Metropolitan State University of Denver's 4th Annual

UNDERGRADUATE RESEARCH CONFERENCE

A Symposium of Scholarly Works and Creative Projects

May 1, 2015

8:00am – 5:00pm

Student Success Building

UNDERGRADUATE RESEARCH CONFERENCE

A SYMPOSIUM OF SCHOLARLY WORKS AND CREATIVE PROJECTS

METROPOLITAN STATE UNIVERSITY℠
OF DENVER
Undergraduate Research Program

Sponsored by

Metropolitan State University of Denver
Undergraduate Research Program

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Undergraduate Research Program Mission

The URP at MSU Denver seeks to engage students and faculty in meaningful and rewarding research experiences and projects thereby promoting active, engaged, experience-based learning. Students participating in undergraduate research gain a deeper understanding of their field and are more prepared for jobs requiring creativity and exploration as well as graduate and professional schools.

The URP promotes, supports, and celebrates faculty and student engagement in undergraduate research activities. The URP defines undergraduate research as:
Scholarly and creative endeavors accepted within one's discipline as activities contributing to the body of knowledge in one's field. Undergraduate research seeks to examine, create, and share new knowledge or works in ways commensurate with practices in a particular discipline. Undergraduate research projects involve student-faculty collaboration in the form of either student initiated projects overseen by a faculty mentor or faculty initiated projects involving students as integral members of a research team. Undergraduate research projects include a dissemination component wherein the results and outcome of the work are shared with a broader scholarly/creative community in some form. This definition includes the four tenants of undergraduate research: mentorship, originality, acceptability, and dissemination.

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METROPOLITAN STATE UNIVERSITY OF DENVER

Two roads diverged in a wood, and I-
I took the one less traveled by,
And that has made all the difference.
-Robert Frost (1874-1963)

Much like the traveler in the timeless poem by Robert Frost, each one of you has taken the road less traveled. Despite the typical undertaking of semesters packed with challenging courses and various other commitments, each of you has also embarked on the path of undergraduate research, a journey that frequently is fraught with many trials and tribulations. However, the challenge of undergraduate research can also have the greatest of rewards. By engaging in undergraduate research, you applied your education in a way that was transformative, not only to you, but also to the community around you, whether it is local, national, or international. The work showcased this year at the Metropolitan State University of Denver's Undergraduate Research Conference: A Symposium of Scholarly Works and Creative Projects truly highlights this transforming experience of undergraduate research.

Thank you to each of you for taking the road less traveled…to each student presenting a research project, to each faculty member who mentored students on those projects, and to each individual in attendance for engaging in discussions about the phenomenal work conducted by our students at MSU Denver! As you will see, the road taken has made all of the difference.

Stephen M. Jordan, Ph.D.
President

It is with greatest enthusiasm that I welcome you to the fourth annual MSU Denver Undergraduate Research Conference: A Symposium of Scholarly Works and Creative Projects! This conference showcases not only the incredible diversity and breadth of expertise on our campus, but also highlights the initiative, perseverance, dedication, and accomplishments of our students and faculty. MSU Denver is committed to the pursuit of knowledge; by providing opportunities in the classroom, laboratory setting, and in the community, we are not only contributing to our fields of study, but are also providing our students an avenue for success – in the classroom and beyond as they pursue their future professional goals.

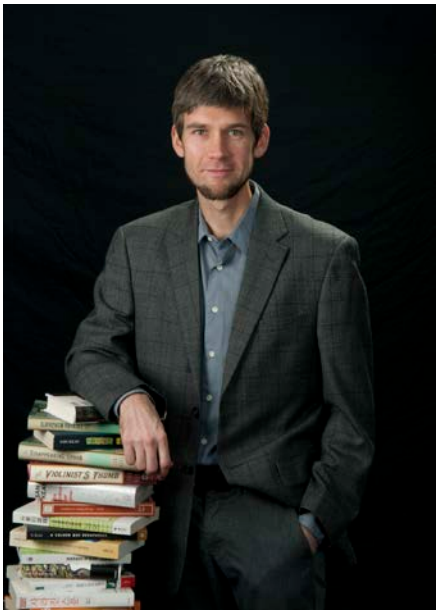
Today, we have the opportunity to observe the tremendous efforts of our students and faculty, and to learn and become inspired by their presentations. My thanks to MSU Denver's Undergraduate Research

Program, a division of the Applied Learning Center, and all of the dedicated faculty and staff who helped to organize and ensure the success of this wonderful event.

I also thank each and every one of you who has participated in undergraduate research this year and I applaud those of you whose work has culminated into the presentation that you are giving today.

Sincerely,
Dr. Vicki L. Golich
Provost and Vice President for Academic & Student Affairs

Keynote Presentation



Sam Kean

New York Time Bestselling Author

Sam Kean spent years collecting mercury from broken thermometers as a kid, and now he's a writer in Washington, D.C. His stories have appeared in *The New York Times Magazine*, *Mental Floss*, *Slate*, *Psychology Today*, and *The New Scientist*, among other places, and his work has been featured on "Radiolab" and NPR's "All Things Considered," among other shows. His books *The Disappearing Spoon* and *The Violinist's Thumb* were national bestsellers, and both were named an Amazon "Top 5″ science books of the year. *The Disappearing Spoon* was nominated by the Royal Society for one of the top science books of 2010, while *The Violinist's Thumb* was a finalist for PEN's literary science writing award.

"The Tale of the Dueling Neurosurgeons"

Siamese brains. Viruses that eat patients' memories. Blind people who "see" through their tongues. Stroke victims who can't speak but can still sing. Until very recently, scientists had only one way to study the brain: wait for misfortune to strike and see how people's minds were transformed afterward. These people's lives laid the foundations of modern neuroscience, and their fascinating and dramatic stories expand our notions of what the brain is capable of — showing that when one part of the mind shuts down, something new and unpredictable and sometimes even beautiful roars to life. Sam's talk will also include some thoughts about the rewards/challenges of research and his personal experience in science.

Conference-at-a-Glance

8:15 am-3:30 pm: Conference Participant Sign-in
Student Success Building (SSB)- Atrium
Light refreshments will be provided in the morning

9:00-10:15 am: **Conference Session I**
Oral Presentations- SSB
Room 202: Humanities/Social Sciences
Room 203: Humanities/Social Sciences
Room 205: Natural Sciences
Room 206: Technology

Poster Presentations Session I (9:30-10:30 am) – SSB Mezzanine

10:30-11:45 am: **Conference Session II**
Oral Presentations- SSB
Room 202: Humanities/Social Sciences
Room 203: Humanities/Social Sciences
Room 205: Natural Sciences
Room 206: Technology
Room 207: Mathematics and Business

Poster Presentations Session II (11:00-12:00pm) – SSB Mezzanine

12:15 pm Lunch
Turnhalle, Tivoli Student Union

12:30-1:30 pm Keynote Speaker: Sam Kean New York Times Bestseller
"The Dueling Neurosurgeons"

2:00-3:00 pm: **Conference Session III**
Oral Presentations- SSB
Room 202: Humanities/Social Sciences
Room 203: Humanities/Social Sciences
Room 205: Natural Sciences
Room 206: Panel Discussion: Effectively Teaching Poetry in the Secondary Classroom

Poster Presentations Session III (2:00-3:00 pm) – SSB Mezzanine

3:15-4:15 pm: **Conference Session IV**
Oral Presentations- SSB
Room 202: Humanities/Social Sciences
Room 203: Humanities/Social Sciences
Room 205: Humanities/Social Sciences
Room 206: Panel Discussion: Culturally Diverse Texts in the Language Arts Classroom

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

Acknowledgements

We would like to extend our thanks and appreciation to the following offices and individuals for their contribution to the success of the conference.

Applied Learning Center Staff
Auraria Bookstore (especially Betty Ingels)
Auraria Library (especially Lorrie Evans)
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Session Moderators
Studio M Class
All Volunteers
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The Writing Center (especially Elizabeth Kleinfeld)

Special thanks to Marcus Hicks for designing the poster for this year's conference. We would also like to thank Scott Surine for enlisting his Studio M class in the development of poster designs.

