which we can access the projection from the SC to the lateral posterior nucleus thalamus (LP), the mouse homolog of the pulvinar nucleus in primates. We hypothesize that a signal from SC to LP is critical for providing motor information to the visual system. To initially test this hypothesis, we first anatomically traced the SC-LP pathway. We will transiently inhibit SC premotor neurons that project to LP via pathway-specific chemogenetics, and examine the effect on the modulation of visual representations by saccades. Preliminary analyses will focus on assessing changes in saccade dynamics and head movement following chemogenetic perturbation. Based on prior findings, we expect to observe head movement coincident with saccadic eye movement that will be reduced after SC inhibition.These experiments will reveal the SC-LP as an important pathway for active vision.
https://symposium.foragerone.com/2025-racas/presentations/73978

Molecular Dynamics Simulations of Wild-Type and R89K Mutant of NarK Membrane Protein
Sophie Morgan *Natural & Physical Sciences*
Mentor: Dr. Hai Lin

Abstract:
Nitrate is the mineral form of nitrogen, which is essential to make protein and DNA building blocks. The NarK membrane protein is a nitrate/nitrite antiporter and serves a critical role in nitrate uptake by archaea, bacteria, fungi, and plants. Understanding the NarK mechanism can aide in the enhancement of nitrogen uptake and alleviate environmental impacts by decreasing fertilizer use. Experimentally, it has been shown the R89K mutation causes disruptions to the proteins function. In this study, we commence a molecular dynamic investigation on the structures of the wild-type and R89K mutant of NarK, focusing on the interactions between nitrate and the key residue R89.
https://symposium.foragerone.com/2025-racas/presentations/73727

Multi-method exploration of participant satisfaction in brief, virtual behavioral parent training group
Anthony Arredondo *Social Sciences & Humanities*

Mentor: Dr. Jacob Holzman

Abstract:
Prior research supports behavioral parent training (BPT) programs' effectiveness in improving parent and child outcomes. However, more research is needed to better understand sociocultural factors related to parent satisfaction with BPT and parents' unique experiences in BPT. To increase accessibility of BPT, we adapted a BPT intervention to be brief (i.e., 6, 1-hour sessions) and delivered through telehealth. Further the intervention manual was reviewed by bilingual and or bi-cultural clinicians for appropriateness to Spanish speaking communities. This study aims to examine whether parent satisfaction with BPT is related to parent income, education, and ethnicity. We hypothesized that there would not be a significant association between parent satisfaction and parent sociocultural factors. Parents (*n*=43) of 3- to 7-year-olds participated in a brief, group-based BPT intervention delivered via telehealth through an outpatient behavioral health clinic and a Head Start program. Parents provided self-reports of satisfaction and open-ended responses related to their experiences in BPT. We also explored parents' own words describing their experiences and feedback in this accessible BPT program. Sociocultural factors (e.g., parent income, education, ethnicity) were self-reported by parents. Parents also completed the Client Satisfaction Questionnaire and open-ended responses assessing their satisfaction with BPT, what they found helpful/useful, their experience practicing strategies from BPT, and their feedback. We found no significant differences in satisfaction by parent income, education, or ethnicity (*p*s > .05). Satisfaction with the group was relatively high (M=26.17; SD=5.92) with a range of 10-32 and a median of 28. Within the open-ended responses, preliminary coding revealed that the vast majority (80%) of participants had positive feedback about their experiences. Rapid qualitative coding procedures will be used to elucidate themes that emerge from parents' open-ended responses. These preliminary findings suggest brief BPT delivered via telehealth may be acceptable to parents from various sociocultural backgrounds.
https://symposium.foragerone.com/2025-racas/presentations/73640

Multiwavelength Investigation of BL Lacertae
Katie Riley *Natural & Physical Sciences*
Mentor: Alberto Sadun

Abstract:
Active galactic nuclei (AGN) are luminous regions at the centers of distant galaxies. Blazars, a subclass of AGN, are characterized by relativistic jets of ionized matter that point towards Earth. These jets radiate across the entire electromagnetic spectrum. BL Lacertae (BL Lac) is a well-known blazar for its extreme variability and the topic of this research. In October 2022, a high energy flare was detected by the Fermi-Large Area Telescope (LAT), followed by another being observed by the Very Energetic Radiation Imaging Telescope Array System (VERITAS) in November 2022. These detections started a multiwavelength observational campaign to investigate the nature of these flares. Timing analysis is done for the Fermi-LAT flare to determine rise and decay rates between the gamma-ray data and optical observations from the Asteroid Terrestrial-impact Last Alert System (ATLAS). The results show that the growth and decay rates differ across wavelengths, suggesting more complex emission mechanisms at play. Broadband spectral modeling was done for the VERITAS flare that shows it favors a synchrotron self-Compton (SSC) model with an external inverse-Compton (EIC) component over just a SSC model. This highlights the role of external mechanisms for Intermediate-frequency BL Lac objects (IBL). Since IBLs are the transitional state between high-frequency and low-frequency Bl Lac objects, studying them can help in understanding the evolution of black holes and how they interact with the matter around them.
https://symposium.foragerone.com/2025-racas/presentations/73725

Nature Narratives of Hope
Hillary Quarles, Amy DePierre *Social Sciences & Humanities*
Mentor: Gregory Simon

Abstract:
In a world that feels upside down, where climate change and political polarization run rampant, we wonder whether it's possible to build a better future. *To spite* this uncertainty, we offer *Nature Narratives of Hope* – a project to **gather and amplify messages of hope.** The project asks four questions on our feelings about nature, capturing diverse perspectives on nature, motivations, and our common future**.** By sharing these narratives with the broader community through social media and other networks, we aim to cultivate hope, purpose, and action in response to environmental and societal challenges. ***Nature Narratives of Hope*** provides a platform for inspiration and collective vision challenging the dominant stories on climate and justice in the media. Join us in inspiring dialogue, creating solidarity, and empowering individuals to believe in and work toward a better future together.
https://symposium.foragerone.com/2025-racas/presentations/73310

Navigating Health through Social Networks and Demographics: A Mixed-Methods Study of Latine Communities in Southwest Denver
Fernando Colunga Rios *Social Sciences & Humanities*
Mentor: Ronica Rooks

Abstract:
Social networks play a critical role in shaping health and promoting well-being. These networks extend beyond individual relationships, forming broader systems of connection that influence health access, behaviors, and perceptions. This study explores how social networks within Southwest Denver's Latine community create both opportunities and limitations for health, with attention to their relationship to socioeconomic factors such as income and education. Using a mixed-methods approach, this research integrates qualitative and quantitative data from unstructured interviews and social network name generators. Fourteen participants who live in or engage with the Southwest Denver area shared insights into their health experiences, cultural identity, and social ties. Thematic analysis was used to explore narratives related to racial/ethnic identity and the meaning of health, while early network analysis provided preliminary insights into relational patterns and perceived support. This approach will explore cultural similarities and differences in perceptions of health and how social networks influence health outcomes. This study also focused on Native American and Vietnamese American individuals. The findings are expected to provide new insights into how social networks influence health, leading to practical recommendations for improving community health outcomes and living conditions
https://symposium.foragerone.com/2025-racas/presentations/73635

New Workflow for 3D Visual Alignment of Laser Scanner Data Documenting Medieval Architecture
Franklin Rojas *Natural & Physical Sciences*
Mentor: Michael "Bodhi" Rogers

Abstract:
St. John's Priory is a medieval ruin near Trim Castle that is open to the public in Trim, Ireland. Some areas at the site are limited to visitors due to instability or preservation. Virtual tourism via LiDAR scanning can create equivalent accessibility for visitors. The Leica P40 LiDAR scanner was used to capture the site in the form of a 3D point-cloud. This was done using a "Visual Alignment" method, which requires multiple scans with overlapping features to stitch together and register to become one complete scan. Tall grass around the site caused issues when registering the different scans in the Lecia REGISTER software. This was because the moving grass did not allow for much overlap to be calculated for adequate registration. A new workflow in the software allows selection of specific areas within the scans. Selecting for only the vertical structures and excluding other noise in the scans allowed for a better registration of more than 90% and less than 1 millimeter of deviation. These registrations are within the historic preservation standards and make the scans of the priory more realistic for virtual historic preservation.
https://symposium.foragerone.com/2025-racas/presentations/73644

"OK, Boomer": Housing Transitions for Large Generation may Depress Home Sale Prices
Jeni Hale, Liz Young, Matt Lanterman *Social Sciences & Humanities*
Mentor: Yosef Bonaparte

Abstract:
Whether it is via inability to live alone, desire to move to retirement communities, or passing away, the baby boomer generation is likely to begin leaving their single-family residences en masse in the coming decade. Our research focuses on the relationship between the baby boomer generation's housing transition and housing prices. As the baby boomer generation transitions out of single-family residences, the U.S. housing market approaches a potential inflection point. The data suggest that the upcoming housing turnover may depress home prices and reshape the U.S. housing market. Our analysis was conducted using a predictive model. For the dependent variable, we used Zillow's median sale price data. For the independent variables, we used Google Trends search frequencies for "assisted living" and "nursing home," St. Louis FRED's housing inventory data, and two constructed variables of 24-month rolling Z-scores for each Google Trends' term. The regression analysis yielded strong results with an in-sample R^2 of 0.98 and an out-of-sample R^2 of 0.44. Our research showed a strong negative correlation between elder care search intensity and future housing prices. For example, a single standard deviation increase in "assisted living" searches was associated with an average $3,007 decrease in median home prices the following year. According to Freddie Mac research in 2022, the baby boomer generation represents 21% of the U.S. population and 38% of homeowner households. As this generation transitions away from demographically-disproportionate homeownership over the coming decade, resulting increases in housing inventory may lead to decreased U.S. housing prices. This demographic shift could impact all housing-market stakeholders including developers, investors, current homeowners, and first-time home buyers.
https://symposium.foragerone.com/2025-racas/presentations/73667

Optimizing Immunofluorescent Protocols for Exploring the Role of Elastin in Achilles Tendon Adhesions
Anthony Sawaged *Biomedical Sciences*
Mentor: Michael David, PhD

Abstract:
This study aims to optimize elastin staining protocols for rat ankle histology, specifically targeting the Achilles tendon, to improve the visualization of elastin fibers. Elastin is a critical extracellular matrix protein providing elasticity to tissues, and its degradation possibly plays a role in tendon injuries and healing. The fluorescent dye Elastin-AF633, which selectively stains elastin proteins, was used in combination with elastase, an enzyme that breaks down elastin proteins. The study compared slides stained with Elastin-AF633 dye alone to those treated with elastase before staining to confirm elastin presence. The reduction in fluorescence intensity after elastase treatment indicated elastin degradation. Various concentrations of Elastin-AF633 (1:500, 1:1000, and 1:2000) and application times (1, 2.5, and 5 minutes) were tested to identify the optimal conditions for distinguishing elastin from other tissues, but no significant differences were observed, with the main effect being a decrease in fluorescence intensity. TrueView was also tested on the samples to help remove more of the autofluorescence, but no significant results emerged. Samples were mounted with VECTASHIELD Vibrance antifade medium containing DAPI, which counterstains nuclei and preserves fluorescence signals. The optimized staining protocol was used with a ZEISS Slide Scanner and Fluorescent microscope, effectively highlighting elastin in the dermis, capillaries, and on the edges of the tendons, while distinguishing it from tissues exhibiting autofluorescence. These findings offer insights into elastin distribution in rat ankle tissues. The next step will be to apply this protocol to compare elastin levels in ruptured versus normal Achilles tendons in rat models, aiming to explore elastin degradation and remodeling during tendon injury and healing processes.
https://symposium.foragerone.com/2025-racas/presentations/73620

Outcomes of IPV in Communities of Color
Christiana Smith *Social Sciences & Humanities*
Mentor: Courtney Leapley

Abstract:
Interpersonal violence (IPV) has been a major focus in social science research for decades, as it affects many aspects of human life. Most people have either experienced IPV themselves or know someone who has. Survivors of IPV are among those most deeply impacted, facing challenges such as depression, job instability, and self-esteem issues linked to social stigma. While these negative effects are well-documented, there is limited research on how they may differ for communities of color. It is unclear whether minority survivors of IPV experience these challenges in the same way as their white counterparts or if signs of perpetrator violence present differently across racial groups. This study seeks to address these gaps by examining the effects of IPV in diverse communities.
https://symposium.foragerone.com/2025-racas/presentations/73759

Personal Exposure to Particulate Matter (PM) 2.5 in Urban Microenvironments: Assessing Variability Across Daily Activities and Commuting Modes
Ronan Witte, Alisha Dahal, Jason Dutcher, Nolan Johan, Raghad Shaker *Natural & Physical Sciences*
Mentor: Dr. Ben Crawford

Abstract:
Particulate matter less than or equal to 2.5 μm (PM2.5) is a significant air pollutant that is positively correlated with adverse health risks. City-wide fixed monitoring stations fail to capture localized microenvironment variation in human exposure. Using low-cost personal air monitors, we investigated how PM2.5 concentrations varied based on daily activities and microenvironments, focusing on commute modes, workplaces, and residential locations. We expect that pedestrians and cyclists will have the highest acute exposure during commute times, with commuters in public transit and personal vehicles experiencing less exposure and anticipate relatively higher PM2.5 exposure in indoor environments that are nearby major roadways and industrial areas. This study may help identify which stakeholders would benefit from PM2.5 exposure mitigation efforts.
https://symposium.foragerone.com/2025-racas/presentations/73578

