

METROPOLITAN STATE UNIVERSITY OF DENVER 9TH ANNUAL

UNDERGRADUATE RESEARCH

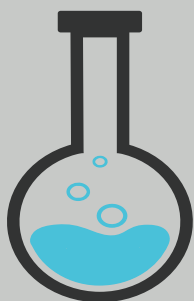
CONFERENCE

A SYMPOSIUM OF SCHOLARLY WORKS AND CREATIVE PROJECTS

MOVED TO AN ONLINE FORMAT DUE TO COVID-19 CONCERNS

APRIL 24TH, 2020

8:00AM - 5:00PM



Program and Book of Abstracts

9th Annual MSU Denver Undergraduate Research Conference

April 24, 2020

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A welcome from Provost Golich

Welcome to the Metropolitan State University of Denver 9th Annual Undergraduate Research Conference: A Symposium of Scholarly Works and Creative Projects! Although the novel coronavirus has conspired to prevent the conference from taking place in person, our amazing and dedicated faculty and staff have labored overtime to ensure that all who worked so hard on their various undergraduate research projects this year will be able to engage in a virtual conference! Students can have their abstracts published, together with the visuals of their posters, PowerPoints, and even a video-recording of their presentation if they choose. The entire conference will live permanently in the Auraria Library's Repository after the event.

Special kudos to Dr. Mandi Schaeffer Fry (Mathematical Sciences) and Jill Lange (Undergraduate Studies) for their remarkable work supporting faculty and staff as they collaborated on a wide array of research projects during this extraordinary year. And even more praise for their efforts to move this face-to-face conference into a virtual space so students and faculty can still share their discoveries and creative works.

I am also pleased to welcome our new Faculty Director for Undergraduate Research, Dr. Kristy Duran, who will deliver our Keynote Address this year. You are joining a faculty and staff who demonstrate their commitment to excellence in educating our MSU Denver students every day. We look forward to many more years of outstanding undergraduate research conferences here.

Thanks to all of you who have contributed so much to make this event happen and to support our students engaged in this high impact practice.

All the best,

Vicki L. Golich, Ph.D.
Provost and Executive Vice President
of Academic Affairs



A welcome from President Davidson

One of the highlights of the spring at Metropolitan State University of Denver is our annual Undergraduate Research Conference: A Symposium of Scholarly Works and Creative Projects! Each year I am reminded once again of the impressive academic and creative energy of our Roadrunner students and this year is no different. In fact, in the midst of the novel coronavirus pandemic, you represent the many ways in which MSU Denver students rise to each challenge and reimagine what is possible despite the curveballs life sometimes sends our way.

Throughout your academic career at MSU Denver, and even more over the last few months, you have shown academic talent, personal resilience, and professional adaptability – all of which will carry you beyond our campus into successful careers, challenging graduate degrees, and rewarding lives with positive impact on your own families and communities.



The diversity of projects being presented is a testament not only to the excellence of our students and their faculty mentors, but also to the human capacity to explore new ideas, invent new ways of doing things, challenge assumptions, and create new narratives. In the face of the coronavirus, every one of you, your faculty, and your friends and families, has a role to play in reimagining what the world can look like in the future and we are proud that you will carry with you the values of community, diversity, excellence, and respect as you continue to challenge yourself with research projects and creative endeavors that will help us address, as a society, the sticky problems that confront us.

We are honored to be part of your path and to have you share with us the discoveries of your research and the insights of your creative endeavors! Thank you for the time and energy you have dedicated to these projects, for pivoting at the last minute to adapt to a changing world, and for providing me the privilege of being a small part of this day. By participating in the Undergraduate Research Program and presenting at the conference despite this year's challenges, you are proving the theory that Roadrunners are always seeking to reimagine what is possible!

Regards,

Janine A. Davidson, Ph.D.
President
Metropolitan State University of Denver

9th Annual Undergraduate Research Conference Keynote Speaker:

Dr. Kristy L. Duran

Dr. Kristy L. Duran is a Professor of Biology and an advocate for diversity and equity at Adams State University (ASU). Dr. Duran has a diverse background in biology, including expertise in neurobiology, ecology, evolutionary biology, and plant biology. She received her B.S. in Biology from the University of New Mexico, her M.S. in Zoology from Colorado State University, and her Ph.D. in Ecology and Evolutionary biology from the University of Colorado, Boulder. She received fellowships from the Ford Foundation and National Science Foundation for her work on dwarf mistletoe. Her research continues to focus on the interactions of dwarf mistletoes between their host species using genetic, ecological, and physiological techniques.



Dr. Duran's work on equity includes two co-authored articles on diversity, "We are never just scientists" and "It's time for science and academia to address sexual misconduct", which were featured in *Scientific American Voices*. As an emerging leader in the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS), she founded ASU's local chapter and serves as its advisor. She is a member of the President's Advisory Group for Equity at ASU and served on the inaugural leadership board for 500 Women Scientists.

As a product of undergraduate research programs, Dr. Duran is passionate about providing her students with undergraduate research opportunities both in and out of the classroom. In her 14 years in academia, she has mentored 30 students in independent research projects, with over half presenting their research at both national and regional conferences. She is a long-time member and chair of ASU's Student Scholars Day Committee, where she has been actively promoting student research and organizing the annual student research conference at ASU. Beginning in the 2020-2021 academic year, Dr. Duran is excited to join the Roadrunner community as the new Director of Undergraduate Research here at MSU Denver!

Join us at noon on April 24th, 2020 for Dr. Duran's keynote address via Teams!

2019-2020 Undergraduate Research Mini-Grants

The Undergraduate Research Program offers mini-grants of up to \$500 to support student research, scholarly works, and creative projects. The primary aim of the grant is to foster student-initiated, faculty-supervised research or scholarly/creative activity that is intended to result in an original contribution to the discipline.

UR Mini-Grant Awardees 2019-2020

- Tyler Bergfalk
- Kathryn Cunningham, Kaitlin Enge, and Juan Jose Andrade
- Cristina Donahue and Kaylee Eastridge
- Clayton Jacobs
- Anika James
- Liesl Jensen
- Keyata Lewis
- Shannon MacFadden
- Josie Moreno
- Kira Pai
- Jessica Pletcher
- Dylan Poch
- Andrew Smith
- Tyler Sodia
- Elizabeth Spear
- Nicholas Sundstrom
- Erica Van Steenhuyse, Amy Babich, and Jeremy Myers

UR Mini-Grant Reviewers 2019-2020

A special thank you to the following faculty members, who helped to review mini-grant applications in 2019!

- Pam Ansborg
- Rebecca Canges
- Bill Carnes
- Megan Filbin-Wong
- Jeffrey Helton
- Sara Jackson Shumate
- Sandy Lane
- Kristy Lyons
- Bridget Murphy-Kelsey
- Jeffrey Parker
- Emily Ragan
- Mandi Schaeffer Fry
- Sheryl Zajdowicz
- Thomas Cech
- Nona Shipman

Outstanding Mentor for Undergraduate Research Award:

Dr. Siva priya Santhanam



The 2020 *Golich Award* for Outstanding Mentor for Undergraduate Research goes to Dr. Siva priya Santhanam, a second-year assistant professor in Speech, Language, Hearing Sciences. Dr. Santhanam's dedication to undergraduate research is exceptional, and as you go through the abstracts, you'll see her work shine! Here's just a snapshot of what her students and colleagues have to say:

Dr. Santhanam is an exemplary mentor who has gone above and beyond to provide the best possible research experience for undergraduate research students. Her tenacity, support, patience, and comprehensive research knowledge is a boon the student body. Dr. Santhanam is a fantastic research mentor who has set a high standard for future research experiences. I am grateful for my experience as her research assistant and cannot think of a more deserving mentor.

- Kayla Murchison, Undergraduate Research Assistant

In less than two years, Dr. Santhanam has made an extraordinary impact in how SLHS students actively engage with research. Equally impressive is how her mentorship continues to serve students as they pursue opportunities beyond MSU Denver including graduate school and clinical practice. I commend Dr. Santhanam for her commitment to undergraduate research and, as chair, formally recognize how her work benefits the department at large.

- Jessica Rossi-Katz, PhD, CCC-A, Professor and Department Chair,
Speech, Language, Hearing Sciences

[...Dr. Santhanam] ensured that we had a voice and made decisions, while asking thought provoking questions and providing new perspectives.

- Kaylee Eastridge, Undergraduate Research Assistant

I think the fact that the number of students Dr. Santhanam mentored grew from two to eight in one year speaks volumes about her ability to inspire students and facilitate their involvement in Undergraduate Research. [...] The mentoring she has done in three and a half semesters has led to one publication, two presentations at the 8th Annual MSU Denver Undergraduate Research Conference, one regional conference presentation, one national conference presentation, two research grants, four proposals for a poster session at a national conference and four proposals for a poster at the MSU Denver Undergraduate Research Conference. I have no doubt that Dr. Santhanam will continue to inspire students to engage in Undergraduate Research and the number of students she mentors will continue to grow, and their work will lead to more publications and presentations.

- Dr. Meredith Flynn, Associate Director, Center for Teaching, Learning and Design

Celebrating



The Rowdy Scholar: A Journal of Undergraduate Research & Creative Works is an online, open-access multi-disciplinary scholarly research journal publishing original research and creative works, including but not limited to works prepared for classes, honors theses, or independent studies by undergraduate students at MSU Denver.

The Rowdy Scholar culminated from the efforts of a highly dedicated team of faculty and staff who are committed to promoting student success. The ultimate goal of *The Rowdy Scholar* team was to develop a journal in which the incredible scholarly works and creative projects of undergraduate students at MSU Denver can be showcased not only at MSU Denver, but also to the public.

Original Founders

Led by the amazing Elizabeth Kleinfeld and Sheryl Zajdowicz, the original founders of the journal were:

Elizabeth Kleinfeld

Vida Melvin

Sheryl Zajdowicz

Liz Moore

Erin Bissell

Anahi Russo Garrido

Salina Blea

Mandi Schaeffer Fry

Sara Jackson

Sarah Schliemann

Kat Martinez



A Huge Thanks

As Elizabeth Kleinfeld and Sheryl Zajdowicz step down as lead editors, the entire editorial board would like to thank them for developing the idea for the original FLC that led to the journal's founding, as well as for their leadership and extreme effort as the lead editors for the first two editions of *The Rowdy Scholar*. We would have been lost without you!



The First Edition of The Rowdy Scholar

In Spring 2019, we published the very first edition of *The Rowdy Scholar*, publishing work from six MSU Denver student authors. Click on the titles to read the articles!

- **Bilingualism in Autism Spectrum Disorders**
 - Author: Shannon Lewis, Speech, Language, Hearing Sciences
 - Faculty Mentor: Siva Priya Santhanam
- **Impact of a SRP in Comparison to Location and Cost on Perceived Value for Money**
 - Author: Mitchell Mattix, Hospitality, Tourism & Events
 - Faculty Mentor: Shinyong (Shawn) Jung
- **Perceived Power: Nonverbal Communication and Masculinity in Public Space**
 - Author: Julia Perry, Sociology
 - Faculty Mentor: Rae Shevalier, Ph.D.
- **Ignore the Playground...**
 - Author: Cassandra Reid, English
 - Faculty Mentor: Renee Ruderman
- **Evaluating Forecasts for Indian Summer Monsoon Precipitation Using the NESM**
 - Author: Erin Roberson, Meteorology
 - Faculty Mentor: Keah Schuenemann
- **That Strikes a Chord! An Illustration of Permutation Groups in Music Theory**
 - Author: Eric Roon, Mathematics
 - Faculty Mentor: Mandi Schaeffer Fry

First Edition Reviewers

The following editorial board members served as reviewers for the first edition:

Elizabeth Kleinfeld	Sara Jackson
Sheryl Zajdowicz	Shinyong Jung
Pamela Ansborg	Kristen Lyons
Shelby Balik	Vida Melvin
Philip Bernhardt	Siva Santhanam
Erin Bissell	Mandi Schaeffer Fry
Salina Blea	Sarah Schliemann
Jeffrey Helton	Kimberly VanHoosier-Carey

For information on the current editorial board and submitting to the journal, visit
<https://www.msudenver.edu/rowdy-scholar/>.
Keep an eye out for the 2nd Edition, coming soon!

Additional Acknowledgments

We'd also like to thank the following people and organizations for their contributions to the 9th Annual Undergraduate Research Conference:

- Poster Design and Program Cover Design: Carlos Hernandez
- Conference Program and Abstract Coordination: Mandi Schaeffer Fry
- Organization of the conference and administration of the URP: Elizabeth Parmelee, Jill Lange, and Mandi Schaeffer Fry
- Materials and advice from previous conferences: Salina Blea and Sheryl Zajdowicz
- Support for hosting the remote conference on the Auraria Institutional Repository: Matt Mariner
- Ongoing support for the URP: Provost Golich and President Davidson



Abstracts

Abstracts are listed alphabetically by the “primary presenter”, the presenter who submitted the abstract and whose name the URC record will be under in the Auraria Library Institutional Repository. The primary presenter is listed first and noted with an *.

Does Childhood Gender Nonconformity Predict Adult Disordered Eating Behavior?