Undergraduate Research Grant Recipients

Stephen Aderholdt
Anastasia Bacca
Chase Buerck
William Carver
Mary Culkin
Alec Curtis
Lisa Fetter
Jillian Foss
Jesse Freelong
Eric Klein
Alexandria Martini
Faye Olsgard
Victoria Ratcliffe
Kimberly Richard
Jonathan Richards
Holly Roberts
Francisco Sanchez
Morgan Spedale
Tamara Tabb
David Watson

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Scheduling/Conference Program

Dr. Sheryl Zajdowicz (Biology)
Cait Mobley (Applied Learning Center)

Presentation Abstracts

(*listed alphabetically by primary student's last name)*

Genetically Identifying *Physa natricina* in the Snake River

Winta Abraham – Biology

Coauthor: Alicia Payne

Faculty Mentor: Hsiu-Ping Liu

Physa natricina is a freshwater snail that has recently been labeled as an endangered species. There is little evidence that they are indigenous to one particular region. However, there is speculation that they can be found along the Snake River in the state of Washington. Along this river, lies a power plant that uses water from the river to fuel its energy. Hundreds of snail samples have been collected from this area. If there are indeed *P. natricina* in the area the plant uses as a resource for energy, then changes will be made in order to protect this species. Due to variations in shell morphology, *P. natricina* are hard to identify amongst the family *Physidae* by physical characteristics alone. *P. natricina* vary from other *Physa* species by the position and size of the preputial gland, pigmentation patterns of the head-foot, mantle, tentacles, and position of the male genitalia. Therefore, the soft tissues and DNA need to be examined in order for them to be correctly classified. The intent of our research is to sequence the DNA of every sample, and identify if *P. natricina* resides in the area that has been surveyed. Of the samples that have been collected each will be genetically examined for sequences of *P. natricina*. This will be accomplished by extracting the DNA of each specimen, running a polymerase chain reaction, running an electrophoresis gel, and cycling the product through a sequence analyzer.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #1)

Socioeconomic Factors Correlate with *Escherichia coli* Levels in an Urban Waterway

Stephen Aderholdt – Biology

Coauthors: David Watson, Rachel Hansgen, Emilie Pryor, Nathan Yudnich

Faculty Mentor: Rebecca Ferrell

Lower Bear Creek (LBC) is a tributary of the South Platte River arising from Bear Creek Lake in Lakewood, CO. LBC flows through several municipalities and is listed as an impaired waterway due to elevated levels of the indicator bacterium *Escherichia coli*. In 2012, Groundwork Denver (GWD) created a plan to reduce *E. coli* in and partnered with EPA Region 8 and our lab to conduct sampling. We sampled bi-weekly throughout the year at 19 sites in the LBC watershed. *E. coli* levels in 100 mL water samples are determined using Colilert 98-well MPN testing kits (Idexx, Inc.), following EPA quality assurance protocols. Data show that *E. coli* counts increase near LBC's confluence with the S. Platte River, often exceeding recreational waters limits (126 CFU/ 100 mL) set by Colorado Department of Public Health & Environment (CDPHE). *E. coli* levels in LBC trend toward an inversely variable relationship with the amount of green space and undeveloped land bordering the waterway. *E. coli* levels in LBC tend to rise in lower socioeconomic areas where homes built immediately after World War II use septic systems that are now aging; these areas also lack green spaces. We observe that similar housing in areas that incorporate a green space between homes and LBC show lower levels of *E. coli* in the

waterway. The Watershed Management Plan submitted by GWD to the State of Colorado proposes to consider these socioeconomic and land use factors in remediation of water quality in LBC.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #1)

Mitochondrial gene order in *Pyrglulopsis bruneauainisis* and *Fluminiocola fuscusa*

Vlonjat Lonnie Alija – Biology

Faculty Mentor: Hsiu-Ping Liu

The general purpose of this research project is to determine mitochondrial gene orders in two different snail species, *Pyrglulopsis bruneauainisis* and *Fluminiocola fuscusa*. Research shows that the mitochondrial gene order in some *Mollusca* species differ widely. The gene order for those specific species, *P. pryglulopsis* and *F. fuscusa* is unknown and has yet to be studied. The first part of my project focuses on determining the gene order of cytochrome c oxidase subunit I and II (COI & COII), part of the electron transport chain in the mitochondria. Primers that worked for COI and COII were used to test gene order. Four different combinations were tested. Preliminary results show the combination of the forward primer for COI and the reverse primer for COII worked for *P. bruneauainisis*, suggesting the back-to-back order for those two genes. None of theses four primer combinations worked for *F. fuscusa*, suggesting that COI and COII might not be close to each other in the mitochondria.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #2)

Sleep Impairment and Stress Among College Students

Liliana Alvarez – Psychology

Coauthors: Steven J. Terry, Corey Engle, Dillon Slagle

Faculty Mentors: Lisa Badanes, Kristen Lyons

In the general population, lack of sleep is correlated with higher levels of stress (Goff, 2011; Han, Kim, & Shim, 2012; Marhefka, 2011; Onyper, Thacher, Gilbert, & Gradess, 2012; Zhou & Kreek, 2014). Stress is a biological response that occurs in the central nervous system and increases feelings of frustration, physical and cognitive ability as well as certain physiological responses. (Zhou & Kreek, 2014). It is not known how sleep impairment and stress are related in college students. This is important to study because college students find it difficult to get the recommended eight hours of sleep per night (Onyper, Thacher, Gilbert, & Gradess, 2012), and because the negative consequences of stress could present obstacles for students in their college success. In our study we were trying to find whether sleep deprivation and stress were correlated. We predicted that high levels of stress would correlate with higher levels of sleep deprivation. Participants were asked to complete an online questionnaire to measure stress and sleep impairment. Participants also answered a demographics questionnaire. We found that stress correlated with sleep impairment $r(251) = 0.45$, $p < 0.001$. Also our findings suggest that age is related to sleep impairment, the youngest participants were more likely to be sleep deprived $r(251) = -0.16$, $p < 0.001$. Future longitudinal research should study this relationship over the period of the academic semester.

(Oral Presentation, Session I: 9:30-9:45 AM, SSB Room 203)

Student Perceptions and Course Syllabi

Natasha Amiri – Psychology

Coauthors: Erik Boss, Lizeth Caldera, Kristen Denning, Sonia M. Rivera, Jennie Torres, Melanie Trenary, Marlene Ventura

Faculty Mentor: Bethany Fleck Dillen, Aaron S. Richmond

The purpose of the study is to assess the impact that cartoons have when placed on course syllabi including their perception of the instructor. Students saw a syllabus with either cartoons or no cartoons and judged the instructor on perceived effectiveness, tone and cultural sensitivity.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #3)

Pushing and Pulling: An Examination of Modern Social Movements in Relation to Contemporary Society

Tyler Antikainen – Speech Communication

Faculty Mentor: Eric James

Utilizing a theoretical framework of push-pull dialectics, this writer aims to show both the advantages and disadvantages of recent and ongoing social movements that use either push or pull methods to enact societal change. Focusing in on the Occupy Wall Street movement and the ongoing unrest in Ferguson, Missouri over the shooting of Michael Brown in August of 2014, push-pull dialectics is applied to a macro level in examining the many different relationships the movements themselves have with other macro-institutions. The movements are analyzed with a particular focus on whether push or pull was utilized and the type of mutual negation present is identified. Looking at technology/use of social media, economics, and the response(s) of the government/elected officials, both movements have similarities and differences in how they interact and balance the tension that is found between themselves and these macro-institutions. After the initial analysis of the movements and their relationships to other macro-institutions conclusions are drawn in regards to the effectiveness of utilizing push or pull methods to enact societal change. Finally, there are then suggestions on how to more effectively enact societal change through the strategic navigation of dialectic tensions amongst macro-institutions.