Perspectives on Lung Cancer Screening in the LGBTQ+ Community: Insights from LGBTQ+ Serving Professionals
Irene Liang *Biomedical Sciences*
Mentor: Dr. Jamie L. Studts

Abstract:
Purpose
Annual lung cancer screening (LCS) is the most significant opportunity to reduce the burden of lung cancer, the leading cause of cancer mortality in the US. Individuals identifying as sexual and gender minorities (SGM) experience higher risk of developing lung cancer due to elevated smoking rates, but have low rates of screening.
Methods
Individuals who work with the SGM community were recruited to participate in a multi-method study using semi-structured interviews and brief surveys. Interviews addressed attitudes on and factors influencing engagement with LCS, while surveys collected demographic data and smoking history. Survey data were analyzed descriptively. Interviews were analyzed using rapid qualitative analysis.
Results
Ten Clinicians, eight individuals from SGM-serving organizations, six students, and one researcher (N=25) from Colorado were interviewed between 2024 and 2025. Most participants identified as members of the SGM community (88%). Eight had a history of smoking (32%). Five themes emerged from the data. First, there was general agreement that LGBTQ+ community members were unaware of LCS . Second, participants recognized that community members would like to hear about LCS from a trusted clinician, but the difficulty of finding welcoming clinicians needed to be addressed. Third, participants noted the importance of ensuring that considerations of SGM and smoking related stigma were infused into LCS outreach, clinician interactions, and clinic environments. Fourth, participants noted that individuals with multiple minoritized identities needed additional support in the LCS process. Fifth, participants noted that engagement efforts, particularly of gender minority communities, must consider the changes in the current political environment.
Conclusion
Cancer screening engagement efforts must develop robust and trustworthy engagement strategies that reach into communities that have historically complicated relationships with the healthcare system. Understanding the perspectives of LCS in the SGM community from individuals working with this community provides insight into the development of targeted engagement interventions.
https://symposium.foragerone.com/2025-racas/presentations/74053

PhishSense
Ashlynn Hainey, Deveyn Hainey *Tech, Engineering, & Math*
Mentor: Dr. Zhengxiong Li

Abstract:
94% of organizations were victims of phishing attacks in 2024, and 96% of those were negatively impacted. PhishSense is an artificial intelligence-powered Gmail add-on designed to help users identify, understand, and educate themselves on potential phishing threats all in their inbox. The goal of this project is to bridge the gap between identifying and educating users. In order to do so, PhishSense enables users by allowing them to choose what emails they wish to scan, which PhishSense securely extracts metadata, stores relevant information in a hosted database, and then leverages large language models to classify the message as “Safe” or “Phishing”. Utilizing this data, the project will provide the user with statistics and relevant information to make an informed decision regarding the email. The testing methodology includes benchmarking PhishSense’s accuracy against known phishing datasets, assessing false positive/negative rates, and analyzing user interactions to measure effectiveness. Through preliminary testing, PhishSense achieved 88% accuracy, surpassing the average human detection rate of about 80%. PhishSense helps bridge this gap by not only identifying threats but also educating users on how to recognize and avoid them. By combining large language model technology, cloud-based big data services, and a user-friendly UI, PhishSense aims to reduce the likelihood of personal loss, deception, and other cyber risks associated with email-based attacks. Unlike traditional phishing detection tools that solely flag threats, PhishSense is built to educate users—helping them understand why an email is phishing, what red flags to look for, and how to make safer decisions in the future.
https://symposium.foragerone.com/2025-racas/presentations/73321

Photisms: Entangled Senses
Ryan Cooper *Arts & Media*
Mentor: William Adams

Abstract:
RaCAS Abstract
Ryan Cooper
Media Exhibit within Arts & Media

As I was talking with my friend about his experiences regarding the phenomenon knownas synesthesia, he was able to describe a full abstract landscape based on a song we were listening to. This was the inception of Photisms, which are the synesthetic visual sensations perceived by people affected with synesthesia. Growing up in Colorado, I always appreciated nature and the sounds it created, forming a unique sensory experience. The camera and visual elements allow me to highlight the interconnectedness of sights and sounds, and how certain stimulants invoke specific moods by emphasizing specific synesthetic textures and colors.
An arrangement of synesthete Alexander Scriabin's 24 Preludes accompanies the imagery. Scriabin associated musical keys with colors, which originally was an organizational method for himself but later influenced his writing. This composer's scores can also be found as marks within the images. Photisms takes traditional photographic subjects and combines and reframes them to expand the medium past the singular sense of sight. Both synesthetes and non-synesthetes can connect tones with colors, demonstrating the hidden functions in our brains and displaying a relation between all people. This link is reflected in the panoramic image ratio and the dissolving of human and instrumental forms into the landscape. This is done in a digital workspace I like to consider my playground. The different components fit like pieces in a puzzle within the compositions, like how humans are just cogs in the machine that is our world. I hope my viewers can use the atmosphere I create to reflect on their own personal connection to nature and their senses.
https://symposium.foragerone.com/2025-racas/presentations/73821

Predicting Individual Differences in Visual Search Using Measures of Attentional Breadth and Saccadic Inhibition
Bradley Stewart, Chloe Alvarado, Zachariah Weir *Social Sciences & Humanities*
Mentor: Dr. Carly Leonard

Abstract:
In a world of abundant sensory stimulation, people must move their eyes to sample the visual environment. However not all people use the same strategies nor do they have the same abilities. Previous studies have shown those who make slower first eye movements on visual search tasks demonstrate higher accuracy and performance. In the current experiment, we use well established cognitive measurements to better understand how attentional and inhibitory functioning may relate to these individual differences in oculomotor behavior during visual search. A useful field of view (UFOV) task is used to test attentional breadth and peripheral sensitivity by varying contrast, followed by a dual-task block requiring both central and peripheral responses. A saccadic stop signal task (SST) is used to test inhibitory abilities by making participants cancel planned eye movements when a stop signal appears. It was hypothesized that individuals with longer first saccade latencies will perform better on the UFOV task. This would suggest that individuals with increased attentional breadth may spend more time accumulating peripheral information, resulting in slower saccades. Additionally, those with faster first saccade latencies may do so because of poor inhibition, as measured by the SST. Therefore, they do not have the time to gain peripheral information, leading to worse saccade accuracy and more overall fixations to complete the visual search task. The results show that the inhibitory measures collected did not significantly predict oculomotor behavior during visual search tasks. However, several measures of attentional breadth were significantly associated with visual search behavior. Overall, this work shows that variability in visual search performance may be impacted by individual differences in attentional abilities. Further research is needed to investigate whether other types of inhibitory abilities play a meaningful role in visual search.
https://symposium.foragerone.com/2025-racas/presentations/73734

Pressed upon Landscape: Colorado History Through the Lens of Poetry
Asma Al-Masyabi *Social Sciences & Humanities*
Mentor: Brian Barker

Abstract:
This project considers Colorado history and how poetry might be used to engage with nuanced questions of what we consider history, how we present it, ways in which it has formed the present, and our own place within it. The history of our state is often overlooked and under-acknowledged in the public sphere, personal awareness, and education, though efforts are being made to change this. Knowing our past allows us to appreciate the present and how it has been shaped – and continues to be shaped – by what has preceded it. This understanding of history also critically includes consideration of our own interpretations of and relationships with history. Thanks to the generous support of a EURēCA Grant from the Office of Undergraduate Research and Creative Activities, I was able to supplement my research of archival documents, photographs, newspapers, and more with experiential research. This included several visits to History Colorado Center, as well as funding travel to important historic landmarks and places within our state, including Amache/Granada Relocation Center, where Japanese Americans were incarcerated during WWII; Sand Creek, where the Sand Creek Massacre targeting peaceful Native tribes took place; Limon, Colorado, where Preston John Porter Junior was lynched, among others. The role of poetry in this is to function as an attempt to understand, to acknowledge and share the knowledge of these events and their ramifications, as well as meditating on what we cannot know. Poetry has a unique

ability to connect with readers while exploring complex ideas in the span of a few pages. By combining poetry and history, I have given myself the chance to better understand the past, its implications, and my place within it, and invite others into this journey, one that they must take and continue for themselves.
https://symposium.foragerone.com/2025-racas/presentations/73775

Prevalence of the Use of Hallucinogens and the Link to Mental Health Outcomes
Muyang Cui *Social Sciences & Humanities*
Mentor: Laura Argys

Abstract:
Hallucinogens are drugs that cause changes in the perception of time, space, or consciousness. Specific hallucinogens include natural substances like psilocybin mushrooms and manufactured substances like MDMA (ecstasy). There can be negative behavioral and emotional consequences of using hallucinations, but early research also suggests that there may be mental health benefits of using hallucinogens. This has received attending in the popular press, and since 2019, some states (including Colorado) and municipalities (including Denver) have passed legislation to decriminalize the use of some hallucinogens. Many studies have looked at the use of substances among different groups. In particular, Jones et al. (2023) found psilocybin use was highest among Whites, Native Americans and Non-Hispanics of mixed race. My project will extend this work to examine patterns of use of hallucinogens by gender, age and education. They also examined the relationship between psilocybin and crime. I will use a similar methodology to investigate the relationship between hallucinogens and mental health. The project uses publicly available secondary data from the National Survey of Drug Use and HealthNSDUHfrom 2015 to 2023. NSDUH provides information on health and substance use from more than 50,000 individuals each year. Most importantly, it asks about mental health outcomes and specifically about the use of psilocybin and MDMA. Though this work examines the patterns of hallucinogen use for various groups by age, gender, and education, the primary analysis will be to estimate a regression model that examines the relationship between hallucinogen use and mental health outcomes. This model will allow us to understand the link between mental health outcomes (such as depression and self-reported mental health ratings) and hallucinogen use controlling for other characteristics, such as age, race, ethnicity, gender and urban status.
https://symposium.foragerone.com/2025-racas/presentations/73653

Probing Near Threshold Electron Dynamics of Neon with Attosecond Transient Absorption
Maggie Price *Natural & Physical Sciences*
Mentor: Dr. Kathryn Hamilton

Abstract:
Light matter interactions exist all around us; from a simple photon exciting a hydrogen atom to the opportunities offered by the emerging field of designer chemistry. The chemical reactivity in a system can be altered by directing electron position with light. Understanding the quantum nature of electrons, and their behavior when interacting with light, is vital to developing the building blocks for the study of light matter interactions of varying scales and complexities. Strong foundations will allow researchers to begin to approach more complex systems and the light matter interactions that govern them. Understanding provides a door to manipulation of the fundamental properties that define both light and the atomic features.
In order to study the nature of these light-matter interactions, one technique used is Attosecond Transient Absorption Spectroscopy (ATAS). ATAS uses a time-delayed extreme ultraviolet (XUV) and infrared (IR) laser pulse scheme, allowing us to take a series of time-ordered snapshots of our system of interest [1]. In this study, we will use the R-Matrix with Time-dependence (RMT) code [2] to implement the ATAS scheme in order to study the process of ionization in the element neon. Ionization is the removal of an electron in an orbital through an interaction with a photon of specific energy. Our results from the ATAS calculations will provide insight into electron behavior near the ionization threshold within the neon atom as it interacts with the ultra-short intense pulses of XUV and IR lasers. The use of the theoretical approach, when compared to an experimental one, provides a greater amount of control over the parameters used within the laser pulse scheme with less difficulty.
https://symposium.foragerone.com/2025-racas/presentations/73651

Psychosocial Characteristics of Hispanic and Latinx Youth Presenting to Pediatric Headache Clinic
Joselynn Calderon *Social Sciences & Humanities*
Mentor: Michelle Clementi

Abstract:

Introduction : Chronic pain, including migraine and other headache disorders, can significantly impair physical and mental health. Though Hispanic/Latinx individuals experience high rates of migraine, they are underrepresented in headache research and face barriers to care (Moreno et al., 2025). Hispanic/Latinx youth with headache disorders are especially vulnerable given that headaches and associated psychosocial concerns (e.g., difficulties coping with pain, anxiety/depression related to headache) can persist into adulthood (Palermo, 2020). This project aims to address this underrepresentation by exploring psychosocial concerns among a sample of Hispanic/Latinx youth with chronic headaches.
Methods: 57 Hispanic/Latinx patients (ages 10-18) with a headache disorder seen in the Children's Hospital Colorado Pediatric Headache Program completed questionnaires as part of standard clinical care in a multidisciplinary or behavioral health appointment. Questionnaires assessed headache-related disability, quality of life, and pain coping, anxiety (Generalized Anxiety Disorder-7; GAD-7), and depression (Patient Health Questionnaire-8; PHQ-8).
Results: Patients reported an average of 7.42 headache days over the past 2 weeks (*SD*=4.62). Over one-third of patients reported difficulty functioning in their day-to-day life due to headaches (33.4%). Approximately one-quarter endorsed poor quality of life (24.5%) or reported they did not have ways to cope with their headaches (28.1%). On average, patients reported mild anxiety (*M*=7.73, *SD*=5.46) and mild depression (*M*=8.36, *SD*=5.46). However, 33% of patients reported moderate to severe anxiety or depression.
Conclusions: Hispanic/Latinx youth presenting to a pediatric headache clinic were significantly impacted by headaches, including having difficulty engaging in activities, poor quality of life, difficulty coping with pain, and increased anxiety/depression. Understanding the burden Hispanic/Latinx youth with headache disorders face is a crucial step towards improving care and addressing health disparities for this population. Future efforts are needed to consider how treatment for Hispanic/Latinx youth with headache disorders may incorporate culturally sensitive approaches to increase acceptance and implementation.
https://symposium.foragerone.com/2025-racas/presentations/73709