Poster

Presenter(s): Annalisa Adams

Major: Psychology

Other Student Co-Author(s): Alex Croft

Faculty Mentor: Cynthia Erickson

Link to Presentation: <http://digital.auraria.edu/IR00000118/00001>

Childhood gender nonconformity is marked by a persistent refusal to conform to the societal norms associated with one’s assigned gender and strong preference for toys, clothing, and playmates associated with a different gender. Children may or may not grow out of their gender nonconformity, and their gender nonconformity may or may not be associated with gender dysphoria, which is defined as significant distress associated with gender nonconformity. Disordered eating is a term used to describe a range of abnormal eating behaviors that interfere with one’s ability to live a normal life but that may or may not rise to the level of a clinical eating disorder diagnosis. Prior research has linked gender dysphoria to disordered eating, but no research has yet investigated the link between childhood gender nonconformity and adult disordered eating. The purpose of this research is to determine whether: 1. childhood gender nonconformity predicts adult disordered eating behavior. 2. childhood gender nonconformity that persists into adulthood more significantly predicts adult disordered eating behaviors, and 3. the absence of distress about one’s gender (dysphoria) moderates the relationship between gender nonconformity and disordered eating behavior. This study was comprised of an online survey given to undergraduate introductory psychology students and emailed to friends and family using a snowball approach. The survey consisted of a demographic questionnaire, the EAT-26 scale, the Adverse Childhood Experiences Scale, and measures of anxiety, childhood gender nonconformity, and gender dysphoria. Determining whether there is a link between childhood gender nonconformity and adult disordered eating would allow clinicians to be aware of potentially at-risk populations. Knowing whether the absence of dysphoria moderates the disordered eating would allow clinicians to focus their efforts on mitigating dysphoria.

Non-Contact Anterior Cruciate Ligament Injury Differences in Males and Females: A Meta-Analysis

Poster

Presenter(s): Keith Alex*, Jose Rios-Ochoa

Major: Biology

Faculty Mentor: Jeffrey Simpson

Link to Presentation: <http://digital.auraria.edu/IR00000119/00001>

Anterior Cruciate Ligament (ACL) is one of the biggest concerns for athletes when it comes to injuries. The reoccurrence of ACL ruptures is more likely in females than males due to certain factors. The hypothesis of this study is that female athletes are more likely to rupture a previous non-contact ACL injury than male athletes due to the biomechanics of the lower extremity. The design of this study is meta-analysis research. Systematic review was conducted from multiple published articles; Descriptive analysis are used as well as three-dimensional motion analysis during the DL (double-legged) DVJ (Double Vertical Jump) and SL (Single Legged drop-landing tasks). Researchers used retroreflective markers which secured to the bilateral upper extremities, trunk, pelvis, hips, thighs, knees, shanks, ankles, and feet to calculate joint centers and tract segmented motions. Other researchers separated ACL injuries based on contact and non-contact injuries. These methods were used to analyze vertical jump tests.

Multiple results were looked at to see the correlation between each study that had similar results when it comes to recurrent ACL injury in females and males. Results from each study were broken down from ipsilateral graft tear and contralateral graft tear. Contact-to-contact action were excluded from their experiments. Based on one study, the odds of an ipsilateral retear were not significantly different for hamstring autograft (odds ratio [OR], 1.60; 95% CI, 0.89-2.90; $P = .12$) but were 5.2 times greater for an allograft (OR, 5.20; 95% CI, 2.60-10.44; $P < .01$) compared with a BTB autograft (bone-patellar tendon-bone). The odds of an ipsilateral retear decreased by 0.09 for every yearly increase in age (OR, 0.91; 95% CI, 0.87-0.94; $P < .01$) and increased by 0.11 for every increased point on the Marx activity score (OR, 1.11; 95% CI, 1.03-1.20; $P < .01$) (12). Risk of a contralateral ACL tear showed that lower age and higher activity level were found to be significant risk factors for tearing the contralateral ACL. The odds of a contralateral ACL tear were not significantly different as a function of sex, smoking status, sport played, graft type, or medial or lateral meniscal tear status ($P > .05$) (12). Similar study results showed Within the 23 participants after ACLR with subsequent ACL injury, 16 (69.6%) sustained contralateral ACL injuries, and 7 (30.4%) sustained an ipsilateral graft retear; 19 (82.6%) were female and 4 (17.4%) were male (14). There was no difference in mean time from surgery to RTS between the participants in the ACLR group who sustained second injury (8.3 ± 2.0 months) and those who did not sustain a second ACL injury (8.2 ± 2.7 months) (14). Standing long jump (SLJ) and (SLH) studies results showed that less than or equal to 79% height, bilateral SLH less than or equal to 69% height have a higher risk of non-contact time-loss lower quadrant risk. Moreover, prior history of ACLR (anterior cruciate ligament reconstruction) resulted in a greater risk of non-contact time loss ACL sprain than those without.

The purpose of this research was to see the difference between female and male anatomy and how vertical tests affect the biomechanics of the lower extremity. Our conclusion is that there were certain factors that may have caused ACL injuries to reoccur more often in females than in males. These factors include Q angle, the kinematics of the knee joint, hip joint, and ankle joint and the use of contraceptive pills. There was conclusive data that supports that higher Q angle could increase the risk of females to rupture another ACL injury. In addition, the kinematic alterations have been a huge factor due to mechanical instability, and altered loadings in the knee joint may affect the quality of life which may lead to osteoarthritis. There was inconclusive data that shows that the use of oral contraceptive pills within 3 months does benefit females by lessening the ACL injury, but inhibiting progesterone would decrease the laxity of the knee joint.

Autismo en Niños de Familias Bilingües: A Video Resource Project

Poster

Presenter(s): Juan Jose Andrade

Major: Speech, Language, Hearing Sciences

Other Student Co-Author(s): Evelyn Rakowsky, Kaitlin Enge, Kathryn Cunningham

Faculty Mentor: Siva priya Santhanam

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000170/00001>

Disparities in identification and access to clinical services for children with autism spectrum disorder (ASD) from culturally and linguistically diverse (CLD) backgrounds have a significant impact on children's academic and social success as well as the cost associated with treatment for children with ASD. In addition, delayed access to services leads to increased caregiver stress and reduced resilience (Murchison & Santhanam, 2019). One way to address this disparity is to educate and build awareness of ASD among caregivers. To this end, we are creating a powerful educational project that includes accessible video-based materials that are culturally sensitive and linguistically appropriate for Spanish-English bilingual or Spanish-speaking monolingual caregivers. We are developing an interactional video series including 25 different questions and answers that address the causes, characteristics, communication needs, language choice, assessment, and treatment considerations for children with ASD. We began our project by asking bilingual families of children with ASD what questions they had regarding their child's development and communication. Then, we wrote responses to these questions based on the research literature on bilingualism and ASD. We are currently creating videos where we role play as a speech-language pathologist and a bilingual caregiver, addressing these frequently asked questions. This project will prevent delayed diagnosis and treatment for children with ASD from CLD families. These educational resources will then be shared with bilingual families in the larger Denver community through outreach, and through various state-level organizations.

Ecological Effects of Fire

Poster

Presenter(s): Adetilewa Awosanya

Major: Biology

Other Student Co-Author(s): Brandi Rodriguez

Faculty Mentor: Christopher Cooley

Link to Presentation: <http://digital.auraria.edu/IR00000120/00001>

Wildfires have been the center of discussion as of recent due to the increase of forest fires that have taken place in California, the Amazon forest, Australia, and so many other places. Not only are these fires affecting humans who reside close to the areas, but it is also affecting the different communities of animals who reside there (Banks et al., 2016) and the quality of the soil which affects how well plants grow (Ahlgren & Ahlgren, 1960). It is also important to determine if restorative measures need to be taken in order to get the areas back to their natural state. The purpose of my Senior experience project will be to determine if the locations that were once abundant with natural resources and diverse communities and have experienced a dramatic environmental change like wildfires are still habitable by animals and plants that used to live there. To do this, I have chosen three sites that have experienced fires (Rocky National Park, Fourmile canyon - west side of Boulder and the northwest part of the Boulder county (black tiger fire)) to investigate. Biodiversity in plants and animals will be recorded for each location and I hope to also attempt to grow at least one plant in all locations to solidify my hypothesis. Soil samples collected from areas that have experienced wildfires will be compared using a soil test kit to areas that have not experienced wildfires.

Solar particles in the stratosphere

Poster

Presenter(s): Tyler Bergfalk

Major: Aviation and Aerospace Science

Faculty Mentor: Randy Owen

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000121/00001>

In this experiment, the goal is to collect both analog and digital data on high-energy particles that can be found in and near the earth's stratosphere. The data will be collected with a balloon-sonde. After the data is collected and processed, the identification of sources of the dots made in the film sheets (analog) will begin. The first method of data collection was to use unexposed camera film to record particles as they pass through the film. The second method is using a Geiger counter to record the presence of solar particles that pass into the box during the flight. On the ground, a 35mm camera and lasers will be used to try and recreate spots on the film to see if the amount of energy can be determined that made each spot. To compare each spot, both computer software and an optical Densitometer will be used. When the film was developed in the lab, small spots did appear in some places as single dots and in clusters. The data from the Geiger counter did record the presence of radioactive particles. Out of three balloon flights, only one came back with both sets of data. On the other two, one had spots on film but no digital data. The third flight had Geiger counter (digital) data, but the film was damaged. With the first set of data, the energy of some of the spots was determined. However, more testing will be needed to calculate the total amount of energy each particle possessed to make it through the box to the film.

Larval Violence in Neotropical Jungle Mosquitoes: Investigations of Interspecific Predation Mechanics in Two Sabethine Mosquitoes

Poster

Presenter(s): Taylor Boyd

Major: Biology

Other Student Co-Author(s): Shannon MacFadden

Faculty Mentor: Robert Hancock

Link to Presentation: <http://digital.auraria.edu/IR00000122/00001>

Intraguild predation by mosquito (Diptera: Culicidae) larvae has been widely recorded in at least thirteen genera of mosquitoes. The manifestation of this behavior is, however, highly varied across the genera from motive to specific mechanism used to execute. To categorize the predation (if any) of larvae from the Neotropical species *Sabethes cyaneus* and yellow fever vector *Sabethes chloropterus*, first, second, third, and fourth-instars were isolated and paired with either an instar of the same species, a species within the genus, or an instar from a different genus (*Aedes aegypti* and *Aedes albopictus*). High-speed microvideography was used to elucidate details of prey capture by mosquito larvae. The facultative predators *Sa. cyaneus* and *Sa. chloropterus* were observed utilizing a unique prey capture mechanism that occurs within sixteen milliseconds and involves a direct hit from the siphon on prey, anterior movement toward prey, and capture by ventrally directed open maxillae bearing elongate apical teeth. Prey consumption, which is typically incomplete, involves action of the teeth on the mandibles cutting into held prey. In experiments set up under laboratory conditions, fourth-instars of both *Sa. cyaneus* and *Sa. chloropterus* were observed preying on *Ae. aegypti* and *Ae. albopictus* larvae, as well as larvae from their same tribe. *Sa. chloropterus* was observed predating as early as the second instar. This predatory behavior coincides with development of the maxillae and siphon in the second instar: lateral teeth of the maxillae take form and the siphon advances, becomes fully sclerotized, and is equipped with setae and a posterior row of filaments. Both species were observed committing fratricide-predation within their own cohort. Preliminary results allude to the presence of

interspecific predation by 4th instar *Sa. chloropterus* on younger 2nd/3rd *Sa. cyaneus* and a lack of predation when the roles are reversed.

A qualitative analysis of recovery aid effectiveness after the 2013 Flood in Boulder County

Oral

Presenter(s): Cassy Cadwallader

Major: Geography

Faculty Mentor: Sara Jackson

Link to Presentation: <http://digital.auraria.edu/IR00000123/00001>

In 2013, Boulder County was hit with a major flood that gravely impacted the communities from the foothills to the plains. Approximately 18 inches of rain poured over a span of three days. The water flowed with such mass and velocity that the flooding eroded roadways, transported cars and debris through the streets, and swept away entire homes. As of 2018, there has been an estimated \$500 million in cost accumulation (Lounsberry, 2018). Various disaster response agencies provided aid options for infrastructural repairs for roads and stream channels, evacuation efforts, and funding for displaced families to repair their lives. To understand the effectiveness and reach of aid allocation, I utilize the 2013-14 Colorado Flood Oral History Project archived by the Public Lands History Center and Colorado State University. By conducting a qualitative analysis of interviews with Emergency Response professionals, FEMA representatives, and community members, I found that there was a range of aid response times based on urgency of need. Directly following the flood, the essential aid was allocated towards utility recovery, such as clean water access and rebuilding of access roads. Residents and businesses were later prioritized for aid in the form of debris removal, funding for private building recovery, and temporary shelter and food resources during the transition into a new home.

-Lounsberry, S. (2018). Five years after Longmont flood, recovery nears \$500M, Unmet needs exceed another \$500 million across Boulder County. The Denver Post. Retrieved from <https://www.denverpost.com/2018/09/01/2013-longmont-flood-costs/>

The Panacea For Access to Healthcare

Oral

Presenter(s): Ines Calvete Barrios*, Joselin Castro, Deisy Rosales, Estéfani Peña Figueroa

Major: Integrative Health Care, Health Care Management, Integrative Health Care, Health Care Management

Faculty Mentor: AnnJanette Alejano Steele

Special Note: Part of MSU Denver Health Scholars

Link to Presentation: <http://digital.auraria.edu/IR00000124/00001>

The MSU Denver Health Scholars research project features multidisciplinary and interprofessional research on the mental, physical and emotional health of DACA/ Undocumented/ Migrant communities. The team will share their research on the priority needs of these communities, next steps to fill gaps in response, as well as available resources in Colorado.

This presentation will build upon research reviewed by the first Health Scholars team, who represent perspectives from 10 Health Institute departments, including Biology, Chemistry and Biochemistry, Psychology, Nursing, Nutrition, Health Professions, Human Performance and Sport, Human Services & Counseling, Speech, Language, Hearing Sciences and Social Work. The group will present on the various areas of health, drawing findings from current research. Social justice and social change scholars question what is assumed to be normal by offering a call to action and change. In the spirit of international relations scholar Cynthia Enloe (2004), the gathered research is a result of the team's commitment to inclusive and culturally-sensitive access to health for all.

This session will focus upon access to health systems, community outreach and filling gaps in response to support health for underserved populations. In addition, presenters will concentrate on solutions and next steps that can empower said community to move towards a better quality of health. Health issues for DACA, undocumented and migrants need more attention than ever, and this multi-disciplinary effort represents the key goals of the Health Institute—to revolutionize health in Colorado by breaking barriers, empowering communities, fostering collaboration, and embracing diversity.