(Oral Presentation, Session I 9:45-10:00 AM, SSB Room 202)

The Cost of Living in Mile High

Jackeline Arce-Castro – Management

Faculty Mentors: Lisa McVicker, William Carnes

In light of the population boom that Colorado is experiencing, this research investigates the recent legislative debate to raise the minimum wage for Coloradans. Two bills passed recently that will allow local governments to raise the minimum wage and let voters decide on a wage increase to $12.50 an hour by 2020. Many considerations must be taken into account when deciding where wages should be increased and how the increase will affect the local economy. Historically wages have been linked to

productivity; therefore, many will argue that minimum wage mandates prevent low-skilled workers from finding jobs that will cater to their low-productivity. This would push many low-wage earners out of the workforce all together. On the other hand, raising wages will allow individuals and families to benefit from affording the cost of living, lifting many out of poverty. As Colorado grows, organizations will need to decide how to best meet the needs of their employees, whether it is through a living wage or other benefits and opportunities. This is why it is imperative that Coloradans understand both sides of the argument so that they may vote wisely in upcoming elections.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #4)

Optimizing Recombinant Protein Purification Techniques for Bio-Analytical Applications

Tiffany Ashbaugh – Chemistry

Coauthor: Laura Roon

Faculty Mentor: Andrew J. Bonham

Many modern analytical protein characterization techniques, such as X-ray crystallography, nuclear magnetic resonance, and activity gel shift assays rely on access to large quantities of purified human proteins that have been expressed in bacteria threw a recombinant vector uptake mechanism. In particular, our lab builds electrochemical and optical biosensors to detect proteins involved in cancer that require pure recombinant proteins for validation purposes. However, the process of expressing and purifying functional human proteins in bacteria requires optimization of conditions on an individual protein basis. Here we investigate varied buffer parameters in the process of affinity column chromatography separation of recombinant Max (myc-associated factor X) transcription factor protein. The gene encoding a version of Max that is fused to a His-tag purification motif was previously introduced into BL21 *E. coli* bacteria, and this bacteria were used to produce large quantities of cell lysate. However, the process of isolating Max from the thousands of native bacterial proteins requires careful selection of purification procedures and techniques. In particular, the concentration of imidazole, an amino acid mimic used to out-compete Max binding to the Nickel-affinity column, has a significant effect on the final purity of the protein obtained. By varying the concentrations of imidazole, we aim to quantitatively determine an effective concentration for optimized purity of Max for testing of our lab's biosensors.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #1)

Human Peripheral Blood Mononuclear Cell Karyotype Protocol which can be Integrated into an Undergraduate Genetics Laboratory

Jamey Atchison – Biology

Faculty Mentors: Hsiu-Ping Liu, Mark Karlok

The goal of this research is to develop a human karyotyping protocol which can be implemented into an undergraduate genetics laboratory. Performing a karyotype in a classroom setting has the potential to be an interesting and rewarding experience for students. Implementation into a laboratory curriculum requires the procedure to be reproducible and conform to the fiscal and time constraints of an academic setting. The procedures evaluated were peripheral blood mononuclear cell (PBMC) isolation, cell culture conditions and slide preparation. Two lymphocyte isolation techniques were compared for ease and

functionality. Time of incubation and concentrations of both mitotic stimulating and arresting agents were assayed during cell culture for their effect on the resulting chromosome spreads. The harvested cells cultures were applied to slides at angles set to 0°, 45° and 70°. The findings demonstrate that performing a Ficoll™ density gradient lymphocyte isolation was the most feasible for the protocol and that incubation for either 48 or 72 hours (± 3 hours) produced a comparable number of usable chromosome spreads. Dropping the cell preparation onto slides at an angle of 70° resulted in sufficient cell lysis and chromosome separation. Moving forward, G, C and Q banding will be explored and the protocol will be beta tested for student compatibility.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #1)

Graphite Nano-particle Matrix Additive for Electronic Discharge Machining of Carbon Composites

Robert Audretsch – Mechanical Engineering Technology

Coauthor: Francisco Sanchez, Cao Hua

Faculty Mentor: Devi Kalla

Machining of composite materials using traditional mechanical means such as drilling and cutting often results in damage to the work piece and significantly increased tool wear because of the high hardness of the material. Electronic discharge machining (EDM) offers several benefits to this process but is not widely used due to expensive tooling, slow production time and the difficulty of composite machining. This study proposes to create a more conductive composite by adding graphite nanoparticles to a phenolic based matrix. A more conductive material will increase production time, decrease or eliminate damage to the work piece and improve the overall machinability of a carbon composite. An additive matrix mixed to closely match the conductivity of carbon fiber will be prepared and holes made via a sinker EDM will be compared to traditional machining techniques by surface finish. Additionally, the EDM parameters will be tracked and statistically analyzed for optimum tool wear versus material removal rate.

(Oral Presentation, Session I 9:45-10:00 AM, SSB Room 205)

Creation and Optimization of Actinide Extraction Resins

Daniel Aughenbaugh – Chemistry

Coauthor: Joshua Holloway

Faculty Mentor: Eric Ball

Radionuclide isotopes are detectable in almost any area of the world. These radioisotopes are the result of natural occurrences, industrial nuclear waste, and fallout from nuclear weapon testing. Analysis of these radionuclides from various samples presents important data on both global and localized nuclear fallout. Pre-analysis extraction of the isotopes presents several unique challenges. Extraction resins are used to isolate the target radionuclide. Commercially available resins, while highly effective, are also prohibitively expensive for undergraduate research. Due to this high cost, several resins were generated and their efficacy was tested for this application. The resins consist of an inert polymeric support coated with Aliquat 336, a quaternary ammonium chloride, which binds actinide ions. Different resins are manufactured and combined with known amounts of radionuclides, which are then analyzed with

Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). The results from the analysis are then compared to the results from the commercially available TEVA resin. Proper resin synthesis will result in a cheaper, comparable alternative to expensive extraction resins.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #2)

Subspecies Identification of Cutthroat Trout Using the OmyY1 Region of the Y Chromosome

Caitlin Babbitt – Biology

Coauthors: Christina Hall, Julio Perez, Judith Chavez, Mariam Zirak

Faculty Mentor: Douglas Petcoff

The Colorado state fish, the Greenback Cutthroat trout or *Oncorhynchus clarkii stomias*, was considered extinct by 1937 due to a combination of environmental changes and the stocking of invasive and hybridizing species. Their "rediscovery" in the late 1950's led to massive conservation efforts to reintroduce them back into their native habitats. Although conservation efforts were considered successful, recent genetic studies indicate that the state fish may only survive in one small isolated stream. It has been theorized that due to indistinguishable morphological differences, a similar looking trout was stocked in error. Genetic methods to determine subspecies have been fashioned to aid in the conservation efforts. The OmyY1 region, the sex determining region in rainbow trout, has proven to be nearly identical to sex determining regions in other salmonoid species. Mutations within this region are rare therefore and may be used for both determining ancestral lineages as well as subspecies identification. Primers have been designed and utilized to amplify the OmyY1 locus. These primers allow us to distinguish male for female, and *Oncohynchus clarki stomias* from *Oncohrynhcus mykiss* (Rainbow trout). The PCR products were sequenced and analyzed for the occurrence of subspecies specific polymorphisms within this region. Taqman assays were utilized to verify the presence of specific single nucleotide polymorphisms. Subspecies specific polymorphisms provide the opportunity to accurately characterize the various subspecies of cutthroat trout, aiding in the conservation of the threatened Colorado state fish, the Greenback Cutthroat Trout.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #23)

Inhibiting Facial Mimicry: Does Emotional Contagion Occur Independently of Expressive Congruence?

Anastasia Bacca – Psychology

Faculty Mentor: Jovan Hernandez

The occurrence of facial mimicry is considered an automatic and unconscious process (Likowski, et al, 2011). Emotional contagion, the synchronization of individual moods, has historically been considered a phenomenon inextricably linked to the occurrence of facial mimicry (Marsden, 1998). The current study will examine whether facial mimicry and emotional contagion occur independently of one another via continual engagement of facial muscles ("inhibition") while exposed to a computer-generated avatar displaying an angry or happy expression. Results indicated significant main effects in the inhibition condition. A significant interaction between the inhibition and anger condition was also reported.