Public Transportation and Social Equity: Evaluating Denver's Light Rail System in policy and Practice
Angel Ruiz Gomez *Social Sciences & Humanities*
Mentor: Rachel Gross

Abstract:
This project explores the evolution of public transportation in Denver from 1920 to 2020, focusing on the development and performance of the Regional Transportation District's (RTD) light rail system. While introduced with the goal of providing sustainable, accessible transit, Denver's light rail has not fully met expectations—especially for transit-dependent communities. Denver's public transportation system has transformed significantly from the early 20th century to the present. This research examines how, despite major investments and ambitious goals, the light rail has not fully delivered on its promises of accessibility, reliability, and equity.
Using a combination of primary documents, policy analysis, and historical context, the project traces key transitions from the Denver Tramway Company to the Regional Transportation District (RTD) and investigates how policy decisions and funding priorities have impacted service outcomes. The study is guided by the question: How has Denver's public transportation system evolved between 1920 and 2020, and to what extent has the modern light rail system fulfilled its intended goals of accessibility, efficiency, and equity for transit-dependent populations? The findings highlight the gap between initial promises and present-day realities, including service reliability issues, funding complications, and equity concerns.
https://symposium.foragerone.com/2025-racas/presentations/73673

Quantification of Mineralization in the Achilles Tendon Post-Injury in aRat Model
Rony Sawaqed *Biomedical Sciences*
Mentor: Michael David

Abstract:
Achilles tendon (AT) injuries result in structural and mechanical changes that affect function and mobility. A key post-injury adaptation is mineralization within the AT, which may impact tissue mechanics. However, the underlying cellular mechanisms remain unclear. Micro-computed tomography (microCT) offers high-resolution imaging for visualizing and quantifying mineralized structures. This study aimed to quantify mineralization after AT rupture in a rat model by developing a standardized microCT analysis pipeline. Using an IACUC-approved rat model, we transected the AT, performed immediate suture repair, and immobilized the ankle for one week. Fourteen rats were included in the study, but data has been processed for 11 so far. Each rat's uninjured ankle served as the control. After six weeks, rats were euthanized, and ankles were harvested, fixed in formalin, and transferred to ethanol for microCT imaging. MicroCT images were imported into DragonFly software to establish an analysis pipeline. This involved importing DICOM files, creating a region of interest (ROI), and applying the upper OTSU threshold in DragonFly. Volume analysis was performed to separate

the tibia, fibula, and metatarsals from mineralization occurring near the calcaneus and rupture site. This segmentation allowed visualization and assessment of mineralization within the ROI. Qualitatively and quantitatively, mineralization was observed in distinct regions within the injured tendon. Smaller to moderate-sized mineralized pieces were diffuse and localized near the rupture site and calf muscle in injured ankles. Larger, more fully formed mineralization was found proximally toward the calcaneus in both healthy and injured tendons. Ongoing analysis is quantifying the spatial distribution and type of mineralization. This study established a standardized microCT analysis pipeline for post-injury AT mineralization, laying the groundwork for future studies on the biological mechanisms driving this process and potential therapeutic strategies.
https://symposium.foragerone.com/2025-racas/presentations/73689

Rebuilding Community in the Digital Era: What we can Learn from the Displaced Aurarians
Sarah Keller *Social Sciences & Humanities*
Mentor: Dr. Rachel Gross

Abstract:
The project will seek to answer how the concept of community has evolved over time on the Auraria campus, from the displaced Aurarians in the 1970s to the college students here today, and how the shift from a physical to a digital world has affected the strength and cohesion of the community. Community is often either described by sociologists as sharing the same physical space or sharing a “common life”, meaning common values, customs, and goals. The evolution of community on the Auraria campus—from the tight-knit, physical community before the 1970s to the fragmented, digital networks of today— fits the second definition of community as a “common life” and presents a fascinating case study in social change and the role of space in fostering connection. By exploring how both physical and digital communities have functioned, the research aims to evaluate the implications of these shifts on students' sense of belonging, support, and well-being.
This project will employ a multi-faceted approach to gather both qualitative and quantitative data about the evolution of community on the Auraria campus. A range of materials, from historical accounts and sociological studies to current digital data and archival research, will be used to build a comprehensive understanding of community in the context of Auraria. The primary methods include defining and analyzing the concept of community, historical research on the displaced Aurarians, analysis of the pre-digital college community, and exploring current digital communities.
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Reforming Justice: Tackling Crime at Its Roots
Nour Nsirat *Social Sciences & Humanities*
Mentor: Dr. Erik Oleson

Abstract:
This presentation explores the link between childhood trauma, substance abuse, and incarceration while emphasizing the profound neurodevelopmental impacts of early adverse experiences. I will describe how trauma- and drug-induced disruptions in brain function compromise decision-making, creating a pathway toward substance dependence, criminality, and incarceration. I will highlight the prevalence of childhood trauma in the United States and its association with substance abuse. Particularly when encountered during childhood, trauma, and substance abuse can have long-term adverse effects on adolescent brain function and contribute to negative outcomes later in life. Both trauma and substance abuse disrupt the pre-frontal cortex, which is critical for decision-making. Impairment of the pre-frontal cortex can cause poor judgment, difficulty with inhibitory control, a lack of empathy, and ultimately, criminality and incarceration. Moreover, I will provide an analysis of the United States incarceration system and advocate for problem-based justice reform. Because incarcerated individuals often go through adverse experiences at a young age, which can be determinants of crimes, my analysis stresses the need for a paradigm shift within the prison system, advocating for a trauma-informed and humane approach to address the root causes of criminality. By focusing on intervention strategies, I will outline how addressing underlying trauma can reduce recidivism and foster a more equitable and effective justice system. Through an exploration of societal costs, such as the $820 billion annual expenditure on drug-related issues, this seminar emphasizes the collective benefits of rehabilitation over punishment. By implementing cultural shifts in prisons and prioritizing early interventions, society can mitigate crime, enhance public safety, and reduce the economic burden on taxpayers. These findings serve as a call to action for policymakers, educators, and community leaders to invest in solutions that not only address the symptoms but also confront the root causes of criminal behavior.
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Refugee Employment Policy: A Comparison Between the U.S. and New Zealand
Jae Meh *Social Sciences & Humanities*

Mentor: Sasha Breger

Abstract:
This study takes a comparative policy research approach to look at employment policies in the United States and New Zealand, with a focus on how these policies impact vulnerable groups like refugees. The analysis draws from qualitative sources, including policy documents, government reports, academic literature, and data from the United Nations High Commissioner for Refugees. It compares how each country supports refugee employment and integration, highlighting both similarities and key differences in outcomes. While both countries give refugees the legal right to work, the U.S. employment-at-will system and short-term support programs often lead to long-term instability. On the other hand, New Zealand's Employment Relations Act and long-term refugee services provide more stable job opportunities and stronger economic support. Even though New Zealand resettles fewer refugees each year, its policies are more effective at helping them build lasting economic security. These findings support the alternative hypothesis (H_1), showing that New Zealand's employment policies offer stronger support for refugees compared to the U.S. system.
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Rising Temperatures, Cognitive Decline: The Impact of Climate Change on Brain Health in Vulnerable Populations
Laila Zeid *Natural & Physical Sciences*
Mentor: Dr. Ivan Ramirez

Abstract:
Although climate change is often framed in terms of its environmental consequences, its neurological and cognitive health impacts, particularly for vulnerable populations, are increasingly drawing concern. This research focuses on the state of Colorado, where rising temperatures and air pollution are compounding existing health disparities. While statewide climate data suggest a warming trend, certain counties are experiencing disproportionate exposure to environmental stressors. For example, high heat has been linked to measurable declines in student academic performance. These effects are especially severe in low-income and minority communities, where access to cooling infrastructure is limited. In this study, we synthesize findings from public health and climate science literature to assess the intersection of climate stressors and brain health outcomes. Findings will be presented to inform future climate strategies, emphasizing the need for equitable public health policies that account for regional and demographic vulnerabilities.
https://symposium.foragerone.com/2025-racas/presentations/73639

Role of the Substantia Nigra to Dorsal Lateral Striatum Circuit in the Acquisition and Maintenance of Voluntary Physical Activity is Sex-Dependent
Briauna Fritz *Biomedical Sciences*
Mentor: Ben Greenwood

Abstract:
The benefits of exercise are extensively documented, yet most of the population fails to achieve the minimum recommended amount of activity. Two processes, goal-directed (intentions) and habitual, govern exercise behavior, and exercise must become habitual in order to be maintained. Understanding the mechanisms that contribute to habitual exercise could lead to novel approaches to increase exercise and thereby reduce the physical inactivity epidemic. Rodents are used to study the processes underlying exercise because rodents display robust voluntary wheel running. We have previously found that male rats prefer to use goal-directed brain circuits involving the dorsomedial striatum (DMS) to acquire wheel running, whereas female rodents preferentially use habit circuits involving the dorsolateral striatum (DLS). This observation explains the more rapid transition to habitual control over wheel running seen in female rats, compared to males. The DLS is a major target of dopamine neurons originating in the substantia nigra (SN-DLS circuit), but the role of dopamine in habitual exercise is unknown. The current experiment sought to determine the role of the SN-DLS circuit in the acquisition and maintenance of exercise and whether sex differences exist. We hypothesize that the SN-DLS circuit is critical for the acquisition of wheel running in females, but not in males. An intersectional chemogenetic approach was used to silence the SN-DLS circuit during daily wheel running in male and female rats. Surprisingly, inactivating the SN-DLS circuit reduced wheel running in males but not in females. These data suggest that females rely on factors other than dopamine for the formation of exercise habits. The fact that SN-DLS inhibition reduced exercise in males could be due to a non-selective reduction in dopamine in the goal-directed DMS. Nonetheless, results reveal sex differences in the role of the SN-to-DLS circuit in the acquisition of voluntary exercise.
https://symposium.foragerone.com/2025-racas/presentations/73619

Roots and Wings: How Generations of Vietnamese Immigrants Build Their Health and Social Networks

Thao Nguyen *Social Sciences & Humanities*
Mentor: Dr. Ronica Rooks

Abstract:
Do you rely on those around us or figure it out by yourself when it comes to health? For first-generation Vietnamese immigrants in Southwest Denver, being healthy is a shared responsibility, as family plays an important role in providing guidance and support. In contrast, for second-generation individuals, independence takes center stage, where they navigate health alone, relying on peers, or turning to their professional network or modern healthcare resources. The study explores how these differences influence well-being, with a focus on intergenerational differences in health behavior and social reliance. Using a mixed-methods approach, we analyzed network patterns that integrate the social networks and their traditional vs. modern health perspective, and how social norms evolve throughout generations. Findings highlight the balance between preserving tradition and embracing independence and how it impacts community well-being.
https://symposium.foragerone.com/2025-racas/presentations/73688

Saving Maternal Health: A Qualitative Study on Maternal Care in the United States
Maleeha Shah *Social Sciences & Humanities*
Mentor: Dr.Hyeyoung Nelson

Abstract:
The United States has one of the highest maternal mortality rates among developed nations (McSpedon, 2024); this rate has risen in the past few years, reaching “32.9 deaths for every 100,000 live births” in 2021 (Hoyert, 2023, p. np) and is unfortunately profoundly racialized. Black women are three times more likely, and American Indian and Alaska Native women are two times more likely to die in pregnancy and childbirth than White women (Hill, Artiga, and Ranji, 2022). Birthing individuals of color are also more likely to experience maternal morbidity and have worse maternal health and infant outcomes compared to White women (Hill et al., 2022). In hopes of addressing and reversing these trends, clinical and public health research has primarily focused on locating key sociodemographic variables that contribute to these racialized inequities in pregnancy (Creanga et al., 2012; Flores et al., 2012; Leonard et al., 2019), in order to define best practice guidelines in obstetric care and research (D’Alton et al., 2019). Social scientific perspectives on maternal health have shed light on the impact of patient-provider interactions in shaping disparate maternal health outcomes. One of the aspects of this paper discussed medicalized birth and the racism encountered during pregnancy and childbirth. This paper will also look into the de-medicalization of birth experiences for women of color as a proposed method to better support marginalized individuals through the support of birth workers such as doulas. Methods of the experiment and results were noted to expand on the literature review with data from researchers in this study.
https://symposium.foragerone.com/2025-racas/presentations/73690

School is Stressful
Kamryn Cahill, Pacey Huebner *Arts & Media, Social Sciences & Humanities*
Mentor: TJoanna syitee

Abstract:
Examining effects of credit hours and upper-division level classes on stress.
https://symposium.foragerone.com/2025-racas/presentations/74062

Selective vulnerability of the posterior visual pathway to acute cuprizone treatment
Kate Brassell *Biomedical Sciences*
Mentor: Ethan Hughes, PhD