The Eye Contact Study

Oral

Presenter(s): Nicole F. Carey
Major: Psychology
Other Student Co-Author(s): Ashlei McGuire-Malone
Faculty Mentor: Cynthia Erickson
Link to Presentation: <http://digital.auraria.edu/>

The purpose of the eye contact study is to gain a deeper understanding of the way people perceive eye contact. The final result is driven by two main factors. The first is culture: what part of the world and what culture one identifies with has profound limitations on how one perceives eye contact. The second factor is one's self-reported levels of anxiety and autism. Anxiety, whether it be social only or other variations can have a dramatic effect on our ability to perceive and participate in eye contact. Autism, on the other hand, is a spectrum disorder rendering many variations in the limitations and abilities in one's ability to calculate true eye contact. In order to seek out results for the question of how good we really are at perceiving eye contact, we designed a study that would be two-fold. With face-to-face contact, our participants wore a targeted mask and were asked nearly 100 times if eye contact was being made. After the physical test they were asked to take two surveys to determine levels of Autism and anxiety and to learn about their cultural backgrounds. With these two parameters in place and supporting background information, we are anticipating the results to show that those with higher levels of self-reported anxiety and autism are able to detect true eye contact more efficiently. Furthermore, those from eastern cultures would also be found to have a better perception of true eye contact. With our present data, the trend overall has shown nobody is great at true eye contact detection, suggesting there are other factors that play in and will have to be discussed for future studies.

The Use of Open-Ended Activities with Older Adults Living with Dementia

Poster

Presenter(s): Eva Carroll
Major: Social Work
Faculty Mentor: Jessica Retrum
Special Note: Part of Community-Based Project
Link to Presentation: <http://digital.auraria.edu/IR00000125/00001>

The World Health Organization has identified dementia as a “public health priority” due to the impact that dementia has on individuals, families, and caregivers; as well as the high cost of caring for those with dementia (WHO, 2019). Research recommends, among other things, to identify factors that influence the transfer of short-term and long-term learning and to apply theories of how people learn in service delivery to this population (Pickett et al., 2018, p. 904). One method of learning that has been shown to increase creativity, learning, and meaningful engagement is the use of open-ended materials (Al-Mansour, 2018). Research has shown that older adults with dementia spend up to 85% of their time unoccupied and this lack of activity can be negative (Cohen-Mansfield et.al, 2010; Cohen-Mansfield,

Dakheel-Ali, Marx, 2009; Morgan-Brown, Ormerod, Newton, and Manley, 2011). This study reports on how use of open-ended materials impacted quality of life and disruptive behaviors in a small sample of older adults with dementia in a Colorado long-term care facility. Both qualitative and quantitative data measures were collected and analyzed. This study was approved by the MSU Denver IRB.

***Cypripedium parviflorum* Monograph**

Poster

Presenter(s): Kendra Carter

Major: Individualized Degree Plan (Research area: health professions)

Faculty Mentor: Kelsey Asplin

Link to Presentation: <http://digital.auraria.edu/IR00000126/00001>

North American is full of herbaceous remedies for all kinds of ailments. Though studies on herbs have had limited funding, we still have a plethora of knowledge of our native plants through historical, research-based, and evidence-based methods.

The purpose of this presentation is to showcase a monograph of a flowering native plant of North America called *Cypripedium parviflorum* and its similar species, which is commonly known as Lady Slipper. The presentation will cover basic botanical information on the plant and the plant's history in North America. We will also show its clinical use primarily as a nervine but will also show its applications as an antispasmodic, diaphoretic, tonic, and anit-depressant. It is purposed to show the contraindications, demographic, and energy of *Cypripedium parviflorum*. This monograph will also point out the way it is to be cultivated and ways we can support the plant's sustainability.

The method of this study will include examining peer-reviewed research and comparing it with historical accounts of the medicinal use of *Cypripedium parviflorum*. It will also explore specific constituents of *Cypripedium parviflorum* and explore the evidence-based medicinal uses of them. We will consider the various ways to pull out the different constituents and their practical application. The methods will identify the pathophysiology of primarily the nervous conditions and consider the way in which *Cypripedium parviflorum* shows itself useful as a nervine. As we look at the research for this as a nervine, we will also look at its use in reproductive health and immune health in general.

As researchers expanding on plant life and its medicinal uses, I'm sure *Cypripedium parviflorum* will soon be seen as the valuable effective nervine as it was seen historically.

Measuring iron content in *Drosophila melanogaster* S2 cells

Poster

Presenter(s): Christina Chan

Major: Biology

Other Student Co-Author(s): Clare Burnett, Karen Nunez Sifuentes

Faculty Mentor: Emily Ragan

Link to Presentation: <http://digital.auraria.edu/IR00000127/00001>

We are interested in identifying the iron uptake mechanism in *Drosophila melanogaster* S2 cells. Our hypothesis is that the activity of ferric reductase enzymes reduces Fe³⁺ to Fe²⁺, allowing the divalent iron to enter the S2 cells. To test this hypothesis we synthesized dsRNA to use in RNA interference (RNAi) experiments to knockdown putative ferric reductase CG1275. We also performed protein concentration and iron concentration assays to measure iron content in S2 cells. Ultimately, we will compare iron content levels in cells with and without knockdown of two ferric reductase proteins.

Early Childhood Experience, Adulthood Anxiety, and Eating Behaviors

Oral

Presenter(s): Alex Croft

Major: Psychology

Other Student Co-Author(s): Annalisa Adams

Faculty Mentor: Cynthia Erickson

Link to Presentation: <http://digital.auraria.edu/IR00000128/00001>

Those who experience high levels of early childhood adversity are more likely to show symptoms of anxiety in adulthood (Cougle, Timpano, Sachs-Ericsson, Keough & Riccardi, 2010). Early childhood adversity includes experiences such as physical abuse, sexual abuse, and household dysfunction (Espejo, et al., 2007). With the experience of adversity, children begin to develop feelings of uncertainty that their needs will be met. These feelings of uncertainty in childhood most likely lead to anxiety later on in life that translates into every day and novel situations. Later on, into adulthood these children tend to display key symptoms of anxiety, which include uncontrollable worry and irrational thought (Spitzer, Kroenke, Williams & Lowe, 2006). Eating disorders are relatively rare psychological disorders that involve maladaptive behaviors and disordered thinking around food and losing weight. The experience of adversities such as emotional abuse and physical neglect predict later eating disorder behavior (Kong & Bernstein, 2009). The current study explores how early childhood adversity and adult anxiety is related to adult eating disorder behavior. We utilized several measures to test for levels of early adversity, anxiety and eating disorder behavior. Our study took place online through Qualtrics, and included Introductory Psychology students, as well as friends and family via snowball emails. If the current study finds that early childhood adversity and adult anxiety is predictive of eating disorder behavior, then future implications would include preventative measures in childhood and adolescence to decrease the development of disordered thinking surrounding food and food intake.

Lentic vs lotic environments and their effects on aquatic insects

Poster

Presenter(s): Charles Dalton*, Ethan Winger

Major: Biology

Faculty Mentor: Christopher Cooley

Link to Presentation: <http://digital.auraria.edu/IR00000129/00001>

This study will be to determine the effects of lentic environments on aquatic insects, including species size and richness, especially when compared to lotic environments in a similar geographic climate. We will do this by taking samples of water from several lentic and lotic regions along the South Platte River of Colorado and estimating counts of organisms of similar sizes within our various collected samples to determine mean values for species size and species richness in each wetland type. We will then use those values as an indicator for potential impacts of the amount of disturbance. We expect to find that the mean values for both species size and species richness will be larger in the lentic environment due to lower amounts of hydro-logic disturbance in these systems.

Ethnography of Online LGBT+ Discourse

Oral

Presenter(s): TJ Daniel

Major: Anthropology

Faculty Mentor: Rebecca Forgash

Link to Presentation: <http://digital.auraria.edu/IR00000130/00001>

Now more than ever, social media is an essential aspect of everyday life, and the unique communities created and sustained online exist and utilize the platform in various ways. This research explores interactions between members of the LGBTQIA+ community through the website Tumblr. Tumblr, a blogging platform launched in 2007, has provided a somewhat safe space for a large, vocal sector of the LGBT+ community to gather. However, within this online community, viewpoints vary between community members, and conflict develops. This research examines patterns of interpersonal interaction, negotiation and gatekeeping, and the deployment of radical feminist ideology within the community. Drawing on digital and face-to-face interviews, a digital survey, and online observation, the research examines personal experiences of individual members, acts of aggression and resistance within the community, and how new identities are established and negotiated in this social space.

Suspected Zoned Metasomatic Kimberlite in Virginia Dale, CO

Poster

Presenter(s): Monike Distefano

Major: Geology

Faculty Mentor: Uwe Kackstaetter

Link to Presentation: <http://digital.auraria.edu/IR00000131/00001>

Kimberlites are the predominant ore rock for diamonds. This unusual mantle derived ultra basic igneous material originates from the mantle and is most likely emplaced through powerful, gaseous, low temperature volcanic eruptions. Due to very rapid weathering when exposed to the surface, their lithology is very elusive, which makes them difficult to detect. Near Virginia Dale, Colorado, close to the Wyoming border, a small kimberlite of the Moen Swarm appears to exhibit a metasomatic contact zone with the Sherman Granite host. Preliminary geochemical data revealed that the composition of this black metasomatic rock lies between kimberlite and granite, with a notable geochemical change from granite to kimberlite. Although infrequently described in literature, metasomatism induced by kimberlite emplacement occurs in a variety of geological locations. This phenomenon alters the composition of the country rock as a result of the introduction of fluidized chemical constituents high in CO₂. The purpose of this study is to determine the development of a kimberlite induced zoned metasomatic rock from Virginia Dale, Colorado.

A Comparison of the Social Communication and Self-Advocacy Skills of Post-Secondary Students with and without Autism

Poster

Presenter(s): Cristina Donahue*, Kaylee Eastridge

Major: Speech, Language, Hearing Sciences

Faculty Mentor: Siva priya Santhanam

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000132/00001>

In recent years, students with autism spectrum disorders (ASD) have been enrolled in university programs in increasing numbers. However, many students with ASD find university environments extremely challenging to navigate. Challenges in social communication in adults with ASD include difficulties in turn-taking in a conversation, topic initiation and maintenance, maintaining eye contact in conversations, asking questions, and providing responses that include less novel informational sharing. Most post-secondary students rely on self-advocacy to get access to services and accommodations, and to assert their preferences and needs in the classroom. However, when self-advocacy becomes challenging, students often fail to ask for help when needed, and deal with high levels of stress and anxiety. In order to understand factors associated with these challenging experiences, the current study aimed to investigate and compare the social communication and self-advocacy skills of adults with and without autism. The study adopted a survey design. Participants completed 3 online questionnaires as part of the study. These questionnaires examined participants' self-reported skills and challenges in social communication and self-advocacy. Data collection is currently ongoing. Results of this study will have important clinical and research implications in planning communication intervention and supports for college students/young adults with autism spectrum disorders.

An Introduction to Mathematical Categories

Poster

Presenter(s): Courtney Fleming*, Joseph Ruiz, Gabriel Vigil

Major: Mathematics

Faculty Mentor: Mandi Schaeffer Fry

Link to Presentation: <http://digital.auraria.edu/IR00000133/00001>

Category theory is a branch of abstract mathematics used to study mathematical structures in their most general form. Finding similar structures can help us reduce complex problems into simple ones. Here, we introduce the mathematical concept of a category—a system of objects and maps between objects, and provide a few concrete examples of categories. From there, we will consider functors—maps between categories, and see how certain natural transformations between functors allow us to cast difficult mathematical problems into much simpler forms. This will give us an idea of the power of category theory, which lies in its ability to establish connections between seemingly distinct mathematical systems.

Using Zebrafish to Explore Embryotoxicity Following the 2015 Gold King Mine Spill

Poster

Presenter(s): Zakariah Garriga

Major: Biology

Faculty Mentor: Vida Melvin

Link to Presentation: <http://digital.auraria.edu/IR00000134/00001>

The 2015 Gold King Mine (GKM) wastewater spill in Silverton, Colorado is an ongoing environmental disaster which initially exposed freshwater species endemic to the Animas River watershed to high concentrations of heavy metals. Although an Environmental Protection Agency (EPA) analysis of biological data following the GKM spill was conducted in 2018, to date, no embryotoxicity testing has been performed using the specific combination of heavy metals detected by the EPA immediately following the GKM spill. Our plan is to utilize the zebrafish embryotoxicity test (ZET), a protocol developed by the European Organisation for Economic Co-operation and Development (OECD), to study potential embryotoxic effects of the GKM spill. The OECD ZET was developed specifically for zebrafish (*Danio rerio*), as they are an easily reared and extensively studied model organism whose translucent embryos allow researchers to observe real-time embryogenesis and embryotoxicity. In addition, the OECD ZET is engineered to be easily replicable and highly accurate, using a limited number of embryos and common laboratory equipment - all of which makes the OECD ZET ideal for our GKM spill embryotoxicity study. It is our hope that in utilizing the OECD ZET, together with the specific combination of heavy metals detected in the GKM spill, we will help to elucidate the full effects of this and other toxic mine spills on local freshwater fish species.