(Oral Presentation, Session III 2:30-2:45 PM, SSB Room 202)

An Investigation of Connections between Resilience, Cognitive Processing Propensities, and Personality Traits

Heidi Baldwin-Kirchhoff – Psychology

Faculty Mentor: Pamela Ansburg

Resilience is the ability to maintain or regain mental health during hardships. This work reports two studies assessing whether basic cognitive processes of reappraisal and inhibition underlie resiliency. Those who reappraise adverse events shift emotional responses to neutral ones. Inhibitory skill enhances resistance to interference from negative stressors. To assess whether reappraisal ability increased resilience, 66 students, under various reappraisal instruction conditions, viewed a negatively emotionally-charged video. Some participants were instructed to view the video while reducing their emotional response, whereas others viewed unregulated. They completed mood questionnaires, personality measures, and resiliency scale. Paired t-test comparing post-viewing moods across viewing conditions showed null results. This manipulation failure prevented a test of the primary hypothesis. However, exploratory analyses revealed significant relationships between resilience, extraversion, neuroticism, and mood. The second study extended work testing whether those showing strong inhibitory skills for irrelevant neutral and emotional stimuli show high resiliency. Performance on traditional and emotional Stroop tasks indicated 126 college students' ability to inhibit interfering stimuli. Overall participants experienced traditional Stroop effects and interference effects for negatively valenced words. Resilience failed to predict interference scores for either Stroop task. Resilience predicts extraversion and neuroticism, $r(115)=.398$, $p<.01$ and $r(112)=-.463$, $p<.01$ respectively. Neither study demonstrated cognitive reappraisal and inhibitory skills predict resiliency. Results from both studies are consistent with models asserting resilience mediates how personality impacts effects of negative life events. Limitations of these works leave open questions of how cognitive processes influence resilience. Continued research identifying cognitive mechanisms affecting resilience benefits future clinical therapy.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #13)

The Role of Vitamin D in Neural Development and Function

Katrina Bengtson – Psychology

Faculty Mentor: Katherine Hill

The present project seeks to address the question does vitamin D have an impact on brain development and function? In order to address this topic, multiple studies and literature reviews have been analyzed to reveal the current findings on vitamin D's influence on the brain. The brain has a prominent amount of vitamin D receptors in many regions that appear to impact development starting shortly after conception (Burne, Eyles & McGrath, 2011). The influence vitamin D has on brain development will be discussed in regards to brain differentiation, apoptosis, and vitamin D's influence on neurotrophins. Vitamin D also plays a role in the production of the neurotransmitter dopamine, mainly by assisting in the production of the synthesizing enzyme tyrosine hydroxylase. Current research reveals that vitamin D deficiencies are linked to the development of Alzheimer's disease and other forms of dementia (Dickens, Kos, Lang, Langa, & Llewellyn, 2011). There is also evidence that also links vitamin D deficiency with neuropsychiatric disorders such as Schizophrenia (Burne et al., 2011). Overall, this project will outline the current findings concerning the neuroprotective and developmental influences vitamin D provides along with the neurological consequences resulting from a vitamin D deficiency.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #3)

How do Millennials Develop a Professional Positive Relationship amongst Clients, Competitors and Co-Workers?

Kendra Bishop – Speech Communication

Faculty Mentor: William Huddy

Millennials, born from 1979-1994, represent the largest and most racially diverse generation. This population also represents the fastest growing segment of the workforce in America. They have been characterized by the public as being entitled and lack a strong work ethic. This up and coming workforce has the working world concerned about communication techniques that may in turn affect organizations. In addition, there is a widespread concern on how relationships with other organizational members will develop. I want to research how one communicates values and expectations to millennials, as well as the effect it has on coworkers. My focus is to examine the workplace interactions that can potentially be modified with millennials present in the work place. I want to evaluate how platonic relations develop as well as sexual relationships occur within working environments. Regardless if you are a millennial or not, so much of life is spent working and relationships are key to success and happiness. How does one rate their relationships with their colleagues? I want to concentrate on the tensions that occur in those relations and propose alternative methods for employees to improve relations through communication. This topic is important because it is the future of our society. On a personally level, I am a millennial and will enter the job market in the near future. A full understanding of work place dynamics and millennials will greatly help me and my colleagues.

(Oral Presentation, Session III: 2:45-3:00 PM, SSB Room 202)

Nectar Sources and Feeding Patterns of Colorado *Aedes* along a Diverse "High Desert" Riparian Corridor

Alissa Bonetti – Biology

Coauthors: Emily Schenderlein, Dana Henze

Faculty Mentor: Robert Hancock

Pest and vector mosquitoes typically exhibit bimodal flight activity patterns with a major evening peak. Feeding, dispersing and mating activities occur during these peaks. We conducted a field study sampling nectar-feeding individuals, actively probing on flowers along a trail in a riparian corridor near the South Platte River above of Chatfield reservoir in Colorado at 5482 ft. elevation. Peak nectar feeding was displayed one hour before true dark. Amongst observed nectar sources, *Melilotus albus* (white sweet clover) and *Ericameria nauseosa* (rabbit brush) exhibited the most activity. CO2-baited CDC light traps were deployed bi-weekly beginning in early July through early November in order to discern the diversity and relative abundance of host seeking mosquitoes during this period. The relative abundance of collected nectar feeding mosquitos was the same as those collected in the CDC traps with *Aedes vexans* being the most common. As in other nectar feeding studies, preferred nectar sources had small, lightly colored, fragrant flowers, but white sweet clover and rabbit brush were dominate in our study whereas favorites from other regions like oxeye daisy and goldenrod were not used. In addition, our determined peak of nectar feeding at 1 hour before darkness was notably earlier than the post-dusk feeding peaks observed in species from less arid and lower elevation locations. Our findings clearly indicate that nectar-feeding patterns are variable and depend on a variety of environmental factors.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #20)

Power and Solidarity: Group Discourse Analysis

Jeremey Bongers – English

Faculty Mentor: Andrew Pantos

This paper is a qualitative discourse analysis of the recording and written transcript of a six person conversation. Laughter, repair (self and other), adjacency pairs, adaptation of speech style (intonation unit length, interruption frequency, volume, laughter length, pause length, turn length, etc.), and intertextuality are analyzed in order to determine whether these are discourse strategies that speakers employ to maintain power relationships. Existing discourse literature suggests that these strategies are in fact employed to maintain power relationships in groups. Accordingly it is hypothesized in this paper that these discourse strategies are used to maintain power relationships and that this will be evidenced in the data. However, the data suggests that the participants used these strategies primarily to maintain solidarity rather than power relationships. The stark contrast between the existing literature and the findings of this study suggest the need for additional research in the field of group discourse.

(Oral Presentation, Session III: 2:15-2:30 PM, SSB Room 202)

Examining Protein Intake and Loss of Lean Body Mass in Backcountry Hikers

Jihan Boughman – Human Nutrition – Dietetics

Coauthors: Kelly Caponigro, Cass Morgan, Tim Ruden

Faculty Mentor: Melissa A. Masters

Nutrition requirements for backcountry athletes have not been extensively researched. Athletes face a unique challenge trying to maintain adequate nutrition while in the backcountry. The purpose of this study is to determine whether protein intake affects muscle mass in individuals participating in backcountry activities. This study examines the nutrient intake and body composition changes of six Naval Academy midshipmen participating in a National Outdoor Leadership School (NOLS) expedition in Lander, Wyoming. Prior to the expedition body composition was measured using a Bod Pod and upon completion the subjects were reexamined to determine any changes. Participants recorded meals using food logs, which were analyzed using Food Processor software. The mean value of nutrients and anthropometric measures were then calculated and analyzed. Pearson correlation analyses were used to examine the relationship between protein intake (mean=1.4g/kg, SD=0.28) and muscle loss (mean=2.59 Lbs, SD=3.6). There was a weak positive correlation between protein intake in g/kg of body weight and muscle loss ($r=0.33$, $p=0.52$), however this correlation was not significant. There was no correlation between total protein intake in grams and muscle loss ($r=0.09$, $p=0.86$). There are multiple explanations for the loss of lean body mass that were not examined in this study. It is possible that due to the type of activity and the engagement of lower body muscles, muscle was lost from one area (e.g., biceps) and gained in another (e.g., leg muscle). Future research in this field should investigate using mid-arm and mid-calf circumference measurements to find more conclusive results.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #15)

Breakthrough for New Opportunity; Research on Local Female Offenders and Lack of Resources to Fight Rising Recidivism Rates

Piper Bradshaw – Women's Studies

Faculty Mentor: AnnJanette Alejano-Steele

Women within our criminal justice system in Western society are put at a disadvantage due to lack of resources and opportunity available to them. Our standards for the treatment of women is based on the male standard of treatment, women are falling through the cracks because their unique issues as women are not addressed. Recidivism rates for female offenders are on the rise. This research looks into women's pathways into crime, and the current treatment programs are not effective at reducing recidivism rates, or addressing the potential traumas that most have experienced on their pathway. The focus for this research is here in the Denver metro area, and the lack of adequate opportunities for female offenders to avoid recidivating. Looking at the studies available for this topic, exposed a lack of current information and accurate data, this shows a need for further research and study. If society were to start treating women differently by addressing their issues that led them into criminality in the first place, then we could be effective at reducing recidivism rates. More research is needed to paint a clearer picture of what female offender's pathways are like in the technology heavy society that we live in today. There are more productive ways to use the available resources for female offenders, more treatment and less punishment will decrease recidivism rates and help female offenders and also help the community grow in the long run.