Abstract:
Multiple sclerosis (MS) is a chronic disease characterized by the degradation of myelin sheaths in the brain and spinal cord, leading to motor, sensory, visual, and cognitive deficits. Myelin sheaths are produced by oligodendrocytes and facilitate rapid communication between neurons. In the laboratory setting, we model myelin sheath degeneration by administering the drug cuprizone to mice, and we monitor the loss and repair of myelin over time in the living animal using in vivo two-photon microscopy. Using this approach, we observed myelin loss in the visual cortex but we are unable to quantify demyelination in the rest of the visual pathway. I hypothesized that acute cuprizone administration in mice would lead to overt myelin loss across the visual pathway in the brain. To test our hypothesis, mice were fed a cuprizone-supplemented diet for three weeks and brain tissue was analyzed via immunohistochemistry, focusing on key regions in the visual pathway. While the optic nerve and a thalamic relay center (dLGN) showed no myelin loss, regions in the rear of

the visual pathway were notably affected, indicating acute cuprizone treatment promotes posterior-biased myelin loss in the visual pathway. This research will inform studies evaluating therapeutic strategies to promote myelin repair in MS and other demyelinating diseases and specifically provide insights into how demyelination in the posterior visual pathway affects vision of patients with MS.
https://symposium.foragerone.com/2025-racas/presentations/73695

Sex differences in striatal dopamine release during voluntary physical activity
Ciana Beller *Biomedical Sciences*
Mentor: Benjamin Greenwood

Abstract:
This project will seek to definitively establish if regular exercise increases dopamine transmission in the brain, specifically a region involved in reward and stress resilience called the nucleus accumbens. There is an assumption in the scientific community and mainstream media that exercise increases dopamine, but this assumption is based in part on research with critical limitations. Prior studies, for example, found an increase in stored dopamine in the brain following exercise in rats. However, an increase in stored dopamine could have various implications, including a reduction in transmission. Another study found an increase in dopamine release during forced treadmill training. However, rats find forced treadmill training stressful, so it is difficult to interpret these findings. Given these crucial limitations, further research is warranted to determine if exercise increases dopamine transmission. We will allow rats unlimited access to voluntary wheel running and will measure levels of dopamine in the nucleus accumbens using fast-scan cyclic voltammetry. We will use voluntary wheel running because rats find it rewarding and it protects rats from behaviors that resemble depression and anxiety. We hypothesize that dopamine will increase in the nucleus accumbens during voluntary exercise. We further expect a sex difference, whereby dopamine will increase during exercise more in female rats compared to males. This is expected based on prior observations that females have potentiated stimulus-evoked dopamine release compared to males. This research has important implications for how exercise alters brain function and behavior, including improving mental health.
https://symposium.foragerone.com/2025-racas/presentations/73797

Sky View Analysis of Urban Heat at RTD Bus Stops
Sierra Reece *Natural & Physical Sciences*
Mentor: Ben Crawford

Abstract:
Sky view factor (SVF) is a key variable influencing pedestrian-scale thermal conditions in urban areas. This study investigates the relationship between SVF and micro-scale heat measurements at over 125 bus stops in Denver, CO. Hemispherical photos were captured to calculate SVF values, representing the percentage of visible sky, and temperature data were collected using a Kestrel weather meter throughout the summer. The objective was to identify how SVF affects heat exposure and passenger comfort at transit stops.
Bus stops are particularly susceptible to thermal stress, impacting rider comfort and willingness to use public transportation. This is especially relevant along East Colfax and adjacent routes, where stops have long been criticized for lacking shade and thermal protection. Understanding the role of SVF in urban heat dynamics can contribute to more resilient transit infrastructure and improved urban mobility.
Analysis using R Studio revealed a loose correlation between higher SVF values and increased surface temperatures. However, sites with significant vegetation cover or shading showed lower temperatures even with relatively high SVF values. These findings suggest that the type and quality of canopy cover have a greater influence on mitigating heat than sky openness alone. Additionally, Denver's high elevation and frequent sunshine amplify temperature fluctuations, further impacting thermal comfort.
With upcoming infrastructure improvements on the East Colfax Corridor, integrating SVF and canopy considerations can enhance the thermal resilience of bus stops. Future research may expand this methodology to other city routes, track temperature changes over time, and evaluate the impact of urban design interventions.
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Sober Artists: Sustaining Sobriety with Social Connection Through Music
Brooke Delgado *Social Sciences & Humanities*
Mentor: Jennifer Reich, Ph.D

Abstract:

Existing scholarship highlights how sobriety is easier to maintain when individuals experience social connection. This thesis examines the linkages between music, social connection, and sustained sobriety and asks, how does creating and performing music impact addiction recovery and sustained sobriety for the artist? Live music provides a pathway to social connection. To better understand how music may support social connection which in turn supports sobriety, I conducted a qualitative research study using semi-structured interviews and participant ethnographic observations. Nineteen sober artists participated in the study and provided details of their experiences with music, performance, and living a sober lifestyle. Additionally, I observed and participated in five sober open mic events that provide safe sober environments for artists to perform. The results from this qualitative study showed that music fills a void that drugs and alcohol once occupied in the lives of sober artists. Music also provides community and connection by allowing sober artists to gather in spaces to express themselves authentically. Specifically, my findings show how a performer's artistry benefits from sobriety, the various roles art plays at the beginning of sobriety, the growth and healing sobriety provides to a sober artist, and the evolution of community during an artist's sobriety journey. I conclude by suggesting how music could be deeply integrated into drug and alcohol treatment programs in ways that might support long term sobriety.
https://symposium.foragerone.com/2025-racas/presentations/73674

Social Capital and Health: Social Network Analysis of Immigrant and Native American Networks in a Diverse Urban Community in Colorado
Paulina Erices Ocampo *Social Sciences & Humanities*
Mentor: Dr. Ronica Rooks

Abstract:
Social networks describe people's closest relationships, which make opportunities available by virtue of connection (Bourdieu& Wacquant, 1992). In minoritized communities, "good connections" may make the difference between receiving timely medical care, facing a life of disability, or between dropping out of high school and getting a college scholarship. Better-connected people can access helpful information, enjoy stronger social support, reach better opportunities for social mobility, and even have better health outcomes (Small, 2009; Berkman & Glass, 2000). However, minoritized groups have smaller social networks and experience reduced access to resources, information, and influence (Lubbers, 2023).
This project is designed to explain the relational mechanisms by which members of the Latino, Vietnamese, and Native American communities generate and share health opportunities within and across their ethnic groups. As a case study, focused on the Southwest Denver community, an area of Denver with a long history of ethnic diversity, discrimination, and activism, this project will allow us to map out the types of relationships people have within and across groups and understand what matters for people's health individually and as a collective. Understanding social networks is fundamental to untangling how inequities emerge at the local level and design interventions and policies that honor cultural traditions, build social network resiliency in anticipation of climate change, and create effective pathways for community health.
https://symposium.foragerone.com/2025-racas/presentations/73691

Storytelling as Research and Creative Work: Undergraduate Student Research Assistant Shares Experiences with Grief, Healing and Drug Culture
Arthur Mason *Social Sciences & Humanities*
Mentor: Dr. Marty Otañez

Abstract:
"I knew that he would change sometimes, but I had no idea why." This line comes from the digital story, Legend, that I produced in Spring 2025. The project blends activist anthropology, arts-based anthropology, and liberatory harm reduction to call attention to skateboarding, psilocybin, and safe drug use practices as diverse forms of liberatory recovery from substance use. Liberatory harm reduction refers to mitigating risk associated with risky behavior at the root of the cause of the danger. A digital story is a short (3-4 minutes) first-person video with audio narration, personal imagery (photographs, video excerpts, drawings), and background music. The digital storytelling method is a process of individually and collectively sharing stories around a theme identified by storytellers. This method is an anecdote for stories being told by others about community members to promote individuals and groups narrating their own stories. Activist anthropology is political and policy advocacy combined with scholarly research to support social justice change. The first-person video is informed by nearly two semesters of independent study with my faculty mentor Dr. Otañez (Anthropology) and applies my video editing skills to create videos related to BIPOC and low-income individuals' lived experiences with psilocybin in the CU Denver psilocybin study. The production of the digital story was inspired by my work on the research videos. My short video includes my own lived experience with substance use and grief due to my father's fatal overdose in 2015. This project adds knowledge on psychedelic harm reduction by providing a humanity-based visual

aid in the form of a video informed by activist anthropology and liberatory harm reduction approaches. Ultimately, this work creates space to celebrate story sharing for health justice purposes.
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Stronger Together: Colorado Home-Owners Associations Wildfire Preparedness Analysis
Clayton Vitek *Natural & Physical Sciences*
Mentor: Austin Troy, Phd

Abstract:
Wildfires across the United States have resulted in rising ecological and social costs. More homes and communities are threatened by wildfires resulting from a legacy of fire exclusion on the landscape, changing climate and fuel conditions, and an expanding wildland-urban interface (WUI). In response, the USDA Forest Service has a 10-year Strategy to partner with a wide collection of local community partners to improve and proactively manage wildfire risk. These include counties, fire districts, property organizations, community leaders and engaged citizens.
Our portion of this research has focused on how Homeowner Associations (HOAs) and other property organizations are addressing these changing wildfire dynamics. Our efforts have been concentrated in the foothills of the Colorado Front Range, with the hopes of expanding to four additional states. By surveying HOA Directors, Managers and Wildfire Liaisons, we have been able to gather valuable insights into how these communities currently prepare for wildfire.
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Structural Analysis of Hypar Foundations: Revisiting Candela's Umbrella with Modern FEA
Marilyn Johnson *Tech, Engineering, & Math*
Mentor: Shengzhe Wang

Abstract:
Standard prismatic footings transfer soil bearing stresses through bending, which is less efficient than the membrane action offered by hyperbolic paraboloid (hypar) geometries. Structural artist Félix Candela constructed hypars in elegant, thin-shell structures to replace conventional roofs and foundations around the world. Among them, the Mercado de Chiclayo in Lima, Peru, features Candela's use of cantilever and membrane analysis to calculate internal forces within an umbrella being used as a foundation. This research revisits Candela's design with a modern computational framework given that this project was originally done in the mid-20th century. Using geometric parameters inspired by the Mercado de Chiclayo, a mesh refinement study identifies the optimal number of shell elements for each tympan. Finite-element analysis (FEA) models are created for hypars with rises from 0 m (flat slab) to 2 m in increments of 0.5 m, enabling the measurement of bending moments and forces. By varying the rise based on the depth from ground to vertex, the settlement, bending moment, and membrane forces within the shell are quantified. Subsequently, These values are corroborated with analytical solutions for a flat shell on an elastic foundation, focusing on transverse shear, bending moment, slope, and deflection. Findings show increasing the rise from 0 m to 2 m reduces maximum bending moments by 97%, concluding that hypar geometries improve load transfer, minimizing bending stresses, material use, and embodied carbon. This efficiency widely enhances structural performance while supporting sustainable practices.
https://symposium.foragerone.com/2025-racas/presentations/73722

Study of the E318Q Mutant of CLCF Proton/Fluoride Antiporter : Comparison Between Fluoride and Chloride
Sam Blessen Fredrick, Jennifer Nguyen *Natural & Physical Sciences*
Mentor: Hai Lin

Abstract:
The CLCF is a proton/fluoride antiporter essential for ion homeostasis and protection against fluoride toxicity. This study focuses on the E318Q mutant, where the wild-type glutamic acid (E) at position 318 is replaced with glutamine (Q). We aim to compare the dynamics of two models of CLCF, which transport chloride and fluoride, respectively. Experiments has established that proteins selects Fluoride over Chloride. Using the experimentally implicated windmill model as a framework, we are examining the differences are caused by the two highly similar anions.
https://symposium.foragerone.com/2025-racas/presentations/73887

Supporting Mothers Beyond the Delivery Room by Bridging Mental Health and SUD care: Insights from the Undergraduate Pre-Health program
Princesa Rodriguez-Herrera *Biomedical Sciences, Social Sciences & Humanities*
Mentor: Taryn Olivera, BSN, RN, CNM

Abstract:
Substance use disorders (SUDs) and mental health issues are significant contributors to maternal mortality in the United States, with overdose remaining a leading cause of death in the postpartum period. During my summer internship experience with CU Anschutz's Undergraduate Pre-Health Program (UPP), I had the opportunity to observe healthcare professionals working with SUD rehabilitation and recovery, while also alongside recovery coaching and maternal care. This included both exposure to clinical care models and on-going community based initiatives that support maternal individuals navigating recovery. These perspectives are instrumental in addressing existing the gap of care in our population. They illustrate how future providers must contribute to bridging these gaps as there is a need for interdisciplinary and systemic approaches that incorporate addiction treatment into maternal care.
Addressing these challenges requires more than clinical intervention. They call for a broader societal shift that recognizes the health and well-being of mothers not only throughout pregnancy, but beyond. There is a critical need to expand support for individuals in the postpartum period through sustained, community-based efforts— while also sustaining efforts to destigmatize roads to recovery in all patient populations. Experiences and perspectives gained through my summer UPP internship emphasize the importance of provider collaboration, continuity of care, and the responsibility of future healthcare professionals in advancing integrated, equitable models. This presentation will share my experiences in UPP including key observations, highlight my preceptors' initiatives, and potentials for how emerging providers can contribute to more holistic, patient-centered care for individuals affected by SUD.
https://symposium.foragerone.com/2025-racas/presentations/73852

Surveying K-12 Arabic Language Programs in the United States: Methodology and Initial Findings
Kate Kirwin *Social Sciences & Humanities*
Mentor: Elizabeth Huntley