Using Character Strengths to Help Combat Depression

Poster

Presenter(s): Vanessa Granados

Major: Psychology

Faculty Mentor: Lisa Badanes

Link to Presentation: <http://digital.auraria.edu/IR00000135/00001>

Research suggests that about 50% of college students report experiencing high levels of stress during a typical college semester (Hudd et al, 2000). The multiple demands of college (such as attending classes, keeping up with schoolwork, working a part-time or full-time job, and in some cases parenting children) can overwhelm a student in itself. Robust literature has also documented that increased levels of stress can negatively impact learning and memory (LaBar & Cabeza, 2006). College students who have experienced trauma and/or adverse life experiences may be at even more risk. Trauma can have lifelong implications on the individual and affect one's cognition, mood, arousal and the way one reacts to any given situation (The National Institute of Mental Health, 2019). Positive Psychology is a newer subfield in the field of Psychology. Positive Psychology is the study of using individuals' strengths that allows them to thrive (Positive Psychology Center, 2020), rather than focusing on what is wrong with an individual. Lee et al. (2019) describe character strengths to be an alternative approach to conceptualizing psychological treatment for individuals. Research suggests that character strengths act as a buffer towards depression, in that it has a negative correlation with perceived stress and negative attribution styles (Lee et al., 2019). Due to Positive Psychology being an emerging field, Lee et al. suggest that interventions promoting character strengths to reduce stress need to be developed. Our current research suggests that participants who reported lower depressive symptoms have also reported higher overall character strengths ($r = -.33, p < .01$). These include specific character strengths such as courage ($r = -.39, p < .01$), justice ($r = -.27, p < .05$), transcendence ($r = -.30, p < .05$), and moderation ($r = -.28, p < .05$). Character strengths such as wisdom and humanity were not linked to lower depressive symptoms. Our current research also suggests depression being linked to cumulative life stress ($r = .47, p < .001$). Though, it is not shown that overall character strengths do

not buffer against the impact of cumulative life stress and depression. However, moderation, justice, and transcendence moderates the effect that cumulative life stress has on depression.

Psilocybin Implementation and Significance in Therapy: A Literature Review

Oral

Presenter(s): Zahava Heydel*, Tyler Devries, Matt Singer, Braden Parker

Major: Psychology

Faculty Mentor: Randi Smith

Link to Presentation: <http://digital.auraria.edu/IR00000136/00001>

Psilocybin has been used for thousands of years in religious ceremonies within indigenous cultures across the world, and yet it has been largely stigmatized in contemporary cultures. Recently, this psychedelic chemical compound has been the subject of many research studies because of its effects regarding several psychiatric disorders (Thomas, Malcom, & Lastra, 2017; Bogenschutz, Forcehimes, Pommy, Wilcox, Barbosa, & Strassman, 2015; Watts, Day, Krzanowski, Nutt, & Carhart-Harris, 2017; Johnson, Garcia-Romeu, Cosimano, & Griffiths, 2014). The amount of research is still being thwarted by the fact that psilocybin is classified as a Schedule I drug, making its use illegal in recreational or medical contexts. However, certain states, such as Colorado, are decriminalizing psilocybin. Considerable advances involving psilocybin-assisted therapy have resulted in the administration of various levels of psilocybin and other hallucinogens in therapeutic settings. Though the potential benefits of psilocybin are probably largely untapped due to the limits on research and the exploration of new treatments, there are still several disorders that it has been shown to be effective in treating. Examples include preventative measures against depression, addiction to alcohol and tobacco, and anxiety. When taking psilocybin, the patient's thought patterns may be re-carved into new healthy thought patterns (Petri, Expert, Turkheimer, Carhart-Harris, Nutt, Hellyer, 2014). For example, someone who has anxiety and ruminating thoughts most likely has a deeply engraved thought pattern; by utilizing psilocybin in an environment that is controlled with a clinician present, this patient's thought patterns can be rerouted. This is partly because of a large increase in brain activity between all regions (Petri et al., 2014).

Halophilic Organism Isolated from Horse Manure-containing Soil Sample

Poster

Presenter(s): Chrissy Hobbs

Major: Biology

Faculty Mentor: Sheryl Zajdowicz

Link to Presentation: <http://digital.auraria.edu/IR00000137/00001>

Halophiles are "salt-loving" organisms that require high saline conditions to survive; they are also highly diverse, having representation in all three domains of life. Commonly found in soil, water, and as part of the microbiota of many humans and animals, the salt requirement for halophiles is varied, having a requirement as low as 2% NaCl to as high as 30% NaCl. The purpose of this study was to identify halophilic microorganisms isolated from a garden soil/horse manure mixture collected in Bailey, CO. We hypothesized that halophiles identified in the garden soil/horse manure mixture originated from the horse manure used to make the soil mixture. To identify and characterize the organism isolated from the garden soil/horse manure, various biochemical and growth analyses were performed, and bacterial 16srRNA gene analysis was completed. The organism was identified as a Gram- positive spore-forming, catalase-positive, bacillus bacterium. The isolate was grown on media supplemented with 0%, 5%, 10%, 15%, 20% and 25% NaCl, which showed that the organism was salt-dependent, having more growth apparent on 10% and 15% NaCl-containing media. Additionally, the isolate's

optimum growth temperature was determined to be 37°C. 16srRNA gene analysis punitively identified the isolate as a *Lentibacillus* sp. Species classification and further physiological characterization of the isolate is in progress. To identify if the isolate originated from the horse manure, metagenomic analysis of the microbiota found in horse manure will be completed.

Sequencing of 16S, 18S, and 28S Genes to Clarify *Fontigens* Phylogeny

Poster

Presenter(s): Chelsea Huck

Major: Biology

Faculty Mentor: Hsiu Ping Liu

Link to Presentation: <http://digital.auraria.edu/IR00000138/00001>

Fontigens is a genus of tiny freshwater snails currently classified under the family hydrobiidae. Previous studies have shown that the genus occupies a wide variety of habitats and may be prevalent across the United States, but the phylogenetic relationships of the genus are unclear. Three genes will be used to study *Fontigens* phylogeny. The mitochondrial 16S gene, which codes for ribosomal RNA, is relatively variable between species and genus level. The 18S and 28S nuclear ribosomal RNA genes are more conserved and are suitable for family level comparisons. Existing primers and the design of new primers for improved PCR amplification will be used to amplify and sequence these genes from the nine currently recognized species in the genus. Analysis of phylogenetic data from this study and available data from the hydrobiidae family will be used to clarify the family status of this genus. This has implications for the conservation of members of the genus, as well as the ecosystems to which they belong.

Political Polarization: Unintended Consequences of Bipartisan Indecision and Indifference

Oral

Presenter(s): Branden Ingersoll

Major: Communications Studies

Faculty Mentor: John Rief; Karen Lollar

Link to Presentation: <http://digital.auraria.edu/IR00000139/00001>

In response to an unprecedented level of political polarization in the United States in the past several years, I have conducted a thorough investigation and written a subsequent essay to ask why, and to what extent, a shift in rhetorical practices might aid in ameliorating it, especially through the implementation of a more robust form of civic dialogue. To do so, I use the theories of Aristotle and Cicero to investigate the communicative approaches of two influential politicians that I have selected, given that they represent two ends of the American political spectrum: President Donald Trump and Senator Hillary Clinton. Through this examination, I find that polarization is largely the byproduct of: (1) the absence of dialogue in favor of targeted rhetorical appeals for specific audiences; and (2) an overemphasis on rhetorical effectiveness at the expense of communication ethics. As a result, individuals across the political spectrum are experiencing the implications of an ongoing degradation of the public square rooted in a lack of robust and authentic civic dialogue including: widespread political indecision, indifference, and divisiveness.

Oxygen Protection is Crucial for Optimal Yeast Cultivation from Bottled Beer

Poster

Presenter(s): Clayton Jacobs

Major: Biology

Other Student Co-Author(s): Kira Pai

Faculty Mentor: Helene Ver Eecke

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000140/00001>

Our research goal was to ultimately devise an improved protocol of recovering and culturing yeast from a bottle of beer. The development of an optimal yeast cultivation protocol could prove useful for samples with few viable cells as well as provide a method for future assessments involving yeast cultivation. The current standard operating procedure of yeast cultivation from a bottle of beer involved opening it in air, thus instantly exposing the microbe to oxygen. Yeast is a facultative organism genetically capable of oxygen-protection when exposed to threatening reactive oxygen species (ROS) of aerobic environments by the production of enzymes such as catalase. Yeast living in a bottle of beer may go an extended amount of time in anaerobic conditions, avoid ROS threats, and may not produce the enzymes that would protect them from that currently nonexistent threat. To compare cultivation success rates, we cultured yeast from a newly opened bottle of commercially available unfiltered beer in aerobic and anaerobic environments. The ultimate goal of this project was to increase cultivation success, which was measured by comparing colony forming units per ml of concentrated beer (CFU/ml). The amount of beer concentrated was varied between conditions so as to produce a statistically countable plate in order to accurately compare CFU/ml and, ultimately, cultivation success. In addition to the variance of oxygen exposure upon bottle opening, there was variance of oxygen exposure during incubation of Petri dishes: aerobic, anaerobic, and microaerophilic. Our optimal protocol and approach could be advantageously applied to various samples to confidently assess if the sample contains any viable cells for quality assurance/control objectives and/or for grand cultivation goals.

Effects of Oral *Neisseria* sp. on the Biofilm Formation of *Streptococcus mutans*

Poster

Presenter(s): Anika James

Major: Biology

Other Student Co-Author(s): Amanda Smith

Faculty Mentor: Sheryl Zajdowicz

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000141/00001>

The human oral microbiome houses a wide variety of microbes, both pathogenic and commensal. This research aims to evaluate the relationship between two species present in the oral cavity— *Neisseria* sp. and *Streptococcus mutans*; in order to identify a specific strategy to prevent or degrade pathogenic biofilms formed by *S. mutans* from the oral cavity. *S. mutans*, due to its acidogenic nature and ability to form biofilms, is a primary cause of dental caries, gum inflammation, and periodontal disease in humans. Various *Neisseria* sp. exist as commensal species in the human oral cavity and nasopharynx. While research has begun to elucidate the complex interplays between members of the oral microbiome, limited information exists regarding the interactions between *Neisseria* sp. and *S. mutans*. Previous studies on *Neisseria* sp. demonstrated its ability to catabolize lactate, including that produced by *S. mutans*; however, limited information exists regarding what influence *Neisseria* sp. have on *S. mutans* biofilm formation. Therefore, this research aims to explore the effect *Neisseria* sp. have on the ability of *S. mutans* to form a biofilm. To study the relationship between *Neisseria*

sp. and *S. mutans*, mature biofilms were formed for each organism and the effect of *Neisseria* sp. as a pioneer colonizer versus a secondary colonizer on *S. mutans* biofilm formation is under investigation. Degradation will be determined using the viable colony count method. Additionally, optimal growth conditions for *Neisseria* sp., including *Neisseria sicca* and *Neisseria lactamica*, will also be determined in an attempt to determine a natural way to promote and enhance their growth. Strategies to promote commensal growth and to limit *S. mutans* are also being evaluated, which may provide insight on ways to promote oral health and dental hygiene.

Twisted Intramolecular Charge Transfer in a Donor Acceptor System

Poster

Presenter(s): Liesl Jensen*, Anna Pham, Jasper Overbey

Major: Biochemistry

Faculty Mentor: Megan Lazorski

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000142/00001>

Cheaper, more accessible solar energy conversion materials and instrumentation could help improve solar energy technologies, the focus of the Lazorski lab research. Donor-Acceptor (D-A) systems can be fabricated cheaply to absorb and “store” solar energy in a charge transfer (CT) state via electron transfer. The CT state energy can then be used for solar energy conversion applications. Thus, the first project in our lab evaluates electron transfer rates in D-A systems forced to adopt specific geometric arrangements, i.e. Twisted Intramolecular Charge Transfer (TICT). The synthesis and characterization of two D-A systems is ongoing: an “untwisted” control and a “twisted” test D-A. Thus, SEC is used to measure the Ultraviolet-visible (UV-vis) spectra of the oxidized/reduced D-A systems to produce a model of their CT state spectra. The SEC model will be compared to Transient Absorption (TA) spectroscopy data to evaluate the effect of the geometric twist on the CT state lifetime. Our first project feeds into the second, which utilizes 3D printing technology for the fabrication of spectroelectrochemistry (SEC) sample cells. This project aims to provide affordable, accessible, reproducible, and chemically compatible instrumentation for the evaluation of solar energy conversion materials, such as D-As. Our synthesized D-A systems serve as a proof-of-concept for our 3D-printed SEC cell designs, which have been fabricated and optimized on a MakerBot 3D Replicator 2X printer. While the current focus is SEC designs, a secondary goal is to provide a generalized technique enabling 3D printing technology to be more applicable in the chemistry laboratory.

Numerical approximation of fluid flow using the finite volume method

Oral

Presenter(s): Keegan Karbach

Major: Mathematics

Faculty Mentor: Henricus Bouwmeester; Randall Tagg

Link to Presentation: <http://digital.auraria.edu/IR00000143/00001>

The Finite Volume Method (FVM) is one of the most widely used and versatile numerical techniques used in computational fluid dynamics. In this method, a computational domain is discretized into a number of control volumes over whose faces the flux of the variable of interest can be calculated. The integral forms of these flux equations are converted to differential forms using Green’s Theorem and these differential equations are numerically solved using finite difference methods. The power of this method lies in the fact that this domain discretization can take on any internal topology – coarse or fine, structured or unstructured, internal or external. In addition to this flexibility, any resulting solutions satisfy conservation laws for the transport of mass, energy, and momentum due to the nature of using flux between control volumes for computation. In this talk, the mathematical basis for FVM

will be briefly reviewed, the discretization of both the computational domain and the Navier-Stokes equations will be investigated, and the entire process will be illustrated with a simple example of a real-world system culminating in a visualization of vortex formation in a Taylor-Couette model based on an experimental apparatus.

Characterization of raw honey and its antimicrobial efficacy

Poster

Presenter(s): Katja Kleih*, Holly Landon

Major: Biology

Faculty Mentor: Sheryl Zajdowicz

Link to Presentation: <http://digital.auraria.edu/IR00000145/00001>

The medicinal use of honey in wound healing has been documented back to ancient times. Honey exhibits antimicrobial activity, which has been well characterized in Manuka honey. With increasing microbial resistance to antibiotics, the interest in homeopathic remedies is on the rise and the heavy focus of research into Manuka honey has left other kinds of honey with little to no research. This study aims to characterize the antimicrobial properties of ten kinds of raw honey collected in the United States. The inhibitory effects of the raw honey was tested against seven common skin and respiratory species including both gram negative, gram positive, and eukaryotic representatives. This was performed using the well diffusion method on brain-heart infusion agar. Inhibition of microbial growth was characterized via the Kirby-Bauer method. Preliminary results indicate susceptibility in *Bacillus cereus*, *Streptococcus pyogenes*, *Staphylococcus epidermidis*, *Staphylococcus aureus*, and *Escherichia coli* to all ten types of honey. Further research will evaluate minimum inhibitory and bactericidal concentrations in concentrated and diluted honey.