(Oral Presentation, Session IV: 3:45-4:00 PM, SSB Room 202)

Microscale Temperature Fluctuations in the Boulder Valley

Noah Brauer – Meteorology

Coauthors: John J. Cassano

Faculty Mentor: Sam Ng

It is difficult to ignore the fact that there are often drastic temperature variations within very short distances. Although the locations of these fluctuations can generally be predicted by analyzing factors such as topography and wind velocity, there are some cases where there are exceptional changes in temperature without an obvious reason. Understanding the causes behind these extreme temperature variations will help us make better weather predictions that will ultimately influence components of society such as agriculture and transportation. The Boulder Valley is an ideal location for the study of microscale temperature fluctuations due to the unique topography and spatial variation in terrain of the region. This research will examine the causes behind large temperature variations in areas in which my initial hypothesis varied from the observed temperature and wind speed measurements. This will be test by using a weather station that is mounted on a bike.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #7)

Wholesome Food for Thought: Analysis of Food Given to Low-Income Families, Comparing the Nutritional Difference of Added Produce

Julie Breidenstein – Human Nutrition – Dietetics

Faculty Mentor: Ann Diker

The non-profit organization, Food for Thought, supports low income families in the Denver area by sending food home with elementary students (ages 3-12) over the weekend. Currently the organization supplies supplemental food aid to five local Title 1 (low income) elementary schools. A nutritional analysis was performed one year ago by MSU Denver nutrition students on the nutritional quality of food being distributed to the families. This current project is a follow-up study with the main difference being added produce which was not available one year ago. Our goal is to analyze and compare the nutrient content of the food bags with produce to the food bags without produce. Presently only one of the elementary schools is receiving produce along with shelf-stable food. We gathered our data from four different donation days by observing, taking pictures, and recording the food put into the shelf-stable bags as well as the produce bags. Using choosemyplate.gov to analyze the data, we will display the difference in nutritional quality of carbohydrates, fruit, vegetables, and protein over a two day span. We hypothesize that our research will show that advocating for more produce would be beneficial so that all of the elementary schools could receive fresh fruits and vegetables. Because of the inconsistency of shelf-stable food and produce distributed each week, our findings are an approximate estimate of the nutritional quality.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #4)

Cottonwood Health in South Platte Park

Sara Brewer – Environmental Science

Faculty Mentor: Sarah Schliemann

The goal of this project is to determine whether soil moisture conditions are contributing to increased death rates of cottonwoods (*Populus deltoids*) in South Platte Park (located just north of Chatfield Reservoir). Forty-two soil samples were collected in March of 2015 in a gridded pattern throughout the unhealthy section of growth and a healthy section of growth. The samples were weighed and air dried to determine the soil moisture content gravimetrically. The samples will be analyzed to determine whether there is a difference in soil moisture between the two groups.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #5)

The Relationship Between Elevation, Slope, and Soil Series

Eric Brink – Land Use

Faculty Mentor: Sarah Schliemann

The purpose of this study is to understand how strong of a correlation elevation and slope have with defining soil series, and to tell which is more statistically significant in defining the soil series, within the state of Colorado. Data presented by the USDA and the USGS will be used to overlay soil series, Digital Elevation Model and a derived slope/hillshade layer in order to comprehend their spatial relationship and association. Additionally, the elevation and slope will be analyzed using different statistical functions and

graphs to understand the statistical significance they have in relation to defining the soil series. The results of this research will provide insight on how correlated elevation and slope are to respective soil series in the area. These developed results may perhaps be used for proactive, beginning-phase studies for future land use, land planning, agriculture, etc.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #6)

NMR Analysis and Qualitative Confirmation of Illicit Drugs

Travis Broneske – Chemistry

Coauthor: Sean Norris

Faculty Mentors: April Hill, Ethan Tsai

When a suspected controlled substance enters a crime laboratory, the substance is typically subjected a set of presumptive color tests to obtain a tentative identification. If a confirmed identification is required, the current practice is to analyze the sample using gas chromatography-mass spectrometry (GCMS). The purpose of this research is to investigate the capability of nuclear magnetic resonance (NMR) spectroscopy for the analysis of suspected illicit drugs that have been cut with a variety of compounds. These NMR results are similar to those produced by GCMS, but NMR requires only a fraction of the time. An average GCMS analysis including sample preparation can take anywhere from 30 minutes to an hour, versus a total of 10 minutes for an NMR analysis. To assess this potential method, mixtures were composed with measured amounts of illicit drugs and cutting agents. The mixtures were relabeled by a third party to ensure sampling randomization. An industry standardized presumptive test experiment was then used for initial assay of the contents of each mixture. Once a presumptive identification of the controlled substance was obtained, the mixture was then prepared for NMR "confirmation" analysis and analyzed using standard proton (1H) and correlation spectroscopy (COSY). The NMR spectra were interpreted and compared with the spectra of drug standards previously analyzed. The data indicates that NMR has the potential to provide similar results to GCMS but in a fraction of the time.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #5)

The Attack on Marijuana is Birthed in the Womb: A Discussion on Legalization of Marijuana and One of its Unintended Consequences

Jasmine Budnella – Women's Studies

Faculty Mentor: AnnJanette Alejano-Steele

The enforcement of United States' War on Drugs, through the Controlled Substance Act (CSA), has been a notable area of research for over forty years. As the climate surrounding drug use and its users has shifted throughout the duration of the drug war, social acceptance of marijuana has been observed through recent policies of legalizing/decriminalizing medical and recreational use of the drug. Activists have suggested that state legislation to legalize the federally scheduled drug is a substantial solution to ending the drug war. However, as legalization has become a national conversation, questions surrounding the harm of such legislation have been focused mostly on non-offenders. One consequential example is the feminization of marijuana missing from policy analysis. Specifically, mothers/mothers-to-be have increasingly become vulnerable in the age of legalization. Through analysis of the history of the US drug war and the positionality of Colorado's legalizing amendment, this paper will illustrate unintended

consequences of marijuana policies as they affect women. The paper's analysis will discuss the nation's attachment to social moralism and the structure of the patriarchal political system to question whether or not women can exercise the right to use marijuana under such regulations. As evidenced by the overlap with federal funding for state programs, the answer suggests that women are not equal consumers of marijuana. Although legalization is a slight shift towards justice for some citizens, changes clearly do not benefit all. The paper concludes with a solution for rescheduling marijuana by amending the CSA.

(Oral Presentation, Session IV: 3:15-3:30 PM, SSB Room 203)

Pushing the Boundaries of Ceramics

Chase Buerck – Art

Faculty Mentor: Robin Johnson

The goal of my research is to accomplish the look of metal with clay through the use of colorants added to the clay body and then fired in a reduction atmosphere using a gas kiln. I began by adding 10% of cobalt carbonate, chrome oxide, rutile, magnesium carbonate, black iron oxide, yellow iron oxide, ochre yellow and copper carbonate to test batches of a white clay body and produced test bars for firing. The test bars were made of each colored clay for cone 04 bisque, cone 9 oxidation, and cone 9 reduction firing. Both the 04 bisque and cone 9 oxidation bars were unaffected, the test bars for cone 9 reduction revealed three colorants that turned the clay body metallic. I have determined that colorants comprised of iron added to a clay body and fired in a gas kiln in reduction atmosphere create a clay resembling metal.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #10)

Development of Algorithmic, Graph-based Techniques for the Automated Design of DNA Biosensors

Aviva Bulow – Mathematics

Coauthor: Jody Stephens

Faculty Mentor: Andrew J. Bonham

Oligonucleotide-based biosensors have been demonstrated as effective tools for detecting heavy metals, small molecule drugs, and protein targets. Recent efforts to move these biosensors from the lab bench to practical use in industry and medicine rely on the ability to rapidly and effectively adapt them to detect new targets of interest. One compelling aspect of DNA and RNA-based biosensors is the great strides that have been made in computational prediction of the three-dimensional structures that they can assume. However, interpreting predicted structures and using that knowledge to design functional biosensors *ab initio* remains a challenging problem. We hypothesize that by representing a potential DNA biosensor as a node-weighted graph, we can simplify the challenge of automated structure interpretation and sorting. If correct, this would allow a researcher to provide a core sequence of interest (such as a DNA recognition element or artificially-selected aptamer) and have a software tool design the ideal DNA biosensor for the sensitive detection of that target. This process builds on ideas from our oligonucleotide fold scoring algorithm, Fealden. With this new implementation of Fealden, we are achieving significantly more flexibility, allowing us to analyze any structure type. Because of this we are able to traverse a search space of tens of thousands of possible sequences to determine a "best candidate" biosensor.