Abstract:
Despite a significant increase in programs promoting Arabic language exposure and proficiency in the United States' K-12 educational landscape, there has not been a research team who has yet conducted a comprehensive study documenting trends, structures, and data from these programs. This has prevented standardized, tested curriculum from being provided to Arabic instructors. The current study fills this gap by systematically surveying Arabic language learning programs that offer instruction to K-12 students. The objective of this research is to develop an understanding of policies and proficiency targets shaping programs of interest, categorizing program models for language instruction, and lastly recording primary components of Arabic language curricula. In this presentation, we will discuss our approach to large-scale survey methodology, program identification, and initial findings. In terms of survey methodology, we used U.S. census data to identify the ten states with the largest Arabic-speaking populations, and corroborated that information with Seal of Biliteracy data for K-12 students. We then utilized two different generative AI platforms (Perplexity AI and ChatGPT) to fine-tune prompts that were specific and accurate to our research. We are currently using generative AI to identify all programs in our target states. Initial findings reveal that the overwhelming majority of Arabic language programs for K-12 students exist in private schools (both secular and religiously-affiliated). This means that students need to pay for private education in order to access Arabic language training, which may present a barrier. Furthermore, the states with the largest Arabic-speaking populations indeed seem to have the most program offerings. For students who don't live in these states with high concentrations of Arabic language speakers, their capability of program access is highly diminished.
https://symposium.foragerone.com/2025-racas/presentations/73750

Survivor's Guide to True Crime: a Feature Documentary on the Ethics of True Crime Media
Cadence Marsolek, Marley Tremmel *Arts & Media*
Mentor: Thomas Kolicko

Abstract:
Survivor's Guide to True Crime: a Feature Documentary on the Ethics of True Crime Media is a film that explores the ethics of true crime media through the lens of primary and secondary victims of violent crimes. Kimberly Corban and Kara Robinson Chamberlain are both victims of assault that have taken their experiences and turned them into opportunities to speak up for victims through their podcast, "Survivor's Guide to True Crime". This film aims to raise awareness about the consumption and creation of true crime media and how it impacts legislation, the criminal justice system, and the culture at large.
https://symposium.foragerone.com/2025-racas/presentations/73698

Sustainable & Ethical Housing Solutions for Climate-Induced IDP in Denver, Colorado

Marianna White *Social Sciences & Humanities*
Mentor: Ivan J. Ramírez, PhD (Health & Behavioral Sciences)

Abstract:
Background: Housing stability, quality, and affordability all impact individual health outcomes. Climate change increases migration through both primary factors and secondary factors. Climate-fueled internal displacement generates significant stress on cities. This report focuses on Denver, CO and sustainable and ethical housing solutions for IDPs that will enter the city in the coming years.
Methods: A desktop review that covered the resources and key institutional parties that play a role in climate adaptation, immigrant health and housing within Denver, Colorado, as well as climate health was conducted. It also included housing solutions that have shown success in comparable cities, with cost analysis, and a review of Denver's social support services and capacity for in-migration.
Results: Denver has a wide landscape of relevant government and nonprofit institutions addressing homelessness. Documents reviewed included 25 governmental and non-governmental reports that outline climate vulnerability in Colorado, assessments, plans and policies from relevant organizations. All records gathered are available to the public. The reports were restricted to publications from 2020 onward. Cator Ruma and Associates (CRA), a locally based engineering consulting firm, provided consultation. Case Studies include the Bowery House (New York) and Saint Andrews (Florida).
Conclusions: It is recommended that Denver push for IDP rights on a state level, embrace mixed-use zoning, and incentivize adaptive reuse and low-income housing construction, and invest proactively in its physical and social infrastructure. Specifically, adaptive reuse on a local level is recommended to turn empty downtown office buildings into mixed use low-income "dorm" style housing and shelter environments.
https://symposium.foragerone.com/2025-racas/presentations/73731

The Computational Component of Developing a Liquid Helium-3 Neutron Detector
Isabella Adolf *Natural & Physical Sciences*
Mentor: Anthony Villano

Abstract:
This research includes using Python coding methods in JupyterLab to model the performance of a liquid helium-3 detector for neutron measurements. When designing a liquid helium-3 detector, the goal is to create a more efficient helium scintillation detector for use in the Super Cryogenic Dark Matter Search (SuperCDMS). For this search, scientists are looking for low and rare energy events that could be an explanation for dark matter. Gaseous helium is routinely used for neutron detection but can only detect neutrons efficiently around 1 Mev. By developing a liquid helium detector that can measure neutron backgrounds more accurately, detection efficiency will increase greatly compared to commonly used gaseous detectors. This process is more efficient because liquid helium is more dense than helium gas, allowing for better neutron-capturing methods. Our model includes understanding fundamental physics processes and theoretical input about what the data will look like, how we can target specific data we need, and how the incoming information will be interpreted. This is a significant aspect of the overall detector development project because it allows researchers to understand the detector's capabilities, and to justify the significance of using liquid helium-3 over gaseous helium-3.
https://symposium.foragerone.com/2025-racas/presentations/73637

The Digital Empowerment Program
Miguel Hernandez *Social Sciences & Humanities*
Mentor: Jenny Keller

Abstract:
Technology is essential for college students entering the workforce, but many low-income families struggle to access it, with 43% of lower-income adults lacking a desktop or laptop, according to Pew Research (Vogels, 2021). This technology gap worsens the achievement gap and limits higher education opportunities. However, programs that provide technology have proven successful. For instance, a study by Araque et al. (2013) found that participants in the "Computer for Families" program were more likely to use technology for productive activities like job applications, demonstrating the value of such programs.
I aim to create a program for low-income, first-generation college students that equips them with essential skills for academic success at Cu Denver. Participants will complete a free Coursera course on Microsoft 365 Fundamentals to enhance their technical skills and employability. After certification, they'll take part in a mock interview with Lynxconnect and gain access to campus resources. Additionally, each student will receive a free laptop and Wi-Fi router to support their college journey. Ultimately, this program aims to help first-generation students stay in college and build a brighter future.

https://symposium.foragerone.com/2025-racas/presentations/73986

The Effects of Multiple Sclerosis Antibodies on Demyelination and Microglial Activation
Stephanie Karas *Biomedical Sciences*
Mentor: Dr. Lindsay Osso

Abstract:
Multiple sclerosis (MS) is an autoimmune disease that destroys central nervous system (CNS) myelin, leading to motor and cognitive dysfunction. However, the mechanisms underlying myelin loss in this disease are not fully understood. To investigate this process, we developed a novel model that mimics MS demyelination by applying recombinant antibodies derived from B cells in the cerebrospinal fluid of MS patients to the cortical surface of mice. Longitudinal in vivo imaging revealed that MS antibody treatment prompts loss of oligodendrocytes and their myelin sheaths. Using immunohistochemistry as a parallel approach, I validated the loss of myelin sheaths and oligodendrocytes in this model, and did not detect any evidence of axonal degeneration, providing support that myelin is the primary target of the antibody.
Given that demyelination in MS is immune-mediated, we next investigated the involvement of the CNS immune cells, microglia. Since microglial activation is often accompanied by distinct morphological changes, I analyzed microglial morphology, measuring soma size and cell complexity using Sholl analysis in MS antibody-treated and saline-treated control mice. While soma size increased over time irrespective of treatment, microglial complexity did not differ, suggesting the observed morphological changes were primarily driven by surgical intervention rather than a direct effect of antibody treatment. Single-cell RNA sequencing of isolated microglia indicated an upregulation of demyelination-associated genes, including *Ccl4*, which was confirmed via RNAscope. In ongoing studies, I am assessing whether Bruton's Tyrosine Kinase inhibition, a drug intervention that prevents demyelination in this model, can reduce the presence of *Ccl4*+ microglia, providing insights into the mechanism of action of this drug. Overall, these findings validate this novel model of immune-mediated cortical demyelination and support a role for microglia in mediating demyelination.
https://symposium.foragerone.com/2025-racas/presentations/73710

The Impact of a New Public Safety Building on Campus Police-Community Relations and Legitimacy
Jessica Valdez *Social Sciences & Humanities*
Mentor: Dr. Mary Dodge

Abstract:
The Auraria Campus Police Department (ACPD) is a 24/7 law enforcement agency serving the 150-acre Auraria Campus in downtown Denver. Home to approximately 46,000 students, faculty, and staff from three institutions—University of Colorado Denver, Metropolitan State University, and Community College of Denver—Auraria's urban setting and proximity to major entertainment venues such as Empower Field and Ball Arena significantly increases daily visitors beyond the student body.
Unlike traditional law enforcement agencies, campus police operate in a unique environment that allows for a greater service-oriented approach. ACPD has traditionally engaged the campus community through events and safety programs such as Cocoa with the Cops, Campus Safe Night, and Active Shooter Training. Like many law enforcement agencies, ACPD has faced challenges related to police legitimacy and community relations. In response, they continued emphasizing community policing strategies to foster trust and engagement.
However, the Department currently operates from an outdated facility within the Metropolitan State University administration building, which limits visibility and accessibility. In 2027, ACPD will transition to a newly designed public safety facility that integrates both police operations and student-focused spaces, such as study and classroom areas. This dual-purpose design is among the first of its kind for a campus safety building.
This study, supported by ACPD and the Auraria Campus administration, examines ACPD's current community policing efforts and explores the potential impact of the new facility on police legitimacy and campus relations. The research addresses three key questions: (1) What factors influence the perceived legitimacy of campus police? (2) Which community policing efforts have been most effective on Auraria Campus? (3) How might the new public safety building impact police legitimacy and police-community relations? Findings from this study will provide insight into how police department facilities can impact legitimacy, visibility, and relationships with the communities they serve.
https://symposium.foragerone.com/2025-racas/presentations/73723

The Importance of Representational Approaches
Madylin Kessler, Efklides Tzimapitis *Arts & Media, Natural & Physical Sciences*
Mentor: Sarah Hearne

Abstract:
Our research looks into the role that representational approaches play in research and design fields. These fields often take for granted the importance of representation for shaping understanding.
Our latest exhibition utilizes representational architectural models to communicate information about complex environmental processes. Through this representational approach provided by Lisa Moffitt and her PhD research, we are able to gain design insights about building environmental mediation.
“Wind tunnels generate steady laminar airflow in order to observe air movement patterns around architectural models placed on the testing bed. The introduction of smokestreams, tufts, or other particulates enables visualisation of air movement around the model. Wind tunnels make complex fluid dynamics principles associated with passive ventilation and urban airflow patterns visible and materially tangible.” (Lisa Moffitt) As designers, wind tunnels such as these can supplement environmental diagrams and digital simulations. They serve as distilled, scaled-down representations of the environment for which we design, helping us to better understand how the built environment affects the natural environment and how the natural environment affects the built environment.
“Water tables create a steady sheet of moving water along a sloped surface. Dyed water poured into a trough is released through small diameter holes at the base, introducing streamlines onto the table surface. As the streamlines flow around the architectural model, deviations reveal pockets of stillness (wind shadows), areas of pooling, and general flow patterns around and through the models.” (Lisa Moffitt) Like wind tunnels, water tables also supplement environmental diagrams and digital simulations. Through water tables, we are able to actively visualize pressure-induced airflow patterns, providing us further insights into the interaction between the natural and built environments.
We believe that through representational approaches we are able to gain deeper insights into the complex environments for which we design.
https://symposium.foragerone.com/2025-racas/presentations/73818

The Inequality of Justice: Investigating Legal Representation and Case Outcomes for Women Survivors of Domestic Violence
Amy Gandarilla, Amira Luensman, Jennifer Zubia Roque, Juan Diaz *Social Sciences & Humanities*
Mentor: Courtney Leapley

Abstract:
This study aims to look at the legal outcomes in justice-involved women who have experienced domestic violence. We will examine the effects of race, class, disability, and gender identification on legal representation. We plan to look at factors like prosecutorial bias, systemic barriers, and the quality of their legal representation and investigate if these demographics affected their experience. For this study, we conducted a survey, in part of a broader study, and administered it to a local women’s domestic abuse shelter, SafeHouse Denver. The survey questions focused on the women’s perceptions and experiences with their legal representation, plea deals, and the overall understanding of their legal options. We hope to contribute to research around helping vulnerable populations of women, seeing how class, race, and other demographics influence their experience in the criminal justice system.
https://symposium.foragerone.com/2025-racas/presentations/73604

The Influence of Music Listening in Study Environments
KAY HYUN *Arts & Media, Social Sciences & Humanities*
Mentor: Dr. Carly Leonard

Abstract:
Existing surveys have shown that a considerable number of individuals listen to music regularly while studying. However, whether it is a benefit or drawback remains unclear, as it can both enhance and impair one's cognitive performance. To address this under-explored area, this poster investigates the influence of music listening in study environments based on a broad range of concepts in cognitive psychology, such as attention, mood, and arousal. On one hand, partially distributed attention to music listening may distract studying. On the other hand, it potentially may enhance the intensity of concentration by positively affecting mood regulation, which indeed is another important factor. Additionally, arousal, which is related to physical or physiological needs, can be altered by music; specifically, the lack of music may lead to discomfort depending on individuals, which may cause cognitive impairment. Beyond these general concepts, a well-known research study regarding Mozart's Effect found that Mozart's music may improve cognitive performance by enhancing mood variation. Nonetheless, Mozart's Effect by itself is insufficient to demonstrate a general effect of music listening since it only represents the influence of classical music. Numerous studies on music-induced mood suggest that each type of music tends to cause different emotional responses and different cognitive consequences. Moreover, music-induced positive mood tends to be irrelevant with the consequences of cognitive performance, unlike music-induced reduction in negative emotion. In conclusion, the comprehensive findings of my literature review indicate that the unclearness of music listening's effect is heavily due to its immense variability of engagement-related factors. Thus,

future studies should consider the many dimensions on which music stimuli can vary more precisely, which requires expertise from many relevant fields (psychology, music, mathematics, etc.). This may benefit future interdisciplinary studies in music, educational psychology, and cognitive science as well.
https://symposium.foragerone.com/2025-racas/presentations/73758