Rainwater Capture on the Auraria Campus: A Way to Prepare for Water Shortages Due to a Changing Climate

Poster

Presenter(s): Jake Kuenzli

Major: Environmental Science

Faculty Mentor: Chris Herr; Jackie Slocombe

Link to Presentation: <http://digital.auraria.edu/IR00000146/00001>

It is no secret that the western part of the country struggles with water supply. Denver alone has seen its fair share of water shortages. These shortages come with drastic consequences. For example, the drought in 2002 cost the state over a billion dollars. Unfortunately, this problem isn't going away and is even predicted to become worse. Climate scientists warn that due to higher evaporation rates, stream flow decrease, and change in runoff timing, water scarcity will become a large issue in the future. There is also the possible implications of a natural disaster affecting the water supply. While the Yellowstone Volcano isn't supposed to go off in my lifetime, there is no guarantee that it won't. The United States Geological Survey estimates that northern Colorado could see between 4-12 inches of ash. Denver Water supplies over one million people, a number that will continue to grow with the booming metropolitan population. Now is the best time for us to reduce our reliability on Denver Water, which provides around 100% of the water to the Auraria Campus. To justify this project, I will use Colorado climate predictions from case studies as well as the Water Action Plan from the ASCP. By using a quantitative analysis, I will discover the projected decrease to Denver's water allotment, discern the possible amount of rainwater that feasibly could be captured, and perform cost-benefit analysis to determine if a rainwater capture system is right for this campus. The goal is to compile this research into an ASCP grant that will ultimately result in a pilot project of rainwater capture on the roof of the Tivoli building that will decrease our dependency on Denver Water.

Efficacy of Cognitive Behavioral Therapy in Treating Bipolar Affective Disorder

Oral

Presenter(s): Kennedy Laidlaw

Major: Human Services

Faculty Mentor: Brian Bagwell

Link to Presentation: <http://digital.auraria.edu/IR00000147/00001>

Bipolar affective disorder (BAD) is a common, chronic and severe mental illness that affects 1-3% of the population. It is characterized by the manic, depressive and mixed episodes that occur. Throughout history, one of the main treatments for Bipolar has been psychotropic medication, such as Lithium, Lamictal, Depakote and others. This paper will examine the effectiveness of cognitive behavioral therapy (CBT) combined with taking psychotropic medication in treating BAD, versus the effectiveness of a medication-only treatment. Improvement was based on medication compliance, decreased levels of depression and mania as well as reducing the relapse rate of bipolar episodes.

Relationship of Advisor and Workshop Intervention on Scholar Self-Efficacy

Poster

Presenter(s): Cassandra Lamas Ortega

Major: Hotel Management

Other Student Co-Author(s): Fernando Ponce-Juarez

Faculty Mentor: Lauren Koppel; Mark Baccei, Adrian Mendoza, Megan Scherzberg

Link to Presentation: <http://digital.auraria.edu/IR00000148/00001>

Self-efficacy is the belief in one's ability to succeed in specific situations or ability to accomplish a task. There is a relationship between self-efficacy and academic achievement—a higher level of self-efficacy is often related to higher academic achievement. However, other studies have shown that first generation students have lower self-efficacy scores, compared to their counterparts. In this study, we were interested in the impact of workshop and advisor intervention on scholar self-efficacy. Testing involved a survey at the beginning and end of the semester, which asked students to rate their level of personal belief to be successful in different situations. Additionally, we encouraged students to attend a self-efficacy workshop to test the effectiveness of social persuasions of reported self-efficacy. Scholar's reported self efficacy was also compared to other factors like gender, race, ethnicity, and GPA.

Ethnography and Heritage Preservation

Poster

Presenter(s): Nichole Lambert

Major: Anthropology

Faculty Mentor: Rebecca Forgash

Link to Presentation: <http://digital.auraria.edu/IR00000149/00001>

This paper examines the relationship between ethnographic research and heritage preservation in Russell Gulch, Colorado. Russell Gulch was established as a mining town in 1859 after the discovery of gold in the area. The population dwindled after the mines were exhausted during the late 1800s, and today only a few dozen residents remain. The town has widely been labeled a ghost town, despite continued inhabitation. Currently, archaeological work is being conducted to research, record, and evaluate historic buildings. Many community members have been enthusiastic about contributing to the collection of historical data and aiding in the archaeological survey work, but these community initiatives have also exposed certain divisions within the community. This research utilizes ethnographic methods to document perceptions of community history and identity, the criteria residents

use to determine community membership and decision, and some of the potentially divisive issues faced by communities like Russell Gulch, which are struggling to preserve their past while creating an economically and socially viable present and future.

Investigating Poverty Traps Through The Lens of Fractal Geometry and Dynamical Systems

Poster

Presenter(s): Ben Lee

Major: Mathematics

Other Student Co-Author(s): Christopher Padgett, Joseph Flatlander

Faculty Mentor: Robert G. Niemeyer; Richard E. Niemeyer

Link to Presentation: <http://digital.auraria.edu/IR00000150/00001>

Wealth inequality is a major problem facing us today. The goal of this project is to identify patterns in city formation that are correlated with economic prosperity. We hypothesize that fractal dimension is an appropriate indicator of the aforementioned correlation. City formation is highly affected by policies, both past, and current. We believe a change in historically discriminatory policies can impact economic conditions and fractal scaling will indicate how benefits will propagate.

Investigation of the Involvement of Nemy and CG1275 of Iron Uptake in Drosophila S2 cells

Poster

Presenter(s): Keyata Lewis

Major: Chemistry

Other Student Co-Author(s): Jessica Holst, Lauren Murphy, Mirella Castaneda

Faculty Mentor: Emily Ragan

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000151/00001>

Iron plays key roles in humans and insects, including in the electron transport chain and other electron transport processes. There is still uncertainty about how iron enters the cell in insects. Currently our group is investigating two cytochrome b561 family members, CG8399 and CG1275, as possible ferric reductase components in a Drosophila S2 cell iron uptake pathway. The scope of the proposed research will focus on a third known homolog of cytochrome b561, which is known as nemy. Ferric reductase is a property of nemy in Drosophila cells, but its main function occurs in the insect's brain, where it is expressed in neuroendocrine neurons. Nemy has not yet been directly linked to how flies intake iron, but we do hypothesize that a ferric reductase such as nemy is needed in order for the cell to uptake iron. We hypothesize that Fe^{3+} is reduced to Fe^{2+} using a ferric reductase (nemy), which will then pass through the malvolio protein for entry into the cytosol. Our experiment involves selective RNA interference (RNAi) in order to initiate gene silencing of nemy. By adding dsRNA with a sequence matching nemy mRNA, we cause selective degradation of mRNA. After successful synthesis of RNAi, we can extract total RNA and use quantitative PCR to analyze mRNA levels to see if degradation of targeted mRNA has been achieved. We will measure cellular iron content using a ferrozine-based assay. If we detect a decrease in iron content in the cells then we will have support for our hypothesis.

The Collective Power of the 1960s: How AfriCOBRA Empowered a Community

Oral

Presenter(s): Emilie Luckett

Major: Art History, Theory and Criticism

Faculty Mentor: Deanne Pytlinski; Jessica Weiss

Link to Presentation: <http://digital.auraria.edu/IR00000152/00001>

For this paper, I explore how collectives came to be so prominent in the 1960s and the conditions that resulted in the formation of AfriCOBRA. I argue that the purpose of the collective's artwork was to empower the African American community and to challenge the negative stereotypes that followed them. I focus specifically on their creation of a Black aesthetic and their focus on the theme of the 'black family' as their main methods to bring about Black liberation. To understand the historical context of AfriCOBRA, or the African Commune of Bad Relevant Artists, I first explain the conditions that resulted in the rise of art collectives forming after World War II based on the scholarly work of Blake Stimson and Gregory Sholette. I then explore the early iterations of AfriCOBRA and the social conditions they were working under that lead to the group's creation. The collective's goal was to create a new Black aesthetic, and through this aesthetic, bring black liberation. There were six main qualities that the group emphasized: capturing the "expressive awesomeness" that encompasses African art and life in the USA; using symmetry and rhythm that is based on African music and African movement with an emphasis on it being free and uncontracted; marking the spot where the abstract and the concrete meet; organic forms and moving away from work that looks like machine-constructed; and the work must shine and have lots of color. The work of AfriCOBRA was highly individual but often contained similar themes. These themes included depictions of black families, prominent black figures, and art that celebrated African/African American heritage generally. The 1960s were a time of turmoil and immense societal change, and AfriCOBRA was keenly aware of the power the media and visual arts had in influencing events such as The Civil Movement or challenging the growing consumer culture. The collective was determined to use art as a tool for connection, building a deeper understanding, empowering communities, and creating social and political change.

Investigating Leaf Preservation Methods to Optimize DNA Concentration for Genomic Analysis of Populus Species

Poster

Presenter(s): Shannon MacFadden

Major: Biology

Faculty Mentor: Erin Bissell

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000153/00001>

Genomic analyses of introgression between *Populus* species via their hybrids can provide valuable insight into evolutionary processes that affect stability of hybrid zones and movement of adaptive genes between species. To perform these types of studies, high molecular grade DNA must first be obtained. While using fresh plant samples is the most ideal method, it is not practical for both large-scale and long-term genomic analyses. This study examines the competency of various leaf storage methods to resolve which will optimize DNA yield. Most chemical preservation techniques used on plant material have been ineffective. Two methods that have proven more successful are dry preservation and freezing. The utility of these methods, however, depends on characteristics of the target species. For example, the use of silica beads is not ideal for species with dense cuticles while freezing methods are unfit for samples rich in phenols, flavonoids, and other readily oxidized compounds. Variation in the efficacy of preservation techniques across different species is why a species-specific study such as ours is a critical contribution to the subject. DNA extraction will be performed on leaf samples from *Populus deltoides*, *P. angustifolia*, and their hybrid, *P. acuminata*, that have been stored dried and frozen for

various periods of time (up to two years). DNeasy Plant Mini Kit will be used for extraction and the quality and quantity of DNA yield from the samples will be quantified using spectrophotometry, gel electrophoresis, and preliminary PCR analyses. By testing storage methods over a period of two years, we hope to elucidate which storage method would be most advantageous for long-term genomic studies on *Populus* species and their hybrids. Because *Populus* leaves have high phenolic content and do not have thick cuticles, we predict dry preservation will result in higher DNA yield as well as lower levels of contaminants.

Forster Resonance Energy Transfer in Olfactory Peptides

Poster

Presenter(s): Roman J. Martinez

Major: Biochemistry

Other Student Co-Author(s): Andrew Melendrez Zerwekh, Austin J. Haider

Faculty Mentor: Joshua Martin

Link to Presentation: <http://digital.auraria.edu/IR00000154/00001>

We report Forster Resonance Energy Transfer studies of a 2-cyanophenylalanine-tryptophan donor-acceptor pair within peptide chains. Two olfactory peptides (OFP) are synthesized as sequence homologues of a 12 residue, disordered region in an olfactory marker protein. In these peptides, tryptophan occupies the N-terminus and 2-cyanophenylalanine is substituted in place of phenylalanine at two different distances from tryptophan; in OFP Long the 2-cyanophenylalanine is at the C-terminus, whereas in OFP Short the nitrile derivatized amino acid is only two residues away from the tryptophan. While phenylalanine is native to the peptide, 2-cyanophenylalanine exhibits a larger fluorescence quantum yield, providing better spectroscopic selectivity. Further, addition of the nitrile group to phenylalanine has been reported to change the peptide structure only minimally, thus preserving the native protein structure. As such, OFP Long and Short allow for comparison of energy transfer efficiency between the donor and acceptor fluorophores at two distances. Additionally, examining OFP Long and Short in solvents that either promote or inhibit secondary structures provide model systems in which spectroscopic techniques are used to determine structural perturbations induced by environmental changes. Our results further demonstrate the potential of 2-cyanophenylalanine as a site-specific probe of protein structure and dynamics.

Microsatellite Primer Design and Amplification for Pebblesnails

Poster

Presenter(s): Daniel McCullough

Major: Biology

Faculty Mentor: Hsiu Ping Liu

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000155/00001>

The purpose of my research is to develop microsatellite primers for pebblesnail species. A microsatellite is a segment of tandem repeated DNA. The number of repeats is variable in a species, typically 5–50 times, making microsatellites ideal genetic markers for identification of individuals and studying population structure. Primers will be designed from microsatellite sequences and tested using polymerase chain reactions. Gel electrophoresis will then be used to visualize results. Successfully designed microsatellite primers will be used to identify scorable loci in individuals to further provide genetic information for conservation Biology.

Computational Examination of the Electronic Properties of 2-Cyanophenylalanine, 3-Cyanophenylalanine, and 4-Cyanophenylalanine

Poster

Presenter(s): Lucy Metzroth

Major: Chemistry

Faculty Mentor: Joshua Martin

Link to Presentation: <http://digital.auraria.edu/IR00000156/00001>

We present an in-depth computational examination of the electronic properties of 2-cyanophenylalanine, 3-cyanophenylalanine, and 4-cyanophenylalanine. Electronic structures of these biologically relevant spectroscopic probes give insight into the observed photophysical properties and use of these chromophores as participants in Forester Resonance Energy Transfer (FRET) and protein folding studies. Computational chemistry calculations using high-level ab initio methods were performed to determine minimum energy geometries and examine the molecular orbitals of a model chromophore (cyanotoluene) and the cyanophenylalanine derivatives. Results suggest that, in the ground state, most of the electron density is situated in bonding orbitals around the ring structure in all three amino acids. However, upon excitation to a singlet excited state, the molecular orbitals become more antibonding in character. In analyzing these changes, we discuss the utility of these reporters in studies of protein dynamics that require spectroscopic selectivity.