Additionally, with this increased flexibility we hope to implement some very desirable features in our software, generally, different types of design constraints that a researcher can specify for their biosensor.

(Oral Presentation, Session II: 10:30-10:45 AM, SSB Room 207)

Affordable Abrasive Water Jet Project

Zach Burck – Mechanical Engineering Technology

Coauthors: Han Lim, Cao Hua, William Schupbach, Dennis Olguin

Faculty Mentor: Devi Kalla

Our group is proposing to design and build a small scale abrasive water jet machine that is capable of cutting thin metals and composite materials. It is a primary goal for this team to provide a scaled down and affordable version of what is offered in the market currently. The secondary goal is to provide a design that small machine shops and schools can use to build their own abrasive water jet machines as well. Lastly, since composite material testing is of growing interest, our team aims to refine the composite cutting process with the abrasive water jet machine that we create, providing students with the capability and knowledge to machine these unconventional materials.

(Oral Presentation, Session I: 9:00-9:15 AM, SSB Room 206)

Jane Eyre through Simone De Beauvoir

Haley Burke – Philosophy

Faculty Mentor: Carol Quinn

In this text I argue that Charlotte Bronte's Jane Eyre is a novel primarily written about oppressive forces against women. I invoke Simone de Beauvoir's existentialism as well as her study of women to make this point. In doing so, it becomes clear that this is the best way to understand the character Jane and the forces that shape her life.

(Oral Presentation, Session III: 2:30-2:45 PM, SSB Room 203)

Using Neuropsychological Evaluation to Assess Language and Attention in the Speech-Language Pathology and Audiology Fields

Andrew Burleson – Speech Language & Hearing Sciences

Coauthor: Elizabeth Kozora

Faculty Mentor: Jessica Rossi-Katz

Neuropsychological assessments are valuable tools to estimate an individual’s cognitive abilities and can easily span an interdisciplinary gap between healthcare fields. These assessments are an objective analysis of brain functions such as memory, attention, and executive functioning (among others). They can be used to infer current cognitive functioning or can be applied in a longitudinal approach to examine

the impact of therapy, rehabilitation, or changes in ability in the context of another medical or psychological conditions. Work in our laboratory applied this interdisciplinary approach with an autoimmune population (systemic lupus erythematosus (SLE)), comparing them against healthy controls. We explored cardiopulmonary, cognitive, rheumatic, psychological, and lifestyle variables. The Controlled Oral Word Association Test (COWAT) provides information about verbal and semantic fluency in the context of executive function, and the Stroop Test assesses attention, cognitive flexibility, and distraction resistance. Using these tests (among others), we found that 32% of SLE patients demonstrate cognitive difficulties compared to controls, including areas such as verbal fluency. Higher BMI was associated with greater likelihood of cognitive impairment. Abnormal lung function (lower DLCO%) was associated with poor performance on measures of memory, attention, and visuoconstruction. Primary medication (prednisone) was not associated to lower cognition in SLE. These findings demonstrate the flexibility of neuropsychological assessment and the application of these tools to get a broader and more diverse understating of brain functioning in the healthcare setting. For this reason, Speech-Language Pathologists and Audiologists alike may find these clinical tools useful when assessing patients with difficult to identify disorders.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #7)

Antibacterial Efficacy of Licorice Root (*Glycyrrhiza glabra*) and Ginger (*Zingiber officinale*)

Krista Burney – Biology

Faculty Mentor: Sheryl Zajdowicz

As bacterial resistance to disinfectants and antibiotics becomes ever present, focus has turned toward the use of alternative, naturally-derived antimicrobial remedies and several studies have investigated the benefits of herbs, diet changes, metals, and plant-derived essential oils. Historically, ancient Egyptian, Greek, Roman, and Chinese cultures valued licorice (*Glycyrrhiza glabra*) and ginger (*Zingiber officinale*) for their diverse medicinal uses. Previous research suggests that essential oils concentrated from a variety of culinary herbs could be effective alternatives to antibiotics. Therefore, we predict that licorice root and ginger extracts will demonstrate efficacy against a broad range of bacteria. This study evaluates the antimicrobial efficacy of licorice root and ginger extracts against both Gram-positive and Gram-negative bacteria known to cause oral, respiratory, and gastrointestinal illness, as well as commonly found environmental organisms. Representative bacteria were plated on Mueller-Hinton agar and exposed to licorice root extract or ginger extract to determine the effect of the oils on bacterial growth. The results showed that both licorice root and ginger extracts primarily inhibited the growth of Gram-positive bacteria, including *Corynebacterium* sp. and *Staphylococcus* spp., and showed limited inhibition of Gram-negative bacteria. Further analysis of the efficacy of licorice root and ginger root against these bacteria grown as a biofilm is currently in progress. Additionally, studies evaluating purified glycyrrhizic acid from licorice root against planktonic and biofilm-associated bacteria are in progress.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #1)

Achieving Moral Insight through Narrative Distance: An Exploration of Children's Anthropomorphic Animal Stories

Emma Butler-Probst – English

Faculty Mentor: Craig Svonkin

This study explores the nature of Children's Anthropomorphic Animal Literature and the benefit that these animal characters can offer to children. Animals with human attributes serve a unique role within children's literature because they combine aspects of fantasy with realism in order to help children negotiate challenging ethical or cultural themes. The underlying question that inspired this research was: How do anthropomorphic animal stories influence children in a manner that is distinct from other works? Exploring the answer to this query involved reading scholarly materials on the function of anthropomorphism and fantasy which included sources such as C.S. Lewis' essay: "On Three Ways of Writing for Children." These sources provided insight into theories of animality and humanity within children's books and these theories were subsequently applied to five children's chapter books that feature anthropomorphic animals. This research revealed that anthropomorphic animals can help children explore themes such as death, prejudice or morality in a unique way due to the foreign nature that children ascribe to animals which distances the child from difficult themes. This intellectual processing is valuable to the child, particularly because it is distanced from their direct experiences and can allow them to conceptualize potentially distressing topics in the nonthreatening guise of an animal character. It is ideal for these animal characters exist with attributes on a midpoint between complete animality and humanity so that children can explore various challenging topics and achieve balance between relatability to animal characters and distance from distressing aspects of the story.

(Oral Presentation, Session II: 11:30-11:45 AM, SSB Room 202)

Evidence for Undocumented Cultural Occupations in the Lurin-Rimac Divide

Jeremiah Camp – Anthropology

Coauthors: Guido Lombardi, Alcides Ricardo Alvarez Vera, Teresa Hogan, Morgan Dreesbach, Jennie Gregory, Tyrel Sorensen

Faculty Mentor: Jonathan D. Kent

In July 2014, MSU Denver field school participants joined Dr. Guido Lombardi and Dr. Alcides Alvarez in investigating undocumented archaeological sites within the Lurin and Rimac divide on the central coast of Peru. The expedition observed structures, ceramics, petroglyphs, and geoglyphs of unknown cultural affiliation and use. Documentation of these sites is important for the preservation of Peru's cultural heritage as they are currently threatened by modern development that endangers further study of the area. This poster will present an overview of the sites, their environmental surroundings, their value to the Huaycán community, and their contribution to understanding inter-valley interactions between the Lurin and Rimac valleys.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #12)

Design, Construction & Testing of an Automated Micro-CHP Platform

William Carver – Mechanical Engineering Technology

Faculty Mentor: Devi Kalla

The need for the microgeneration (<2.5kW) of electricity and heat in remote locations is well known and has many solutions currently in the marketplace. That said, renewable energy systems classified as 'small-scale' are comparably large and require support personnel, logistics and a robust infrastructure to operate efficiently; this makes them a poor choice for remote use. This project seeks to investigate the issues of size, reliability and efficiency common to alternative energy systems, examining Concentrated Solar Power (CSP) technology as a competitor in the microgeneration market. Specifically, the project will design and produce a Concentrated Solar Power (CSP) dish-Stirling system capable of fulfilling the need for remote Micro Combined Heat and Power (Micro-CHP) system under adverse conditions. The complete system will be man portable per DoD standard, ruggedized, simple in operation and maintenance, capable of solar energy collection and onboard generation of electrical power. The need for on-site produced power and microgeneration methods is expanding. Leveraging smallscale CSP in this market provides benefits not found in other Micro-CHP systems; a renewable source of electricity and process heat that never needs refueling and can be carried by a single person.