The Israeli-Palestinian Conflict: The Path to Peace
Amanda DeCoster *Social Sciences & Humanities*
Mentor: Dr. Martin Widzer

Abstract:
The Israeli-Palestinian conflict has endured for more than 75 years, rooted in territorial disagreements and differing national identities. This research examines the conflict from the nation's inception to the current state of these territories. By employing historical and comparative analysis, along with an examination of various wars, political movements, and foreign interventions, this study outlines the violence, displacement, and perspectives of both Israeli and Palestinian communities. Additionally, it investigates the roles of nationalism and religious symbolism, which have exacerbated divisions and diminished the prospects for enduring peace. Drawing from diverse international viewpoints, the research highlights how inequality and unmet promises continue to hinder reconciliation. Ultimately, the study contends that achieving sustainable peace necessitates more than just negotiations and temporary agreements; both sides must address historical grievances and recognize the profound impact of hatred surrounding issues of land, identity, and the desire for human recognition. By situating the conflict within its historical and ideological framework, this research aims to understand the obstacles to peace, emphasizing that empathy and equity are vital for any potential resolution.
https://symposium.foragerone.com/2025-racas/presentations/73767

The Journey of Optimizing Ankle Tissue Histology and Spatial Transcriptomics for Rat and Human
Lluvia Mejia Tovar *Biomedical Sciences*
Mentor: Michael David

Abstract:
Purpose: Our research focuses on unraveling the cellular mechanisms underlying ankle pathologies, such as tendon disorders and osteoarthritis. Traditional histology and emerging spatial transcriptomics are critical for studying these diseases at the cellular level; however, we lacked an optimized process for spatial transcriptomics or standard histology for ankle tissue from preclinical and clinical sources. This study aimed to establish optimized protocols for spatial transcriptomics of human ankle synovium and standard histology of paraffin-embedded rat ankle tissues.
Method: For spatial transcriptomics using frozen human synovium, we optimized cryosectioning techniques to preserve RNA integrity and minimize sectioning artifacts. Cryostat temperature settings were systematically varied to identify an optimal range that prevents curling and tearing. Additionally, hematoxylin and eosin (H&E) staining protocols were refined by adjusting staining times and reagent concentrations to enhance nuclear and cytoplasmic detail while ensuring consistency.
For paraffin-embedded samples of in-tact rat ankles, fixation times and decalcification protocols were extended for paraffin-embedded samples to accommodate larger samples and maintain tissue integrity. H&E staining identified processing parameters that preserved morphology while improving sectioning consistency.
Results: Optimal cryosectioning was achieved at -28°C, with sections adhered to cold slides and gently secured by applying finger pressure to the back of the slide, minimizing tissue distortion. The optimal H&E staining protocol included a 5-minute hematoxylin step followed by a 30-second eosin stain, resulting in enhanced contrast. For paraffin-embedded samples, a combination of 2 weeks of fixation, 5 weeks of decalcification, and a 53-hour processing cycle produced optimal paraffin sections.
Conclusion: The optimized protocols improved section quality and RNA preservation and reduced variability in sample preparation. These refinements provide a robust framework for processing ankle tissues, ensuring reliable morphological and molecular data in preclinical and clinical research. The methodologies enhance spatial and structural characterization, supporting injury modeling and biomarker discovery for ankle pathologies.
https://symposium.foragerone.com/2025-racas/presentations/73701

The One Health concept in dental education using applied learning theory
Colby McDaniel, Alexandria Bender , Jasmine Duchene , Leah Conley, Lauren Knoll *Biomedical Sciences, Social Sciences & Humanities*
Mentor: Raquel Baroni de Carvalho

Abstract:

The One Health Initiative focuses on the interactions between animals, people, plants and their shared environment. The goal is to present an experience of introducing the One Health concept into the dental curriculum at the University of Colorado School of Dental Medicine and the applied learning theory (applications). A collaborative online international learning (COIL) elective pilot course was designed, where CUSDM dental students shared a virtual classroom and learn alongside dental students from Universities in Brazil (UFES) and Mexico (UAC). The curricula focused on developing practical knowledge relevant to One Health using transdisciplinary approaches in the context of oral health and it was divided into a 6-hour theory module and 6-hour application module. The applied learning theory was used to guide students in developing hands-on experiences andcreative projects that had dental practice relevancy. Students worked together in mixedgroups (USA/Brazil/Mexico) to choose their topics and to develop an application - including posts for social media to increase awareness of the general public or didactic lectures (slides) for the dental students that didn't attend the course in the following topics: antimicrobial resistance (AMR), over prescription of opioids, waste in dentistry, microplastics influencing human health, the importance of One Health for health care providers and the use of fluoride/dental resins in an One Health approach. In the applications, learners identified sustainable solutions that could reduce environmental impact and promote health equity at their immediate level (e.g., implementing practice change at dental schools), and at the professional/government level (e.g., developing recommendations affecting policy). Integrating One Health educational opportunities into dental school curricula allows students to act on societal issues that resonate with them while fostering health and sustainability within a global learning context, including providing unique opportunities to collaborate with peers from other institutions.
https://symposium.foragerone.com/2025-racas/presentations/73618

The Role of Emergency Medical Services in Combating Health Deserts: A Case Study of Eagle County, Colorado
Lauren Kuraganti *Social Sciences & Humanities*
Mentor: Kirsten Christensen, MSS, MURP (University of Colorado Denver)

Abstract:
Millions of Americans reside in health deserts: locations that lack adequate healthcare resources, infrastructure, or personnel, and/or residents must travel significant distances, often in adverse terrain or weather conditions, in order to receive necessary care. Health deserts may also refer to areas in which a significant portion of its population is uninsured or faces difficulty accessing care due to physical disabilities, socioeconomic status, or lack of transportation. This leads to marked geographical healthcare disparities amongst communities in need. One solution to this problem lies in an existing, mobile resource: emergency medical services. Emerging initiatives such as Community Paramedicine, where highly-trained paramedics and nurses can practice at an expanded scope and monitor patients with chronic conditions in their homes, could be the breakthrough rural and underserved communities desperately need. One such program that exemplifies the future of EMS is Eagle County Paramedic Services, which serves largely rural communities in the Colorado Rocky Mountains. ECPS is the sole provider of emergency medical services in the county, and saw a need for creative healthcare solutions in their community and thus began various community health programs including community paramedicine, behavioral health support, community outreach, and primary prevention strategies. Since their inception, such programs have seen considerable success in the county.
https://symposium.foragerone.com/2025-racas/presentations/73729

The Willam Tell Act: the Beatniks and Jazz in Film
Marley Tremmel, Jack Kabel *Arts & Media*
Mentor: Andrew Bateman

Abstract:
The Beat Generation refers to a literary movement which originated in the 1940's and 50's and was spearheaded by a group of highly experimental writers and poets including Jack Keroac and Allen Ginsberg who sought to use improvisation and performance to push the art of the written word to its limits. Far less talked about are the many women whose contributions are rarely acknowledged and almost never published or revered the way their male counterparts were. Among these women was Joan Vollmer, a writer who was tragically killed by her Husband William Burroughs, who would go on to be revered as a literary giant of the Beat Generation, by gunshot in an act of performance art. The William Tell Act is a short film project seeking to, in part, rectify this inequity while also presenting a unique marriage between this unconventional writing style and the medium of film. The film centers around Joan's story and confronts head on the historical misogyny which is inherent to it. Previous filmic adaptations of Beat Generation stories focus heavily on the sex, drugs, and murder which surrounded these writers instead of their highly influential artistry. This film seeks to emulate this style of writing through writing, performance, cinematography, editing, and score to deliver a one-of-a-kind film which both honors and challenges its source material.
https://symposium.foragerone.com/2025-racas/presentations/73730

Therapeutic Contact Lens for Corneal Disease
Elizabeth Chung *Biomedical Sciences*
Mentor: Jungjae Lee

Abstract:
Chemical burns to the eye, particularly from acids, can trigger an overproduction of matrix metalloproteinases (MMPs), which degrade the extracellular matrix and worsen corneal opacity. The treatments that have been developed to address this issue all have their limitations such as increased risk for infection, failure to target specific injury sites and high costs. The proposed research aims to combat these issues by developing an cost-effective hydrogel that can deactivate MMP activity directly at the site of the injury. The goal is to develop hydrogels with zinc specific chelators that can remove zinc and stop MMP production. The specific zinc chelators that will be used in this research project are EDTA and DPA. Hydrogels will be made and tested with varying concentrations of both zinc chelators. The goal is to create a procedure that will create a hydrogel with the most amount of pores as possible. It has been hypothesized that an increased porosity of the hydrogel leads to an increased zinc uptake, due to the increased surface area and contact with the zinc specific chelator. Once the hydrogels are developed they will undergo a zinc assay to analyze how much zinc each hydrogel can absorb. This research proposes an affordable hydrogel with zinc specific chelators to directly inhibit MMP at the injury site to prevent extracellular matrix degradation and corneal opacity.
https://symposium.foragerone.com/2025-racas/presentations/73715

Thermal Comfort at Urban Bus Stops in Denver, CO: A Seasonal Analysis
Olivia Young, Ian Echelmeier, Anthony Gesford, Evan Wittman, Ryan Goodale *Natural & Physical Sciences*
Mentor: Benjamin Crawford

Abstract:
The urban heat island effect exacerbates the effect of heat in urban areas due to little vegetation, the built environment, and reduced nighttime cooling. Public transportation is frequently used in urban areas, but thermal comfort at the bus stop is largely unstudied. Measuring thermal conditions at bus stops is essential for assessing temperature exposure and improving stop design for commuter comfort. This study examines thermal conditions at unique bus stops across various bus lines in Denver, CO, and compares measurements from summer 2024 with ongoing measurements from winter 2025. Previous research shows that each of these factors also influences the microclimates surrounding each bus stop. Air temperature (in sun and shade), wind speed, globe temperature, and light intensity (LUX) were measured with heat stress trackers (HSTs) and light meters across terrain with varying amounts of shade, vegetation, pavements, and infrastructure. The measurements from summer 2024 indicate variability in thermal comfort between bus stops, with shaded bus stops' temperatures being noticeably cooler. We expect that the measurements from winter 2025 will show a similar result, with shaded bus stops being slightly cooler than unshaded locations. This research project contributes to a broader understanding of microclimate impacts in transit environments while highlighting the importance of heat/cold mitigation strategies in public spaces.
https://symposium.foragerone.com/2025-racas/presentations/73663

Thermal Sensing of Green Infrastructure in Denver, CO
Casey Jenson, Gabriela Guerrero-Teran, Lauren Kuraganti, Garrison Garrison, Benjamin Doyle *Natural & Physical Sciences*
Mentor: Dr. Ben Crawford

Abstract:
Urban heat islands produce exasperating heat conditions in cities, especially conventional, dark-colored rooftops. In 2018, Denver implemented the Green Buildings Ordinance, mandating that new buildings and certain roof replacements incorporate green spaces or other sustainable features. Green roofs are promoted as a climate mitigation strategy, but their detailed thermal performance under Denver's specific climatic conditions remains underexplored. This study uses high-resolution thermal imaging to investigate surface temperature variations on green roofs compared to traditional rooftops. We observe three green rooftops near downtown Denver and their surface air temperatures during milder winter and early spring weather. Multiple pictures are taken with a FLIR C5 infrared camera and air temperatures via a handheld, portable weather station known as a Kestrel. All data recorded is then compared to a control measurement on the top level of a parking garage. The thermal images highlight the contrast between the surface temperatures of typical urban roof materials and green roof vegetation. Our results are influenced by winter conditions that affect plant interactions with the environment. This project indicates the potential of green roofs as urban microclimate "islands" providing growing space and temperature relief even in areas where gray infrastructure is dominant.
https://symposium.foragerone.com/2025-racas/presentations/73585

Three-Dimensional Video Conferencing
Luis Carlos Gutierrez *Tech, Engineering, & Math*
Mentor: Dr. Nam Bui

Abstract:
Since the 2020 COVID-19 pandemic, video conferencing has become a predominant means of communication for business, school, and work. The issue with video conferencing is a lack of interpersonal communication which is limited by the medium of a screen. Our goal with this project was to create a 3D volumetric display that would be more conducive towards our natural modes of communication, such as non-verbal, that are diminished over video conferences. We have resorted to the 3D projection of images through the method of plane rotation. This 2D plane will be driven by an LED matrix. We are using Computer Vision Algorithms to recreate a 3D figure from a 2D image. We have also created a prototype to drive the rotation of the LED matrix. We anticipate that creating a 3D volumetric display for the use of video conferencing will enable end users to have a more intimate and natural experience regarding communication over the internet.
https://symposium.foragerone.com/2025-racas/presentations/73577