Canadian Geese Defense Response in Urban Settings

Poster

Presenter(s): Nastassja Michel*, Rebecca Rikke, Chloe Gilbreth

Major: Biology

Faculty Mentor: Christopher Cooley

Link to Presentation: <http://digital.auraria.edu/IR00000157/00001>

Studies have shown Canadian geese to exhibit different defense responses in urban and suburban locations. There is a general consensus that Canadian geese are more tolerant to human disturbances in urban settings compared to suburban settings (Eberhardt et al. 1989, Dzus and Clark 1997, Didiuk and Rusch 1998, Yerkes 2000). There have been few studies regarding how geese exhibiting defense responses to human disturbance are dependent on their flock size and location. The purpose of our project is to investigate whether there is a direct correlation between geese exhibiting defense responses to human disturbance and the size of their flock in urban and suburban settings. In order to perform this study, we will observe geese behavior in the suburbs of Golden compared to downtown Boulder in Colorado (Smith, Craven, Curtis, 1998). The experiment will consist of approaching a group of geese (Stafl, N. & O'connor, I. M. 2015) and recording their flock size, distance from alert and defense responses. While walking directly at a flock of geese, at approximately .5 meters/second, one marker will be dropped when the geese become alert (Stafl, N. & O'connor, I. M. 2015). Continuing the same pace, a second marker will be dropped when the geese exhibit defense responses such as walking away, head-flipping, head pumping, or head forward attack (Link, R. 2005). Results from these two different locations will then be compared. If our results indicate an increased desensitization of geese to human interaction in urban settings, this could bring recognition to potential harm to human and geese due to close interactions.

Ferric Chelate Reductase Knockdown in Drosophila S2 Cells

Poster

Presenter(s): Laura Murphy

Major: Chemistry

Other Student Co-Author(s): Jessica Holst, Gregory Kane

Faculty Mentor: Emily Ragan; Maureen Gorman

Link to Presentation: <http://digital.auraria.edu/IR00000158/00001>

Although the mechanisms of cellular iron uptake in mammals are largely understood, there is still little known about the mechanism of iron transport in insects. Not only is iron essential, it can also be toxic and therefore needs to be well-regulated to maintain balance between necessity and toxicity. In mammals, a duodenal cytochrome b acts as a ferric reductase to allow for uptake of iron into intestinal cells. We identified a cytochrome b561 family member in Drosophila, CG8399, that is expressed in Drosophila S2 cells. CG8399 is similar to ferric chelate reductase-1 in humans as both contain reeler, domon and cytochrome b561 domains. We are testing the hypothesis that there is reduction of iron by CG8399, which allows the transport of iron into the cells. To test this hypothesis, we used RNA interference (RNAi) to knockdown the CG8399 mRNA. We quantified the RNAi knockdown caused by RNAi using real time PCR and compared iron concentrations between untreated and treated cells using a ferrozine-based iron content assay. A lower concentration of iron in RNAi treated cells would support our hypothesis.

Suspected hybridization in Colorado Culex? Preliminary molecular microsatellite analysis

Poster

Presenter(s): Stephanie Musick

Major: Biology

Faculty Mentor: Robert Hancock; Hsiu-Ping Liu

Link to Presentation: <http://digital.auraria.edu/IR00000160/00001>

Colorado is home to many species of mosquito, including *Culex pipiens* and *Culex salinarius*. Vector Disease Control International Colorado Division believe that a hybrid may exist in sympatric populations of both *Cx. pipiens* and *Cx. salinarius*. This possible hybrid has morphological characters similar to both species. The ultimate goal of this research is to determine if this mosquito is a hybrid, *Cx. pipiens*, or *Cx. salinarius* through analysis of microsatellite fragment sizes. The first step will be to identify and optimize microsatellite primers that can be used to diagnose *Cx. pipiens* from *Cx. salinarius*.

Activity Budgets of *Branta canadensis*: Rural vs Urban Environments

Poster

Presenter(s): Sophia Nem

Major: Biology

Faculty Mentor: Christopher Cooley

Link to Presentation: <http://digital.auraria.edu/IR00000159/00001>

An organism's activity budget provides invaluable information about how it interacts with its environment and other organisms within it. This includes but is not limited to how a population allocates its energy via activities such as foraging, sleeping, reproduction, socialization, migration etc (Neumann, 2001). Many factors known as disturbances can affect activity budgets of a population and these can be of natural origin such as drought or human origin often observed with the presence of humans (Riddington, 1996). While disturbances of natural origin are largely uncontrollable, disturbances of human origin are controllable and observation of their impact on wildlife populations is of

great importance. The Canada goose (*Branta canadensis*) is an organism that may find its activity budget greatly affected by disturbances of human origin, as they can be found roaming anywhere from the sidewalks of Auraria Campus to inhabiting our local lakes. Thus, the purpose of this research was to determine if activity budgets of the Canada goose (*Branta canadensis*) differ in a rural environment versus an urban environment (due to the pure contrast of possible human disturbances between the two locations). *Branta canadensis* were observed on the Metropolitan State University of Denver Campus (representing the urban environment) and Lake Arbor located in Arvada, CO (representing the rural environment). Data collection took place over four separate days (for each population). Observation lasted for approximately one hour each via an instantaneous focal sampling method in ten-minute intervals with photo documentation. The same time of day and weather conditions were accounted for.

Uncovering Disparities in Health Care

Oral

Presenter(s): Karen Nunez Sifuentes*, Gemma Chacon, Ana Lopez Morales, Deisy Rosales, Diana Morelos

Major: Biochemistry

Other Student Co-Author(s): Jacqueline Alderete Urena

Faculty Mentor: AnnJanette Alejano Steele

Special Note: Part of MSU Denver Health Scholars

Link to Presentation: <http://digital.auraria.edu/IR00000161/00001>

The MSU Denver Health Scholars Research project features multidisciplinary and interprofessional research on the health of DACA/ Undocumented/ Migrant communities. Together, the team will share their research on the key health issues needing attention, priority needs for serving these communities, as well as Colorado resources. The presentation will provide the whole-person approach to wellness and illness, drawing out key needs representing the perspectives from 10 Health Institute departments, among them Biology, Chemistry and Biochemistry, Psychology, Nursing, Nutrition, Health Professions, Human Performance and Sport, Human Services and Counseling, Speech, Language, Hearing Sciences and Social Work. This session will focus on various issues that underrepresented communities face such as: depression, anxiety, lack of dental care, HIV care, high stress and negative health outcomes, opioid use and addiction. These areas of health represented by the Health Institute are drawn from current research. In the spirit of international relations scholar Cynthia Enloe (2004), the team's gathered research represents the commitment to inclusive and culturally sensitive access to healthcare for all. Health issues for DACA, undocumented and migrants need more attention than ever, and this multidisciplinary effort represents the key goals of the Health Institute—to revolutionize health in Colorado by breaking barriers, empowering and educating communities, fostering collaboration, and embracing diversity.

The curious case of nasophilia in Sabethes mosquitoes: Mechanisms and cues of a successful blood meal, exclusively from blood host facial features Poster

Presenter(s): Connor O'Brien-Stoffa

Major: Biology

Other Student Co-Author(s): Shawn Ward

Faculty Mentor: Robert Hancock

Link to Presentation: <http://digital.auraria.edu/IR00000162/00001>

Female mosquitoes use a combination of thermotaxis, chemotaxis, and phototaxis to locate suitable blood hosts. We observed lab populations of Sabethes Species (S. cyaneus and S. chloropterus) displayed a strong preference for the nasal region of the human face. That nasal-focused behavior appeared consistently under varying treatments within our bioassay arena, such as manipulations of blood host carbon dioxide exhalation and skin odor. Using a comparison of living hosts to inanimate sensory models, with controllable thermal and chemical cues, will help us separate the relative importance of host stimuli. Our study will contribute to a modern understanding of this rarely documented behavior, to the benefit of safety concerns as the Sabethes sylvatic cycle is disrupted more often by anthropogenic expansion in Central and South America.

Finding a Solution for Homelessness

Oral

Presenter(s): Caitlin O'Donnell

Major: Global Business Studies

Faculty Mentor: Sara Jackson

Link to Presentation: <http://digital.auraria.edu/IR00000163/00001>

From 2016 to 2019, the City and County of Denver, Colorado has experienced an average of an 8 percent growth in its homeless population each year. In 2019, there were a total of 5,755 people in the Denver Metro Area experiencing homelessness, including veterans, families, unaccompanied youth, and people fleeing domestic violence. Homelessness is a hot-button issue throughout the United States, especially in large cities where the cost of living is rising and wages aren't rising at a rate to compensate for the increased price. There are many factors that contribute to homelessness, including growing up in a broken family, suffering crippling depression and anxiety, struggling with drug addiction, escaping domestic violence, widening income inequality, rising housing costs, and growing housing insecurity. There are traditional services for people experiencing homelessness such as shelters, food banks, and support for mental services. However, both the Colorado and the Houston branches of Coalition for the Homeless agree that affordable and permanent supportive housing is the foundation of reducing homelessness. In 2011, the city of Houston, Texas had a homeless population of 8,538 and since then has aggressively pursued a "housing first" approach to reduce its homeless population, which has led to a 50 percent decrease in its homeless population from 2011 to 2019. Using Houston as a model, I have researched ways that Denver could reduce its population of people experiencing homelessness. I examined the similarities and differences in the way each city addresses homelessness and how those services affect homeless populations. The overwhelming differences between the two cities are the number of affordable and permanent supportive housing services that each city has. Houston has implemented more of these programs in the last nine years than Denver has.

Yeast Cells Within Bottled Beer May Not Be Able to Protect Themselves from Oxygen Stress

Poster

Presenter(s): Kira Pai

Major: Biology

Other Student Co-Author(s): Clayton Jacobs

Faculty Mentor: Helene Ver Eecke

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000164/00001>

Our research hopes to improve the recovery success of yeast from a bottle of beer. This protocol can be applied to samples to confidently assess if the sample contains any viable cells for quality assurance/control objectives and/or for grand cultivation goals. Although yeast is facultative, with the genetic capacity for oxygen protection, its epigenetic/biochemical state within the anaerobic bottle may not adequately protect it from damaging reactive oxygen species (ROS). Oxidative stress could presumably cause excess macromolecule degradation to viable yeast stored in a no/low oxygen state within a bottle, thereby decreasing the likelihood of cultivation success. Various permutations of oxygen handling methods were tested with unfiltered commercial beer bottles. A fluorescent assay quantitatively compared the amount of ROS that yeast was exposed to when the bottle was opened aerobically or anaerobically. To gain insight on the enzymatic ability to protect itself from ROS, catalase tests were performed on yeast pellets from aerobically and anaerobically opened beer, as well as yeast propagated under these conditions. Spot-tests incorporating various ROS into media were used to exhibit reduction/inhibition of growth of bottle-stored yeast by these compounds. Aerobic recovery, previously the most common practice, may have hindered the recovery of previously assessed bottles. Our oxygen protection approach lends to generalizations of the cultivation of the rare-biosphere; we must perpetually aim to collect and treat samples in environmentally relevant ways to optimize microbial cultivation and domestication success. Dissemination and application of this knowledge and/or approach may hopefully provide methodology to broadly promote more optimized microbial recovery.

Effects of Mating Season Based on Canis Lupus Howling Behavior

Poster

Presenter(s): Karen Perez

Major: Biology

Other Student Co-Author(s): Tiffany Tran Phan, Jerred Castellano, Melissa Hadjich

Faculty Mentor: Christopher Cooley; Robert Hancock

Link to Presentation: <http://digital.auraria.edu/IR00000165/00001>

A wolf's (*Canis Lupus*) prime form of vocalized communication is howling. The howls made by wolves are long-range signals that are used for territorial defense, social stability, and as a bonding mechanism. The multicomponent signals are composed of a series of different vocalizations emitted by a pack. Previous researchers have examined an increase in howling behavior in what is called a seasonal cycle. These howling peaks correlated with elevations in estradiol, testosterone, and luteinizing hormone. Following the breeding season, overall howling abruptly decreased (McIntyre et al., 2017). In this study, the seasonal cycle was considered in order to determine whether there will be an increase of howling patterns in the spring mating season in relation to the fall non-mating season if a wolf is in heat during the springtime. To do this, on March 27th- 29th all the data will be collected at a wolf sanctuary called Mission Wolf located in Westcliffe, Co. Mission Wolf is a non-profit educational wolf preserve that provides a home to wolves that are not able to be released back into the wild. Taking advantage of digital sound recording, an external microphone adapter set will be connected to an iPhone, which will be used to store the recordings. In the following weeks, all the data, for a total of a two-night recording period, will be cataloged. The following test will be applied: the G-test of

independence, the G-test of goodness-of-fit, and the Two-sample t-test. The results will be compared to the data that was collected on a previous project that was done in the Fall of 2018 on the same sample of wolves. On March 16, 2020, due to the COVID-19 outbreak, Mission Wolf closed its doors to the public until further notice. Due to these unforeseen circumstances, our results will be inconclusive.

Are male mate choice and female interaction important in pair bond formation in a monogamous, bi-parental convict cichlid fish (*Amatitlania nigrofasciatus*)?