(Oral Presentation, Session I: 9:15-9:39 AM, SSB Room 206)

The Impact of Dolls on the Body Image of Young Girls

Kendal Cassidy – Psychology

Coauthors: Melanie Trenary

Faculty Mentor: Cheryl Sanders, Linda Lockwood, Chrislyn Randell

Do Barbie dolls have an impact on girls? The effects of playing with a Barbie doll versus a more realistically-shaped doll were examined. Fifty-three girls completed a body image assessment before and after playing with a doll. Results revealed significant differences in body image depending on frequency of play.

(Oral Presentation, Session I: 9:15-9:30 AM, SSB Room 202)

The Japanese Beetle (*Popillia japonica*) Susceptibility to Color, Scent and Flower Choice Tests

Christina Castaneda – Biology

Coauthors: James Wortham, Eva Sandoval, Jason Nolan

Faculty Mentor: Robert Hancock

Popillia japonica better known as Japanese beetles are herbivorous insects that feed on various types of plants but specifically have a preference to feed as well as mate and dwell in lavender roses. Living organism's tend to be attracted by stimulants such as chemicals, heat, color, light etc. A logical explanation for this specific preference would conclude that Japanese beetles are attracted to a certain color and scent of rose, and that the lavender rose contains a very distinct fragrance and/or chemical compound that capture's the attention of these beetles. The researchers specifically investigated the

chemical and visual cues from roses that attract Japanese beetles. The methodology utilized was observational field work and examining the lack of interest that the beetles had with other plant species. The method was to collect several groups of beetle populations, different colors and extracts of various floral species, and imitation roses. Our goal was to find out which chemical or chemicals attracted the beetles. In the natural environment our major observational results show that lavender roses were favored more than the other species of flowers. In conclusion, based upon the data collected the evidence suggests that there is a correlation with Japanese Beetles favoring Lavender roses.

(Oral Presentation, Session I: 9:00-9:15 AM, SSB Room 205)

Net Neutrality

Kim Chambers – Aviation & Aerospace Science

Faculty Mentor: Janos Fustos

In a groundbreaking decision on February 26, 2015, the Federal Communications Commission (FCC) approved new rules supporting Net Neutrality. The regulation restricts Internet service providers (ISPs) from giving preferential treatment to companies that would pay extra to get their content to consumers. Originally, the FCC was considering a proposal that would allow companies like AT&T, Comcast and Verizon to segregate online and create pay-to-play fast lanes. Also Internet Service Providers (ISPs) could relegate everyone else to a slower tier of service if they couldn't afford faster speeds. Thanks to the millions of people who contributed to the public and political uproar, FCC Chairman Tom Wheeler dismissed his original proposal, and on February 4, 2015, he announced that the new Net Neutrality rules on Title II of the Communications Act would safeguard Internet users to the fullest. My paper summarizes some of the recent and past highlights about Net Neutrality history, purpose, arguments, and considerations that have existed within the last couple of years.

(Oral Presentation, Session II: 10:45-11:00 AM, SSB Room 206)

Dietary Intake and Changes in Body Composition

Lilia Chavez Bernal – Human Nutrition – Dietetics

Faculty Mentor: Melissa Masters

The purpose of this research is to assess dietary intake levels of those participating in a 30 day backpacking expedition. The balance between energy expenditure and dietary intake during backpacking expeditions has not been readily researched and has the potential to influence performance in the backcountry. This study examines the dietary intake of 10 participants enrolled in a 30-day long National Outdoor Leadership School (NOLS) backpacking course. Participants recorded dietary intake in a food log throughout the expedition. Food logs were analyzed using Food Processor Software. In addition, pre and post tests were conducted using a Bod Pod to assess changes in body composition. Mean values of nutrient intake and body composition changes were calculated Participants consumed an average of 1.13 g/kg of protein, which meets the Recommended Dietary Allowance (RDA) of 0.8g/kg of a sedentary individual but falls in the lower spectrum of the recommended intake for athletes (1-2g/kg). Average calorie intake was 2438 kcals, average weight loss was 8lbs, average fat loss was 9lbs, and average muscle loss was 0.76lbs. This research allows for more consideration of important dietary recommendations for athletes in the backcountry and may direct future research focused on energy balance during backpacking expeditions.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #2)

Detritivory Drives the Arthropod Community on a 2-year Old Extensive Green Roof in Denver, Colorado

Levi Coleman – Biology

Coauthor: Kimberly Richard

Faculty Mentor: Robert Hancock

During the growing season on a 2-year old extensive green roof (of primarily Sedum spp.) in Denver, Colorado, an intensive sampling scheme was employed to monitor the arthropod diversity and assess community structure. Specifically, it investigated whether this artificially created habitat exemplifies a community with a typical early successional food web driven by herbivory or a novel community with an atypical successional food web driven by mostly detritivorous primary consumers. Due to the exotic nature of Sedum spp. and a general lack of endemic species that consume it, as well as the initial counts of arthropod orders present, it is suspected that a higher percentage of detritivores inhabit the green roof than would be expected in a standard food web. The data will be presented in number of individuals as opposed to biomass to determine if a higher ratio of detritivores exists. Continued studies will focus on successional changes, particularly those brought on by the addition of a sprinkler system late in the 2014 season.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #8)

Establishing Normal Early Postnatal Weight Loss in Exclusively Breastfed Infants

Alicia Cone – Human Nutrition – Dietetics

Coauthor: Heather Thompson

Faculty Mentor: Jennifer Weddig

During the early postpartum period (first two weeks of life), newborn weight loss and subsequent weight gain is normal. The American Academy of Pediatrics' current normalcy of weight loss guidelines are based on data that includes formula fed infants, so standards for normal postpartum weight loss for exclusively breastfed infants are unclear. This study aims to establish a normal postnatal weight loss and re-gain trajectory for exclusively breastfed infants in the first 10 days of life. Since 2009, more than 600 healthy, full-term infants were born vaginally at a free-standing birth center in Denver, CO to low-risk mothers. The births included no intravenous fluids, Pitocin, or epidural. Following birth, the babies were exclusively breastfed for at least the first two weeks of life. Weight data (birth weight, weight on day 2, weight on day 8-10 – all in grams) of these infants will be plotted into a growth chart to determine a normal weight loss and re-gain trajectory for exclusively breastfed term infants. A small, initial set of data (n=54) has been analyzed for the pilot stage of this project. Further data will be collected and added to the growth charts in the future. By determining a normal postnatal weight loss and re-gain trajectory for exclusively breastfed infants, health practitioners can accurately know when it is appropriate to be concerned about weight loss for breastfed term infants. This will decrease unnecessary intervention that may interfere with exclusive breastfeeding.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #22)

Water Quality, Nutrient Removal and Landscape Changes Related to Storm Water Detention Ponds

Laura Coutu – Environmental Science

Faculty Mentor: Sarah Schliemann

Surface water runoff is a critical component of the hydrologic cycle, and can carry contaminants into streams and rivers especially in impervious urban environments. Storm water management is critical to control flow of water and prevent flooding, in addition to providing storage of excess water before releasing into streams. However, volume control and flood management typically take priority over water quality. Storm water ponds can contain elevated levels of nutrients, coliform bacteria, sediment, and litter. This study investigates five streams and four detention ponds that are part of storm water management in Aurora, Colorado. In March 2015, water temperature, pH, and presence of coliform bacteria were measured at (number of locations). On the same date, water samples were collected from the top (depth) of the water at the same locations. The samples were analyzed in the lab using a Hach handheld device to determine ammonia, nitrate, and phosphate concentration. Differences in nitrate, ammonia, and phosphate were detected between water in the streams, in the ponds and at entrance and exit points to and from the ponds. Coliform bacteria were also detected, in both the streams and ponds. From this study, it appears that the storm water ponds are not removing a significant level of nutrients and they may be acting as a reservoir for trash, coliform bacteria, and other debris. This study provides a general idea of water quality, and effectiveness of the ponds at removing nutrients. Further testing for heavy metals, other pollutants, and dissolved and biological oxygen demands would be necessary to determine overall water quality in the ponds and aid in future storm water management planning.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #26)

The Neural Bases of Synthesia

Ryan Coyle – Psychology

Faculty Mentor: Katherine Hill

Synesthesia is a brain abnormality that affects approximately 4% of the world's population. Synesthesia occurs when a sensory stimulus that typically causes one perception involuntarily causes another perception at the same time - literally meaning "together perception." There are three overarching types of synesthesia: developmental/innate, acquired, and drug-induced (Brogaard, 2013), with developmental being the most common (Brogaard, 2013; Brogaard, Vanni, & Silvanto, 2013). Within these main categories are 60 or so variants, the most common being grapheme-color (letters/numbers are associated with specific colors). This literature review focuses its discussion on the role of serotonin and abnormal association areas of the cortex found in synesthetes, in addition to data obtained from functional magnetic resonance imaging (fMRI) studies from case reports. General findings from the peer-reviewed literature are summarized.