Through the Lens of Pauper Graves: Understanding Colorado History From Below
Chaeli Hobbs, Daniel Torres Diaz *Social Sciences & Humanities*
Mentor: James Walsh

Abstract:
Our project is split into two studies of historical graves. One being the Roselawn Cemetery in Pueblo and the other being the Convict Section of Greenwood cemetery in Canon City. Through the studies of these historical graves, we are able to discover disparities that existed in the history of Colorado. The Roselawn Cemetery is home to many victims of the Pueblo Flood of 1921. The Pueblo Flood of 1921 is one of the deadliest floods recorded in Colorado history. The devastation was so grand that to this day there is no exact number for the lives lost. The range is anywhere from 500-1500 victims. Through our study issues emerge such as housing justice, health care, and immigration statues. The Convict Section of Greenwood cemetery holds nearly 400 people convicted at Colorado State Penitentiary. The graves of these people are simply marked as CSP Inmate ignoring the lives that each of them may have had. Studying this grave highlights disparities regarding race and economic hierarchy. All of these issues ranging from economic, racial or gendered discrimination have a huge history in Colorado that remains uncovered. In each of these graves lies a story that deserves to be told. The people in these graves have been reduced to forgotten names and untold stories. Through the use of historical articles, obituaries, and genealogy sites we are able to connect the names to their stories. We are able to find the victims of the Pueblo flood and paint a geographical picture of the effects the flood had. We are able to connect the stories of convicts and find out more about them when history would rather erase them. The goal of this project is to uncover the historical disparities in Colorado through the lens of pauper graves.
https://symposium.foragerone.com/2025-racas/presentations/73666

To What Extent do Domestic Violence Survivors Trust Law Enforcement to Provide Protection and Justice, and How is That Shaped by Existing Police Protocols?
Nitara Lewis, Melannie Gonzalez, Harper Baird *Social Sciences & Humanities*
Mentor: Courtney Leapley

Abstract:
Understanding IPV/DV: Intimate Partner Violence (IPV) and domestic violence continue to pose serious public safety and public health challenges across the United States. Law enforcement is often the first line of response, yet how officers are trained and how they engage at the scene can significantly impact the outcomes for survivors.
Law Enforcement Protocols: Recent literature highlights a range of approaches to improve law enforcement response. Complementary research emphasizes the importance of tactical protocols during domestic violence calls. However, structural critiques warn against overreliance on policing, especially for survivors who may face additional risks due to race, immigration status, or socioeconomic background.
These perspectives argue for more community-based, survivor-centered models of intervention and support. By examining training models, response strategies, and the socio-political context of criminalized survivors, this poster aims to illuminate the complexities of law enforcement's role in IPV response and raise critical questions about where reform should begin and where alternative approaches may be necessary.
https://symposium.foragerone.com/2025-racas/presentations/73605

Tracking Immune Cell Biomarkers in RET + Lung Adenocarcinoma Bearing Mice
Daniel Skhisov *Biomedical Sciences*
Mentor: Dr. Lynn Heasley

Abstract:
This project is working towards creating biomarkers to track lung adenocarcinoma therapeutic response. Current studies show that TKI treatment of adenocarcinomas lead to tumor shrinkage, however full removal of tumors is rarely observed. The current hypothesis is that when the tumor shrinks, a small amount of cells are able to persist and acquire resistance to TKI treatments. Eventually, the tumor is able to grow out again. Now, there exists no studies showing the host immune system contribution during the treatment and it would be helpful to track this. The work proposed will track these biomarkers through all stages of treatment. The proposed biomarkers to be tracked are CD4 and CD8+ T cells, neutrophils, and macrophages. Tracking biomarkers may provide doctors with new strategies of monitoring tumors and lead to clinical research into lung adenocarcinoma treatment.
https://symposium.foragerone.com/2025-racas/presentations/73726

Translations of the Ecole William Ponty Notebooks from Senegal, West Africa
Jenna Bachman *Social Sciences & Humanities*
Mentor: Emma BUNKLEY

Abstract:
I have been translating the Cahiers Ponty (Ponty Notebooks) that come from Sénégal. These notebooks were written from 1933 and 1957. They were written by students in their third year that attended a school named after a French man called William Ponty. The notebooks served as these student's dissertation. The school was founded on November 24th, 1903. Through the notebooks, we can see that the French imposed certain cultural standards on West African peoples through the Ecole William Ponty. Its graduates demonstrate that the French pursued a consistent policy of educational assimilation. At least at the level of Ecole Ponty, education in Africa closely mirrored that of France, intentionally aimed at shaping "black Frenchmen" (Sabatier 1977). These notebooks explore African culture, customs, and folklore, education, and illnesses. My favorite notebook focused on one man and his journey from school to having a career and all of his ups and downs.
https://symposium.foragerone.com/2025-racas/presentations/74047

Uncovering the neural circuit responsible for exercise-induced stress resistance
Maria Londono Cano *Biomedical Sciences*
Mentor: Benjamin Greenwood

Abstract:
Exercise reduces the risk of developing future stress-related mental health disorders, but the mechanisms remain unclear. Research using voluntary wheel running in rats prevents anxiety-like behaviors (exaggerated fear and social avoidance) which are typically observed in sedentary rats following exposure of inescapable stress. The nucleus accumbens (NAc) is a brain structure involved in the rewarding effects of exercise, which has long been assumed to contribute to the mental health benefits of exercise. However, how the nucleus accumbens enables stress resistance from exercise is unknown. One possible mechanism is that the NAc constrains activity of serotonergic neurons in the dorsal raphe nucleus during stressful experiences, activity that is necessary for behavioral outcomes of inescapable stress. To test this hypothesis, we inhibit NAc activity during stress by local administration of the GABA agonist muscimol. We hypothesize the inhibition of the NAc will restore stress-induced social avoidance and exaggerated fear in rats who were physically active. We will examine the neural activation marker cfos in the dorsal raphe nucleus and this will reveal whether the inhibition of the NAc restores activity of serotonergic neurons. Data are currently being analyzed. This experiment could reveal an important role of the NAc in the stress protective effects of exercise in female rats.
https://symposium.foragerone.com/2025-racas/presentations/73687

Understanding Employment Trends in Urban China
Isabel Wolf *Social Sciences & Humanities*
Mentor: Laura Argys

Abstract:
Since the 1980's China's economy has been growing astonishingly rapidly by global standards. For a while, it looked like China's Gross Domestic Product would surpass the US, but recently China's growth has slowed down—a result of

China's rapidly decreasing workforce (Fang, 2023). The percentage of the population that is employed or looking for work has been falling for the last 30 years (World Bank Open Data), and women's employment has been falling at a faster rate than men's. The purpose of this project is to identify the cause for this sudden, unexpected fall in China's employment with a specific focus on factors discouraging women from participating in the workforce. Data from the China Household Income Project for urban residents between the years 1995 to 2018 is used to illustrate change in employment rates to understand the underlying causes of the decline in employment. Initially, I examine the declines in work from men and women separately; the decline for women between 1995 and 2018 (a nearly 12% decline) is substantially larger than the decline for men (about a 2% decline). To understand the underlying causes for these changes, I use an Oaxaca-Blinder decomposition technique that separates changes in employment into one group that represents changes in the demographic characteristics of the population and another group that identifies changes personal attitudes towards work. My results indicate that demographic changes (e.g. aging of the population, education levels, and marital status) account for only a small proportion (just over 20% for women and 12% for men) of the decline in work. The remaining contributor to the declining employment in China (nearly 80% and 88% for men) during this period is changes in people's decision to work. These results suggest that policy makers should focus on incentives to make work more attractive.
https://symposium.foragerone.com/2025-racas/presentations/73656

Understanding Energy Depositions in Dark Matter Detectors
Daniel Mazin *Natural & Physical Sciences, Tech, Engineering, & Math*
Mentor: Dr. Amy Roberts

Abstract:
This research seeks to understand how particles deposit energy in detectors. Specifically, silicon-based and germanium-based dark matter detectors used by the SuperCDMS (Super Cryogenic Dark Matter Search) collaboration. Specifically, my research focuses on determining the nuclear recoil Fano factor – a parameter that quantifies the statistical variance in electron-hole pair production during particle interactions with nuclei inside the detector. The Fano factor directly impacts detector sensitivity and dark matter event identification. My work includes analysis of CDMS-II experimental data collected between 2007-2008, detailing the extraction of zero-energy resolution measurements and the troubleshooting of probability distribution functions used to differentiate between electron and nuclear recoil events. I will demonstrate the reliability of probability distribution functions and establish future work for the nuclear recoil Fano factor analysis.
https://symposium.foragerone.com/2025-racas/presentations/73685

Understanding Mechanical Stresses: In Vitro Disease Modeling of Cardiac Biomechanics
Efren Montelongo *Biomedical Sciences*
Mentor: Dr. Brisa Pena

Abstract:
Pathological mechanical stress is a major cause of cardiac hypertrophy and cardiac remodeling post-myocardial infarction, regulating fibrosis and scar formation. Although it is well known that cells respond to changes in their mechanical environment, the molecular mechanisms underlying this response, the mechanoreceptors that receive mechanical stress and convert it into intracellular biochemical signals, and how cells interact with each other under pathological conditions are still poorly understood. To address this gap, we have engineered an innovative device to study mechanical stresses on cells: a cell stressor that simultaneously applies tension and compressional stresses. We propose to use this device to model the mechanical stresses experienced by cardiac tissue during pathological conditions. ***We hypothesize that mechanical stress activates mechanotransduction signaling pathways that induce fibrosis in the heart, mediated by mechanosensitive ion channels.*** To test our hypothesis, we will employ a combination of biological and bioengineering approaches to identify the mechanotransduction signaling pathways associated with PIEZO1, a mechanosensitive ion channel that we propose may play a role in activating fibrosis during cardiac injury. Our findings could lead to novel therapeutics for cardiac injury and for other fibrotic conditions caused by mechanical stress. *Additionally, since fibrotic diseases account for 1/3 of deaths globally, the tools that we have engineered for this project could be also applied to studying fibrotic mechanisms in various organs such as, the lungs and kidneys*.
https://symposium.foragerone.com/2025-racas/presentations/73981

Understanding physics majors' readiness and recommendations
Shilene Davis *Natural & Physical Sciences*
Mentor: Michael "Bodhi" Rogers

Abstract:

The students that make up the University of Colorado Denver's physics departments are non-traditional students, who either transferred in, changed their major, or are career changers returning to college after years in the workforce. The fact that our students are not the traditional student means that using traditional cohorting methods and retention tracking practices is challenging and at times impossible. To get a better understanding of the physics majors at the University of Colorado Denver, Dr. Rogers and I created a new form of cohorting called "Readiness Categories." These categories were based upon what physics track courses a student was ready to take when they joined the major. Our total population of 239 students, of which 95 were omitted and 144 were included. The math Readiness Categories and the General Physics 1 category showed the highest number of dropped students (35 out of 85), whereas the General Physics 2, Modern, and Mechanics Ready courses had a lower number of dropped students (14 out of 65).
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Understanding Political Communication Through TikTok
Ethan Howes *Social Sciences & Humanities*
Mentor: Dr. Mia Fischer

Abstract:
Social media has always been a melting pot of ideas and opinions, and politics are no exception. Recent years have seen politicians campaigning and engaging with voters through posting and commenting. Through a thematic analysis of the U.S. presidential candidates posts and language used, I can examine and understand how emerging themes fit broadly into the political party and programs created by candidates. In doing so, I can also understand and predict broader themes used on social media platforms and how they might evolve in future elections. The themes suggest that both political parties utilize the same broad themes but focus their energy into different uses of those themes. Both politicians are striving for a more relatable approach and appear to be attempting to connect with the everyday issues of voters.
https://symposium.foragerone.com/2025-racas/presentations/73697

Understanding the Legal and Psychological Realities of Women Who Have Killed Their Abusers: A Literature Review and Case-Based Insight
Juan Diaz *Social Sciences & Humanities*
Mentor: Courtney Leapley

Abstract:
This study will explore the neurobiological and behavioral impact of intimate partner violence, with a particular focus on how past trauma—especially adverse childhood experiences—influences cognitive, physiological, and legal system interactions for survivors. Through a survey, this research hopes to examine automatic defensive reactions, cognitive dissonance, altered perceptions of abuse, and long-term behavioral adaptations in individuals who have experienced IPV. The survey is designed to find how survivors process and respond to violence on a subconscious level, including involuntary physical reactions, dissociation, time distortions, and trauma-driven behavioral patterns that may affect their decision-making, memory recall, and interactions with legal and social institutions. Furthermore, the study explores the ways in which survivors may struggle with internalized perceptions of abuse, a reenactment of past patterns in new relationships, and the broader impact of trauma on self-perception and relational dynamics through a case study of a survivor. This study hopes to contribute to a deeper understanding of how neurobiological survival mechanisms influence IPV-related behaviors, particularly in legal and social contexts where survivor actions are often misunderstood, misinterpreted, or criminalized (which should not be the case). This research underscores the urgent need for trauma-informed legal policies and support systems that recognize dissociation, involuntary self-defense, and non-linear trauma responses as valid survival mechanisms. The findings will provide insights that challenge conventional assumptions about victim behavior and inform more equitable legal and psychological frameworks for IPV survivors.
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Understanding Young Men's Perspectives: Exploring Masculinity, Politics, and Social Identity
Michelle Vasquez Loya *Social Sciences & Humanities*
Mentor: Lonnie Schaible