Poster

Presenter(s): Jessica Pletcher*, Blanca Gonzalez, Caroline Rogers

Major: Biology

Faculty Mentor: Jennifer Gagliardi Seeley

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000166/00001>

Previous research suggests that female interaction may play an important role in pair bond formation. Here we determine if giving males a choice between two females and/or female interaction affects pair bond formation. We predicted that pair bond formation would increase when two females are present and when females interact in competitive displays. This experiment contains one control (one male and one female), and three experimental groups with two females and one male: 1) No female interaction; 2) Female interaction without male observation; and 3) Female interaction with male observation. After female interaction was completed in the two different female-interaction experimental groups, all groups had a 4-hour acclimation period followed by a 21-day preference period. During the preference period, 5 daily observations were taken on male location and tanks were videotaped for courtship behavior. Video was recorded for 15-minute periods on days 1, 7, 14, and 21. Daily observations suggest pair formation occurred more often in the treatment groups with female interaction, both with and without male observation. We analyzed day 21 video and found that approximately half of the males are showing monogamous behavior and the other half are showing bigamous behavior. We are currently analyzing video from days 1, 7, and 14 for courtship behaviors.

Electrochemical DNA Biosensors for Detecting Nontuberculous Mycobacteria (NTM)

Oral

Presenter(s): Dylan Poch

Major: Biochemistry

Other Student Co-Author(s): Tyler Sodja

Faculty Mentor: Andrew Bonham

Special Note: Part of Undergraduate Research Mini-Grant Program; Honors Thesis

Link to Presentation: <http://digital.auraria.edu/IR00000167/00001>

Mycobacterial infection and mortality rates remain high; an estimated 10 million cases of Tuberculosis emerge each year, primarily caused by *Mycobacterium tuberculosis* (TB). However, less studied *Mycobacterium* species are becoming a growing concern: species of nontuberculous *Mycobacterium* (NTM). Over the last 30 years, NTM-based lung disease cases have grown to outnumber TB infections in many regions. The “gold standard” for NTM diagnosis involves a weeks-to-months-long microbiological culture-based method. In this work, we are developing a novel electrochemical biosensor to detect NTM, and it may ultimately be used as a more efficient diagnostic tool than the current, time-intensive methods. Two molecular targets for our NTM biosensor are being investigated: Mannosylated lipoarabinomannan (ManLAM) and glycopeptidolipids (GPL). ManLAM is a complex lipoglycan abundantly

found on the cell envelope of NTM and TB. GPLs are absent from TB and may consequently increase the specificity for NTM-exclusive diagnostics. The biosensor contains an electrode-bound DNA aptamer that is thiol-bound to the surface of a gold-plated electrode. The aptamer changes conformational shape upon binding to its molecular target (ManLAM or GPL), subsequently changing the proximity of the redox moiety (methylene blue) with the electrode surface. This conformational change is measured by voltammetric analysis, where a significant difference in electrochemical current upon binding of the target is observed. Future directions include optimizing this NTM biosensor to more robustly and sensitively detect ManLAM and developing an aptamer sequence to target GPLs. The ultimate expected outcome of this project is to improve rapid, point-of-care diagnostics that eliminate invasive sampling and lengthy culturing requirements and hence improve outcomes of patients with NTM infection.

Baby Got BACI: Changes in Forest Community Composition in Response to the Chatfield Reallocation Project

Poster

Presenter(s): Ashley Purcell*, Colette Ramey

Major: Environmental Science (Purcell), Biology (Ramey)

Faculty Mentor: Erin Bissell

Link to Presentation: <http://digital.auraria.edu/IR00000168/00001>

The Chatfield Storage Reallocation Project was implemented to increase the municipal water storage capacity of Chatfield Reservoir, Littleton, CO, during years of high water availability. The plan included removal of cottonwood trees from forests around the reservoir and its tributaries. The process began in Fall of 2017, and most of the major modifications were completed by June 2019. We conducted a Before-After-Control-Impact (BACI) study to monitor changes to vegetation composition resulting from the reallocation project at sites located along the Platte River upstream of the reservoir. These cottonwood forests occur in two distinct age categories: 1) younger stands in dense formation, and 2) more widely spaced older legacy trees. We collected two years of data from both stand and legacy forest sites before the modifications, one year of post-modification data, and data from two control sites located outside of the park. The post-modification data show a significant reduction in the density of trees throughout the study area, but especially in the stand forests. We found higher numbers of saplings, shrubs and woody vines in both the legacy and stand formations. The number of species found in the post-modification forests was also higher than observed prior to plan implementation. Both forest types experienced an uptick in the density of invasive plants as well. Modifications associated with the Reallocation plan also resulted in reduction in the number of snags and course woody debris found in the site areas. Cottonwood tree removal may have enabled the growth of new plants, including invasive species, by opening up the canopy and allowing more light to penetrate to the understory. Growth of new seedlings from the seed bank may also have been facilitated by reduced competition with trees or the transmission of invasive seeds by the activity of the project itself.

University and Children's Museum Partnerships

Poster

Presenter(s): Rachel Radebaugh

Major: Psychology

Faculty Mentor: Kristen Lyons

Link to Presentation: <http://digital.auraria.edu/IR00000169/00001>

The goal of this research project is to understand partnerships and relationships that exist between universities and children's museums in order to establish an opportunity for students at Metropolitan State University of Denver (MSU) in the future to observe child development and behavior in a real-world, naturalistic setting. A literature review was conducted that investigated the relationship between children's museums and universities. A survey was also put out for students in Introduction to Psychology courses to find their interests in participating in different types of learning activities at a children's museum to help with fundamental child development understanding. The main focus of this research project is to find partnerships that involve child psychology departments working with children's museums to study child development. The research study will give an understanding of how university partnerships are established, so future partnerships at MSU Denver can be established in order to give students an opportunity to observe child development and behavior in a real-world, naturalistic setting.

Dark Enigma

Poster

Presenter(s): Jose M. Romero

Major: Computer Science

Other Student Co-Author(s): Anna Sanchez, David Kittleson and Stuart Griffin

Faculty Mentor: Thyago Mota; Steven Beaty

Link to Presentation: <http://digital.auraria.edu/IR00000171/00001>

Human trafficking is a modern form of slavery that affects millions of men, women and children all over the world. Most people exploited as slaves are victims of forced labor and other abuses, such as working extensive hours in conditions that lack the bare minimal sanitary conditions, often without (or poorly) being paid. It is common for humans trafficked to have extortionate debts with their bosses and, because of that, they are lured to physical confinement, suffering daily violence and threats. Human trafficking is one of the saddest realities of our century and we must fight it in every possible way, preventing it from happening in the first place and providing assistance to victims after the condition ceases to exist.

This project aims to contribute to the reduction of human trafficking in two ways. First, we plan on learning more about how TOR networks work as well as exploring any vulnerabilities within the tool in order to help collect data more efficiently. Also related to this objective is a proposal of a way to index the dark web's content. Second, our project aims to explore social media platforms in the context of their use as a human trafficking recruitment tool. This part of our research will focus specifically on the use of the WhatsApp platform in Brazil and Mexico. The ultimate outcome of this project is that it will contribute to our society by trying to stop the scourge of human trafficking. Additionally, it will increase our understanding of the type of content that is available through the so-called dark web through a comprehensive catalog. Likewise, it will also shed some light on the discussions related to job opportunities in the US advertised through WhatsApp groups in Brazil and Mexico. We hope that by creating those catalogs we will be able to contribute to the general understanding of how human traffickers remain anonymous and how they deceive and recruit people who end up being trafficked as slaves.

Character Theory and the Symplectic Group

Oral

Presenter(s): Joseph Daynger Ruiz*, Courtney Fleming, Gabriel Vigil, Alex Tusa

Major: Mathematics

Faculty Mentor: Mandi Schaeffer Fry

Link to Presentation: <http://digital.auraria.edu/IR00000172/00001>

A group is an abstract object that gives a mathematical way of representing symmetries. Representation theory gives a way of studying general finite groups using more concrete groups of invertible matrices. Roughly speaking, each way we can “represent” the group as a set of matrices satisfying certain properties is called a matrix representation. The trace of the matrix representation is called a character, which turns out to encode most of the relevant information about the original representation. One of the most prevalent questions in the area of character theory asks what information we can obtain about the group itself from its characters. In our work, we study an open conjecture regarding this question, relating the characters of a group to the structure of certain subgroups. In particular, our goal is to prove this conjecture for the “Symplectic Group” $Sp_4(q)$.

Tools for Navigating the Dark Web to End Human Trafficking: Dark Enigma

Oral

Presenter(s): Anna Sanchez*, David Kittleson

Major: Computer Science

Other Student Co-Author(s): Stuart Griffin, Jose Romero

Faculty Mentor: Steve Beaty; AnnJanette Alejano-Steele

Link to Presentation: <http://digital.auraria.edu/IR00000144/00001>

This study will explore the presence of human trafficking on the dark web as well as the prevalence of the selling and purchasing of humans. Dark Web transactions are incredibly difficult, if not impossible to track because of a series of encryption all layered within an anonymous setting. Because of this, we have, with the help of MSU Denver staff, begun to formulate an algorithm to track patterns in the verbiage used by traffickers on the Dark Web. We will be using various mechanisms in order to de-anonymize perpetrators of human trafficking. The name of this project is Dark Enigma. Some obstacles we are preparing to overcome are the encryption layers (there are 6), Blockchain, and CAPTCHA's. All of these are added forms of security used to increase anonymity of users. Utilizing a web crawler, Dark Enigma's goal is to systematically index the Hidden Services on the dark web. With the emergence of innovative technologies, hopefully Dark Enigma will begin to provide more insight into the inner-workings of the dark web, and a viable method to stop human trafficking. In conclusion, the purpose of indexing the dark web is to look for patterns, or fundamental vulnerabilities in the dark web's network to de-anonymize human traffickers.

A phenomenological study of TRIO student's definitions of success

Poster

Presenter(s): Brooke Schneider

Major: Psychology

Other Student Co-Author(s): Vanessa Atencio, Maly Mendieta, Jeancasia Nolen

Faculty Mentor: Eric Silva

Link to Presentation: <http://digital.auraria.edu/IR00000173/00001>

The goal of this study is to identify the common definitions of success shared among TRIO SSS (SSS) participants, and to better understand what shaped those definitions. The study seeks to better understand how these definitions influence a SSS student's college experience, and also hopes to inform practitioners and institutions that serve SSS students, so that they may better understand their needs. The study will also clarify how institutional definitions and measures of success overlap or conflict with SSS student definitions to influence the supports offered to SSS students.

Hyperbaric Oxygen Therapy: An Overlooked Treatment with Traumatic Brain Injuries

Oral

Presenter(s): Brianna Simmons

Major: Biology

Faculty Mentor: Sheryl Zajdowicz; Megan Hughes

Special Note: Part of Honors Thesis

Link to Presentation: <http://digital.auraria.edu/IR00000174/00001>

Hyperbaric Oxygen Therapy (HBOT) can improve the overall health of those affected by traumatic brain injuries. Current forms of concussion therapy lack the physiological component to repair the damaged tissue of an individual who has suffered from a traumatic brain injury. This new form of treatment uses pure oxygen at one atmospheric level, which helps to promote repair to the damaged tissue through oxygenation; growth development can occur for new tissue and aids in fighting infections. However, even though this treatment is available, it is currently not FDA approved for concussion therapy and many other medical conditions. Research shows that individuals who have been treated with hyperbaric oxygen therapy had a higher success rate for tissue repair and overall symptom(s) improvement. Individuals who were not treated with hyperbaric oxygen therapy still experience most of their symptoms from the concussion. Hyperbaric oxygen therapy can reshape concussion therapy by introducing a treatment option that does not include any additional medications or harmful chemicals. If the FDA approved having hyperbaric oxygen therapy, not only for concussion treatment but for many other medical conditions as well, individuals could apply for financial aid and be able to receive this therapy to help improve their health.

Rapid and Affordable Detection of Carrion's Disease

Oral

Presenter(s): Andrew Smith

Major: Biology

Faculty Mentor: Andrew Bonham

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000175/00001>

Carrion's disease is an infectious hematologic disease caused by *Bartonella bacilliformis* affecting mainly rural, impoverished populations in northern Peru, Ecuador, and Colombia. Left untreated, the disease's mortality rate is between 40 and 80%. Diagnosis is difficult because the initial symptoms are similar to other infectious diseases, such as Dengue, but common diagnostic methods have low sensitivity. In the acute phase, thin blood smears, the most commonly used diagnostic technique, only have a sensitivity between 24 and 36%. Other diagnostic methods, such as PCR, are not viable due to the remote and resource-poor nature of the areas of endemicity. As such, there is great need for better diagnostic methods. eDNA biosensors are an appropriate solution to this problem as they are cheaper than most modern diagnostic methods, are highly portable which allows them to be used in rural communities, and can have detection limits in sub-nanomolar concentrations. Our development technique centers around the use of SELEX (Selective evolution of ligands by exponential enrichment), in which DNA fragments are assayed for their ability to bind our target, an extracellular matrix protein of *B. bacilliformis*. Those that bind well are replicated by error prone PCR and re-assayed until a DNA oligonucleotide is developed that binds well to the target. Once an aptamer has been created that binds well to the target, it will be sequenced and then modified into an aptamer with on and off conformations, which allows this sequence to act as a biosensor. Currently, our target has been purified and we are preparing to begin the SELEX process.

Variation in Gymnosperm Phenology along Temperature, Elevation & Latitudinal Gradients in Rocky Mountain National Park vs Yellowstone National Park using NEON Data

Oral

Presenter(s): Kathleen Smith

Major: Biology

Faculty Mentor: Erin Bissell

Link to Presentation: <http://digital.auraria.edu/IR00000176/00001>

Seasonal shifts in phenology, the timing of growth and reproduction, are likely to occur in plants in response to climate change. Specifically, bud break in trees will likely happen earlier in the spring, potentially exposing buds to hard freezes that could damage new growth and/or negatively impact reproductive events. These changes may have long-term consequences to overall forest health. Using National Ecological Observation Network (NEON) open source data, we evaluated differences in the timing of bud break in gymnosperms along temperature, elevation, and latitudinal gradients between NEON sites located at Rocky Mountain National Park (RMNP) and Yellowstone (YELL). Variation along temperature, elevation, and latitude is similar to changes related to climate change and can be used to model the projected effects of climate change in relation to bud break. *Pseudotsuga menziesii* (PSME – Douglas fir) is the only species in the NEON data set that overlaps between the two sites. We performed an analysis of covariance between the two sites to identify differences in the timing of bud break associated temperature, elevation, and latitude. In performing this analysis, we encountered challenges in using open-source data, specifically difficulty in forming a hypothesis that can be addressed using a secondary data set with no control over the data collected. These drawbacks are balanced by the benefits of open-source data, which include inexpensive access for users who lack the resources to collect data at this scale, while also controlling for systemic bias by separating data collection from data use. NEON is a valuable source for continental-scale data collected in a

standardized way in line with many governmental data gathering techniques and may prove invaluable in modeling long-term impacts of climate change on plant phenology and forest health.