Abstract:
This research examines how young men perceive the political left's stance on their struggles and how ideological spaces that frame masculinity as being under attack influence their worldview. While existing studies explore young men's engagement with political and social discourse, limited research specifically investigates their perspectives on political alienation and masculinity. Research on masculinity and ideology suggests that specific online communities reinforce beliefs that masculinity is under threat. Yet, gaps remain in understanding why some young men are drawn to these

spaces and how their experiences shape their views. Drawing on qualitative interviews, this study explores the social, economic, and psychological factors contributing to these perceptions and their influence on political and social beliefs. As a result of the dismissal of mainstream politics, particularly from the left, young men are more likely to engage with ideological spaces that reinforce notions of masculinity under attack. Consequently, exposure to these spaces influences their political and social attitudes, often reinforcing traditional or reactionary gender ideologies. By identifying patterns related to upbringing, relationships, education, work, and mental health, this research aims to foster more inclusive and constructive conversations about gender, identity, and politics.
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Using Diatom Assemblages to Reconstruct Historical Water Quality in Barr Lake, Colorado
Scott Serafin, Emma Censky, Emma Tunks, Raghad Shaker *Natural & Physical Sciences*
Mentor: Dr. Christy Briles

Abstract:
This study reconstructs historical water quality trends of Barr Lake using diatom assemblages preserved in sediment cores. By comparing diatom assemblages of a 2024 Metro Water Recovery core with a 2017 Community-Based Practicum core, we analyze shifts in species composition as proxies for nutrient loading, eutrophication, and long-term ecological change. Additionally, we investigate the 1965 flood event as a marker within the core using magnetic susceptibility and diatom community shifts.
https://symposium.foragerone.com/2025-racas/presentations/73712

Using Scanning Electron Microscopy to Identify Animals Associated with Limber Pine Damage in Yellowstone National Park
Sachiel Oberto *Natural & Physical Sciences*
Mentor: Dr. Diana Tomback

Abstract:
Limber pine (Pinus flexilis) populations in Yellowstone National Park are declining due to mountain pine beetle outbreaks, introduced white pine blister rust, more severe and frequent fires, and climate change. Additionally, recent severe bark damage may further impact limber pine survival in the park. We investigated the extent and cause of this damage in an old growth stand in the Lamar Valley; in some cases, we found some trees likely to die in the coming years. Hair was adhered to the wounds of 22 of 23 pines examined, suggesting wildlife were associated. Seven Yellowstone mammals are potentially capable of such damage: American bison (Bison bison), white-tailed deer (Odocoileus virginianus), mule deer (Odocoileus hemionus), elk (Cervus canadensis), moose (Alces alces), black bear (Ursus americanus), and grizzly bear (Ursus arctos horribilis). Given rising bison populations in the Lamar valley, as well as research and field observation documenting their vegetation damage, we hypothesize bison are more associated than other mammals. To investigate this, we collected hairs from 14 limber pines and used scanning electron microscopy (SEM) to compare morphology of collected hairs from the Denver Museum of Nature & Science mammalogy collection. We assessed qualitative (scale shape) and quantitative (scale height, hair width) characteristics of hairs to distinguish species. Identifications were made using the constructed key. One elk, four black bear, and seven bison were observed, with two unable to be identified. 50% of the observations were bison, suggesting an association between them and limber pine damage. Understanding how wildlife alter forest structure is crucial for informing conservation strategies of keystone forest species. We hope our research can identify which limber pine communities are at-risk of this type of wildlife damage and inform management actions in Yellowstone National Park.
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Validating the use of a Chemogenetic approach to selectively control the activity of dopamine D1 receptor-expressing neurons in the brain
Filsan Mawlid, Minan Abdin *Biomedical Sciences*
Mentor: Benjamin Greenwood

Abstract:
Fear extinction-based exposure therapy is used to treat anxiety disorders. The effectiveness of exposure therapy is limited by fear renewal, a phenomenon in which anxiety reemerges after successful extinction when subjects encounter fear-inducing stimuli in contexts different from where extinction occurred. Exercise after fear extinction reduces fear renewal in both humans and rodents. This effect is thought to be mediated by activation of dopamine D1-receptor (D1) expressing neurons in the dorsal lateral striatum (DLS) during the recall of extinction. Activation of D1 neurons in the DLS could weaken the contextual influence on extinction memory, thus reducing fear renewal. To understand the role of D1 neurons

in exercise-augmentation of extinction, we need a way to manipulate their activity in the DLS. A chemogenetic approach, which takes advantage of viral-mediated gene transfer to express inhibitory designer receptors exclusively in DLS D1 neurons, can be used to silence D1 neural activity during recall of fear extinction. If fear renewal returns in rats that exercised after fear extinction, then DLS D1 neurons were likely involved. However, the success of this approach in restricting the expression of inhibitory designer receptors to D1 neurons remains unknown. We aim to verify the effectiveness of the chemogenetic technique in selectively targeting D1-expressing neurons using RNAscope to label mRNAs for D1 and inhibitory receptors. Data collection is ongoing.
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White Supremacy and The Weaponization of "Civility" and "Decorum" in the Legislative Process
Hazzel Chavira *Social Sciences & Humanities*
Mentor: Dr. Tony Robinson

Abstract:
Debates over “civility” & “decorum” in legislative processes are increasingly common in American politics. In Colorado, Montana, & Tennessee legislators targeted for alleged breaches of incivility were either legislators of color or LGBTQ+, who vigorously challenged policies causing racial or gender harm. Throughout U.S. history, socially constructed words like ‘decorum’, ‘etiquette’ & ‘civility’ have often been used against civil rights protestors and legislators of color to critique their demands and help perpetuate a racist system that maintains white privilege.
This paper hypothesizes that critiquing legislators of color for allegedly “Divisive” critiques/ behaviors is a harmful double standard that allows/ignores polarizing language/behavior by white legislators nationwide.
This paper will study the language/acts of censure/reprimands occurring in State Capitols nationwide to document: 1. *actions/behaviors* that lead to/or not official condemnations and 2. *how often official condemnations (censures/reprimands) are imposed* for incivility against which Legislators
Nationwide patterns regarding points 1,2 (above) will be identified through a review of national press coverage of state legislatures, using databases like Newsbank.
In Tennessee the GOP-dominated House expelled two black members for roles in demonstrations circling gun control. In Montana, a trans legislator was censured/banned from the legislative floor. In Colorado, a Black legislator was censured/removed from Committee Chair role for joining a pro-Palestine protest in the gallery.
Being an intern with Colorado’s 74th General Assembly for Representative Bacon, a legislator of color, will give me unique insight into ongoing Colorado legislative debates over “decorum” & “civility” & how these debates do or do not inequitably target/harm legislators of color.
This research will allow for an informed assessment of the racialized/genderized patterns of “civility enforcement” by America’s legislative bodies whilst compiling an encyclopedic list of frequency legislators of color have been reprimanded/censured nationwide (for what) versus white/GOP legislators, since 2020.
https://symposium.foragerone.com/2025-racas/presentations/73591

Why Do Patients Come to the Emergency Department After Using Cannabis?
Tianah Reyes *Biomedical Sciences*
Mentor: Andrew Monte

Abstract:
Background: Prevalence of cannabis use has increased dramatically after liberalization of medical cannabis, raising concern that cannabis associated hospital visits have also increased. Cannabis became the most often purchased in flower form for smoking, whereas the Colorado Behavioral Risk Factor Surveillance System, 40.4% of marijuana users reports smoking cannabis and 3.6% report using edible cannabis products only. The total number of cannabis products sold and used frequently contribute to emergency department (ED) visits and may be toxically harmful to users. The objective of this study was to inform cannabis users they may be ill-informed or underappreciate the risks of cannabis use.
Methods: This study was an observational chart review study from patients who had came to the ED. Charts were identified by pulling cases with a cannabis ICD-9 or 10-CM code between 2012 and 2016. Reviewers captured reasons why visits were related to cannabis. Complaints were then categorized into clinical complaint categories. Retrospective chart review study was involved using descriptive statistics, Chi-Square, and T-tests to evaluate the data.
Results: A total of 449,031 patients were seen in the UCH ED. Cannabis ICD codes were present in 9973. About one-fourth (25.74%) of visits with cannabis ICD-CM codes were found to be at least partially attributable to cannabis. These patients are more often young, Caucasian males when compared to the overall ED population. Patients with a cannabis-attributable visit were more often admitted to the hospital (p
Conclusions: These findings represent areas to target in cannabis user education as public perceptions change across time. At the UCH ED, patients with cannabis-attributable visits are more likely to be younger Caucasian males when

compared to the overall ED population. Begin to address this gap in public perception of the drug to ensure users do not view cannabis as free from all adverse health implications.
https://symposium.foragerone.com/2025-racas/presentations/73719

Wind/Spray Tunnel Development for Weather Simulation for Wind Turbine Blades
Juan Hernandez Jimenez *Tech, Engineering, & Math*
Mentor: Dr. Linyue Gao

Abstract:
The design and development of a custom wind tunnel aimed to simulate controlled weather conditions for a wide range of experiments. A key goal was to ensure uniform and consistent airflow at the exit, as irregular flow can compromise data accuracy. To achieve a stable velocity profile, the design focused on optimizing internal components—especially honeycomb flow straighteners. These structures reduce turbulence and align the flow. Several honeycomb configurations were tested, varying in cell geometry, length-to-diameter ratio, and material. Results showed that these parameters significantly impacted flow quality, with certain designs enhancing uniformity and reducing turbulence. Anemometry was used to characterize the velocity field during each iteration. These assessments confirmed that optimized honeycomb geometry is essential for achieving predictable, laminar-like flow. This wind tunnel now serves as a reliable platform for high-quality, repeatable tests under well-controlled conditions.
https://symposium.foragerone.com/2025-racas/presentations/74050

Wintertime Thermal Refugia on the South Platte River Downstream of a Wastewater Treatment Facility
Ryan Emmerson, Weston Burcar, Emily Melton, Gretchen Wilson, Jacob Casey *Natural & Physical Sciences*
Mentor: Jordan Parman

Abstract:
Wastewater treatment plant (WWTP) effluent poses a significant thermal stressor— especially in arid and semi-arid regions. In the South Platte River near Denver, CO, WWTP effluent can comprise up to 85% of winter flow and raise temperatures above the wintertime chronic standard of 12.1°C for up to 11 miles downstream. These elevated temperatures can disrupt organisms and ecosystems, including temperature-sensitive biological cues in native fish (Figure 1 below). Thermal refugia—cooler water patches created by groundwater inputs, tributaries, or backwaters—may offer winter protection. However, their availability, spatial extent, and use by native fish like the Johnny darter are poorly understood. We investigate thermal refugia in Segment 15 of the river to inform management strategies to support native fish populations in effluent-dominated conditions
https://symposium.foragerone.com/2025-racas/presentations/73801

Womb of Horror - Women's Bodily Autonomy in Contemporary Horror Cinema
Dorothy Lopez *Arts & Media*
Mentor: Dr. Yang Wang

Abstract:
The horror genre has long served to express cultural anxieties around the female body, reproduction, and bodily autonomy. Lucy Fischer examines these anxieties through iconic films like *Rosemary's Baby* (*1968*), while Sonia Lupher suggests the evolution of women's horror cinema in the twenty-first century as a genre increasingly shaped by female perspectives and contemporary sociopolitical concerns. Despite this scholarly foundation, there remains a gap in literature regarding the sudden surge of pregnancy-focused horror films released in 2024; a phenomenon that speaks to current cultural concerns. Recent films such as *Apartment 7a*, *Cuckoo*, *Immaculate*, and *The First Omen* echo a collectively artistic response to increasing debates over women's reproductive rights and bodily autonomy - particularly in a post reversal of *Roe v. Wade* landscape - and yet have not been analyzed collectively in academic writing. My thesis fills this gap by positioning these films as part of a developing cycle of reproductive horror that surpasses individual narratives, acting instead as a cultural conversation around forced impregnation, autonomy, and the systemic controlling of women's bodies. Drawing on the works of Fischer and Lupher, I argue that these films engage pregnancy as both literal horror and a cultural metaphor, expressing societal fears of lost bodily autonomy control due to legal restrictions. Ultimately, I argue that this cinematic trend not only reflects contemporary anxieties but also challenges audiences to confront the vulnerability of bodily autonomy in contemporary society.
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Wrist Ligament Imaging: Comparative Analysis of Cameras in Photogrammetry Model Creation

Hunter Swartwout *Natural & Physical Sciences*
Mentor: Michael "Bodhi" Rogers

Abstract:
Digital 3D reconstructions of anatomical structures have become a common tool of research and education through advances in computational power and software. After our preliminary literature review, this work is the first, that we know of, to use photogrammetry to image cadaveric wrist joint surfaces through a surgical approach. Photogrammetry software uses a collection of still images from different but overlapping perspectives to create 3D models. An intra oral dental camera, a Revopoint structured light scanner, and a specialized surgical micro-camera system will be the focus instruments and qualitative comparison of ability to image visible bone surface are as to recreate accurate 3D models using photogrammetry software.
https://symposium.foragerone.com/2025-racas/presentations/73679