Detection of Mannose-capped Lipoarabinomannan among Mycobacterial Pathogens via Diagnostic Electrochemical Biosensor

Poster

Presenter(s): Tyler Sodja

Major: Biology

Other Student Co-Author(s): Dylan Poch

Faculty Mentor: Andrew Bonham

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000177/00001>

Mycobacterium tuberculosis (M.tb) is one of the world's most prevalent bacterial pathogens. However, Nontuberculous Mycobacterium (NTM) are less recognized, yet just as impactful as M.tb while remaining a difficult public health risk. While there are over 140 NTM species identified, not all are pathogenic, and those that are tend to be opportunistic. Often, NTM disease is confused with that of a tubercle infection leaving diagnosis semi-unreliable. Additionally, the time spent to fully diagnose a mycobacterial disease is extensive and dependent on the species growth rate due to the necessity of culture. The duration of culturing and obtaining an isolate colony of NTM is highly variable. Furthermore, in 2014 the estimated expense for treatment and diagnosis of NTM was approaching \$1.7 billion. Thus, designing a sensitive electrochemical DNA-based (E-DNA) biosensor for a diagnostic tool for NTM would dramatically decrease the timeline of diagnosis and therefore improve patient outcomes all while being much more cost effective. One possible avenue for improved detection lies in the cell envelope of various NTM species, which includes many complex glycolipids and glycopeptidolipids—many of which are believed to have immunopathogenic mechanisms. Mannose-capped lipoarabinomannan (ManLAM) is one of the most prevalent of the glycolipids and presents as a novel biomarker for the sensitive detection of various NTM strains. The purpose of this research is to design and develop an electrochemical biosensor that is equipped to detect ManLAM in biological fluids (serum, sputum, urine, etc.) at a very early stage of infection.

Deleted in Colorectal Cancer Inhibits Protein Synthesis, But How?

Poster

Presenter(s): Elizabeth Spear

Major: Biochemistry

Faculty Mentor: Megan Filbin

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000178/00001>

Deleted in colorectal cancer (DCC) is a chemotropic transmembrane receptor known to regulate neuron growth by stimulating or suppressing protein synthesis machinery. DCC does this by sensing an extracellular signal known as netrin-1. In the absence of netrin-1, DCC tethers translation machinery with its cytoplasmic tail (C-tail), blocking ribosome function. In the presence of netrin-1, DCC homodimerizes, releasing the translation machinery for local protein synthesis. While netrin-1's role is understood, the C-tail-translational machinery complex is poorly defined. Our lab focuses on which portion of the DCC C-tail is necessary and sufficient at regulating protein synthesis. Using site-directed mutagenesis, traditional cloning, and recombinant protein expression, we have created a series of C-tail truncation mutants. We plan to measure the inhibitory function of each mutant using an in vitro luciferase assay. Our results will indicate whether or not the inhibitory region of the tail lies toward the N-terminus. In doing so, we will develop a model for how it is interacting with the translation machinery. Collectively, our data contribute to a growing body of knowledge about the relationship between chemotropism and protein synthesis.

Can Golf Lessons Help Save the Environment? - The effects of various aqueous conditions on golf ball degradation

Oral

Presenter(s): Nick Sundstrom

Major: Environmental Science

Faculty Mentor: Sarah Schliemann

Special Note: Part of Undergraduate Research Mini-Grant Program; Honors Thesis

Link to Presentation: <http://digital.auraria.edu/IR00000179/00001>

Plastics use has increased tremendously over the past half-century, as they are economically efficient and simple to manufacture, as well as being malleable. However, they are notoriously slow to degrade and even slower to decompose. These features present problems with a growing world population and increasing plastic consumption. An understudied potential source of microplastic pollution may come from an unlikely culprit: golf balls. Many golf courses include rivers, creeks and/or ponds, which generally serve the dual purpose of creating a challenge for golfers and for irrigation of the course. Plastic coated golf balls may enter these aquatic systems and stay for an indefinite amount of time. Research into the degradation potential of golf balls in various aqueous environments is seemingly nonexistent at present. This study exposed modern polyurethane coated golf balls to treatment solutions of varied pH, salinity, alkalinity and ultraviolet light. After a period of six months, the solutions were tested for changes in total carbon (TC). A golf ball's polyurethane cover is chemically composed of organic hydro-carbon units linked by carbamate functional groups. Measuring a change in total carbon (TC) of the treatment solutions acted as a proxy for chemical degradation. The results of the study will help to identify under what conditions golf ball degradation takes place or can be accelerated. The extent of degradation under certain conditions may assist in further understanding the effects of microplastics on underwater ecosystems.

Effects of river otters on benthic macroinvertebrate populations of the Colorado Rocky Mountains

Oral

Presenter(s): Amanda Tetz

Major: Biology

Faculty Mentor: Christopher Cooley

Link to Presentation: <http://digital.auraria.edu/IR00000180/00001>

Reintroduction efforts of keystone predator species have had significant trophic effects on their endemic ecosystems, with the most famous being the reintroduction of wolves to Yellowstone National Park. In 1976, the Colorado Division of Wildlife implemented the River Otter Recovery Plan, introducing 114-122 river otters (*Lontra canadensis*) across the state over 15 years. Populations of *L. canadensis* have since stabilized and otters now thrive in the riparian ecosystems of the Rockies. River otters are a link between aquatic and terrestrial ecosystems, and their effect on terrestrial plant life has been documented. However, no research has been done on the effect otters have on benthic macroinvertebrate populations. This study was an investigation into the relationship between *L. canadensis* and macroinvertebrates to test if the presence of otters led to larger populations of bottom-dwelling invertebrates in the rivers of the Colorado Rocky Mountains. Riparian invertebrate benthos were collected from the river bottoms of 10 sites along a 29.7 km stretch of the Colorado river between Dotsero and Glenwood Springs, Colorado, where river otters are frequently sighted. These were compared with 10 samples collected from a 29.7 km portion of the Roaring Fork River between Basalt and Aspen, Colorado, where there have been no recorded sightings of river otters. A gross count of macroinvertebrates collected along each river were compared to examine whether river otters affected the number of invertebrates living on the river bottoms. It is hypothesized that the presence of otters will result in an increased population of macroinvertebrates since otters feed on the fish, amphibians, turtles, and other species that typically prey upon invertebrates.

Impact of Vibrational Frequencies on State Mood and Mindfulness

Poster

Presenter(s): Erica VanSteenhuysen

Major: Psychology

Other Student Co-Author(s): Erica Payne, Zahava Heydel, James Webster

Faculty Mentor: Michael Rhoads

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000181/00001>

The aim of this study is to examine the following: Do sounds at 20,000 Hz or more increase state mindfulness levels compared to sounds at 100 Hz or less? This was tested using participants in a controlled research setting. Each research session will be randomly assigned to a control or values condition. Regardless of condition, the participants will be given a packet with the following questionnaires to complete.

- State Mindfulness Questionnaire, SMS (Tanay, Bernstein, 2013).
- Positive and Negative Affect Schedule, PANAS (Watson & Clark, 1989).
- Demographic questionnaire-age, gender, sex, race/ethnicity, year in school.

After the questionnaires, participants will reach a page instructing them to stop and wait for further instructions. Participants will then be asked to sit in their seats while the researcher plays a series of tones for the participants to be exposed to. The researcher will play the tones from their cell phone on an app. The app is called 'Sonic', and allows the researcher to type in a specific frequency anywhere in the range of 0 Hz to 25,000 Hz. Three different frequency levels have been chosen for each condition group. Those in the high-frequency condition will have the following frequencies played for them: 100 Hz, 50 Hz, and 5 Hz. Those in the low-frequency condition will have the following frequencies played for them: 20,000 Hz, 22,500 Hz, and 25,000 Hz. Each frequency will be played for a total of 30 seconds. After the tonal exposure, participants will be asked to fill out the SMS and the PANAS a second time. SPSS software and the MANOVA formula are used to calculate final results.

Mindfulness Sports Performance

Poster

Presenter(s): Erica VanSteenhuysen

Major: Psychology

Other Student Co-Author(s): Amy Babich, Jeremy Myers

Faculty Mentor: Michael Rhoads

Special Note: Part of Undergraduate Research Mini-Grant Program

Link to Presentation: <http://digital.auraria.edu/IR00000182/00001>

This study is an investigation into the benefits of Mindful Psychological Skills Training. A total of 10 participants completed semi-structured interviews at the end of the training sessions. In the interview, participants were asked about any changes they experienced in their mindfulness, performance anxiety, and negative thinking. Interviews were also used to explore athlete's experiences with the program and to decipher barriers to intervention effectiveness. Interviews were transcribed verbatim, followed by open and axial coding. Every interview was coded by two researchers to ensure credibility. Using a thematic analysis, the following emergent themes were identified: *Intervention Effectiveness, Difficulties, Psychological Skills That Improved, and Recommendations to Improve the Program.*

The Effects of Forest Restoration on Avian Communities Along a Successional Gradient

Poster

Presenter(s): Shane Way

Major: Biology

Faculty Mentor: Christy Carello; Scott Yanco

Link to Presentation: <http://digital.auraria.edu/IR00000183/00001>

The cumulative effects of habitat loss and degradation present leading mechanisms associated with avian population declines globally. From a biodiversity lens, it is essential to investigate avian communities and their associated habitat-selection dynamics with respect to used-habitat types versus available habitats in order to develop effective conservation initiatives. In our habitat-selection study, ten distinct reforested sites of varying age were sampled within the Monteverde Reserve Complex in Costa Rica. Survey data was collected between February 2018 – May 2018. New forest-habitat structure varied since being reforested (2003, 2008, and 2011) and were compared to a climax forest control. As expected, avian species compositions varied with each successional class with most migrants being detected in the youngest successional class (2011). We hypothesized and our preliminary data suggests that migratory species may be frequently out-competed for ideal habitat sites and forced into occupying lower quality, homogeneous, early successional forest habitat. Interestingly, this trend appears to be nonlinear, and only holds for the earliest successional habitats (2011), afterwards there is no discernible difference when compared to uncut forest habitat. Furthermore, the youngest reforestation class (2011) had greater total species abundance (11.77 ± 1.44), and richness (26.5; range = 23-30) while also being the least heterogeneous. These findings suggest that early successional, homogeneous forest provides habitat for avian communities and may especially provide critical habitat to migratory birds.

The Sand Creek Massacre National Historic Site: Collective Memory and Memorialization

Oral

Presenter(s): Tammy White

Major: History

Faculty Mentor: Andrea Maestrejuan

Link to Presentation: <http://digital.auraria.edu/IR00000184/00001>

Historical truth. It cannot be inflexible and it cannot rest on the politics of power. Research analyzing the success of the Sand Creek Massacre National Historic Site memorialization effort requires an awareness of multiple public memories and an acceptance of multiple historical truths. This research study examines the events precipitating the Sand Creek Massacre, the memories of the participants surrounding the day itself, and the results of the memorialization process headed by the National Park Service through the additional lens of the Cheyenne and Arapaho Tribes. It becomes clear that there is room for more than one interpretation of this watershed moment in the annals of westward expansion and more importantly, a multiplicity of historical truths. The research sources for this analysis included both primary and secondary historical sources, data collected by the National Park Service in the site study, and the oral traditions of the Cheyenne and Arapaho Tribes. These sources were synthesized in an effort to prove that it is the professional responsibility of the public historian to consider and provide multiple memories of a historical event in order to allow visitors to a site such as Sand Creek the ability to interpret and contemplate a difficult past. This analysis found that it was a struggle for the National Park Service to consider site interpretation beyond the Eurocentric view, but through ongoing collaboration with the Tribes, the site is flowering into a multicultural commemoration of the violence committed and a celebration of the strength and self-determination of the Cheyenne and Arapaho peoples. It is the hope that continued research in this area would benefit current and future

sites of commemoration and memorialization in the American West, such as Wounded Knee, Washita, and the Battle of the Little Bighorn.

The neural intersection between music and language

Oral

Presenter(s): Paige Zaring

Major: Linguistics

Faculty Mentor: Marina Gorlach; Andrew Pantos

Link to Presentation: <http://digital.auraria.edu/IR00000185/00001>

This research examines the similarities in which the brain processes music and language. The progression of neural imaging technology has allowed for researchers to better understand the way the human brain processes information. Music and language are understood to be two different information types. However, there is a significant amount of recent evidence to suggest that the brain digests them the same way. Wernicke's area is a part of the brain known to be associated with high-level syntax processing. An fMRI shows that the same area activates when processing complex rhythms. The same fMRI shows another region of the brain activated: Broca's area. Broca and Wernicke's areas are the two most significant regions of the brain in the psycholinguistic study. The neural overlap that occurs in these areas could suggest evolutionary overlap in the development of music and language. There is also strong evidence to suggest this overlap found in brain damage and disabilities: Dyslexia affects a child's ability to perceive and produce language to varying degrees. Evidently, dyslexia also affects a child's ability to perceive and produce music; Alzheimer's patients cannot demonstrate memory through language. However, through melodic preference tasks, music provides evidence that memory is still retained through the illness; Trauma that occurs on Wernicke or Broca's areas will result in language as well as musical problems. Language abilities almost always recover, but musical abilities almost never do. The evidence, though, seems to suggest at something bigger - a deeper connection humanity is just on the verge of discovering. The expansion of research between music, language, and intelligence has the potential to revolutionize education, medicine, and culture.

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