(Oral Presentation, Session I: 9:30-9:45 AM, SSB Room 202)

Thermodynamic Conditions Associated with Significant Tornadoes in the High Plains Region

Tyler Croan – Meteorology

Faculty Mentor: Sam Ng

The majority of the tornadoes that occur in the High Plains tend to be relatively short lived and weak. While significant tornadoes are rare across the high plains, they do occur in this region and pose a significant risk to an area of increasing population density. As the population of the High Plains continues to expend, the threat presented by significant tornadoes in the region will only continue to increase. The purpose of this study is to examine and determine thermodynamic conditions that are associated with the occurrence of significant tornadoes in the High Plains Region of the continental United States. To achieve this research, a database of derived soundings from the Rapid Update Cycle model will be used to determine the mean values for thermodynamic parameters associated with significant tornadoes. These calculated mean values will then be compared to the values of thermodynamic parameters associated with the occurrence of significant tornadoes across the United States, in order to better understand the High Plains environment that is conducive to the occurrence of significant tornadoes.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #25)

Escherichia coli Source Tracking

Mary Culkin – Biology

Coauthors: Emilie Pryor, Linden Northern

Faculty Mentor: Rebecca Ferrell

The Platte River flowing through Denver has been found to be contaminated with *Escherichia coli*. Storm sewer flow into the river has been shown to contribute significant levels of *E. coli*, but the source of these bacteria is unclear. *E. coli* is an indicator of fecal contamination, but a number of animals can be carriers of these bacteria, so *E. coli* presence alone does not show that the source of contamination is human. Since many human diseases are transmitted through fecal matter, it is important to know whether or not the *E. coli* is originating from humans, or from another source. If the contamination is coming from another animal, such as a dog, it is not likely to cause disease in humans. The goal of this study is to isolate and characterize *E. coli* from various animals in the areas surrounding the contaminated river in order to determine the source of the *E. coli*. To date, *E. coli* has been successfully isolated from five dogs and one deer, and confirmed by metabolic analysis. Once enough samples have been gathered, the DNA from each *E. coli* will be compared to the *E. coli* found in the river using polymerase chain reaction targeting repetitive sequences in the genome (rep-PCR). This should help identify the source of the fecal contamination, assisting the City of Denver in formulation a management plan.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #19)

Nitrogen cycling on an urban green roof

Alec Curtis – Biology

Coauthor: Mary Culkin

Faculty Mentor: Rebecca Ferrell

Green roofs are growing in popularity in urban environments because of the associated benefits, such as reduced energy costs, added insulation and management of rainwater. The microbes present and their ability to cycle nutrients have a large potential impact on green roof effectiveness, but little is known about their influence on roof performance in the arid western regions of the United States. The Student Success Building green roof provides an ideal setting to study these soil microbes, and was the focus of this study. Samples from 4 different zones of the roof were taken from established transects, and 2 plots in ground-level landscaping beds near the building were also sampled as controls. Samples were analyzed for organic content by incineration and soil DNA extraction was also conducted in parallel on different samples using a spin column method. These experiments showed that ground level soil organic matter content and DNA levels were 2-3 times higher than the soil samples from the vegetated roof. Nitrification potentials were observed by inoculating ammonia media and analyzing for nitrite and nitrate production. Ammonia media inoculated with roof soil showed only 1 transect positive for conversion of ammonia to nitrite or nitrate over a period of 2 weeks, while both ground level control soils showed evidence of nitrification with 48 hours. These baseline data will be important as we continue observing the soil microbial ecology on the green roof.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #21)

Where is the Ketone: Development of an Undergraduate Laboratory

Jessica Daniel – Biology

Coauthors: Chance Denbrook, Melanie Flores, Ana Gutierrez

Faculty Mentor: Russell Barrows

In Organic Chemistry I and II courses, students often mistakenly predict a ketone as the product of the reaction with one equivalent of ester and one equivalent of Grignard reagent. This error is often made because students do not take into account that reaction intermediates control the outcome of chemical reactions. To demonstrate and evaluate this concept, several Grignard reactions were developed with the goal of producing an undergraduate laboratory module. Competitive reactions using methyl butyrate, 2-pentanone, and methyl magnesium iodide at varying concentrations established that the ketone intermediate controlled the outcome of these competitive reactions. Through several trials, experimental conditions were refined. Reaction products were determined and quantified by Gas Chromatography-Mass Spectrometry (GC-MS). These reactions provide an outline for an inquiry-based undergraduate laboratory module that would enable students to evaluate and understand the control that reaction intermediates have over the outcome of chemical reactions. By running these experiments, students would also develop skills in setting up, running, and analyzing the results of challenging chemical reactions, as well as GC-MS sample preparation, methods and analysis.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #24)

Destruction and Origination, Effects of the Boulder County Colorado 2013 Flood on Geologic Features

Jessica Davey – Applied Geology

Faculty Mentor: Barbara EchoHawk

Boulder County was the focus of the 2013 Flood of northern Colorado. As a result of record-setting stream flooding, a wide variety of geologic features were altered or created. New bedrock outcrops were exposed by channel scouring and migration, and deposits from multiple previous floods were exposed by incision into stream banks and floodplains. Stream channels were deepened, widened, and in many locations permanently rerouted. The full stratigraphic section of Boulder County is exposed on various properties of Boulder County Parks and Open Space (BCPOS) that were extensively impacted by the 2013 Flood. Although BCPOS is actively working to mitigate flood damage, a great deal of the original destruction is still visible in the parks along the foothills and plains of Boulder County. The summer of 2014 has been spent cataloging, measuring, photographing, and obtaining GPS coordinates for mapping of some of these features in BCPOS. One finding of this research is that geologically significant features, such as Permian stromatolites newly exposed by the flooding, are subject to rapid alteration or destruction by normal stream processes. Estimates of maximum cubic feet per second (cfs) for the 2013 Flood event as well as prehistoric flood events are being calculated from types and sizes of flood-transported clasts and bedform measurements. This study will provide BCPOS with a catalog of altered geologic features resulting from the 2013 Flood, with data on how quickly newly created or exposed features are being degraded and with evidence for repeated significant flood events along Boulder County foothills.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #22)

Assessment of Remaining Oil and Gas Potential, Papoose Canyon Field, Paradox Basin, Colorado and Utah

Jessica Davey – Applied Geology

Faculty Mentor: Barbara EchoHawk

Oil and gas have been produced from Papoose Canyon Field on the Colorado-Utah border since 1970. A 2005 government study concluded that the field is nearly exhausted of oil and gas resources. However, new technologies such as directional drilling paired with hydraulic fracturing, have led to the rejuvenation of numerous long-established oil and gas fields. In light of this trend of renewed production in older fields, this undergraduate research investigation was undertaken in order to identify and characterize possible potential for future oil and gas production in Papoose Canyon Field. Based on the well logs for this field, the main pay zone in the Desert Creek Formation was occasionally missed, as the geologist and/or drill team apparently misjudged the depth of the target zone for drilling. Subsequently, drill stem tests were performed in unproductive zones. The well logs of these locations show some potential for possible oil and gas present in the pay zone, based on porosity and resistivity. This study of the Papoose Canyon field will provide subsurface structural maps of the Pennsylvanian Upper Ismay and Desert Creek Formations as well as cross-sectional maps depicting lateral and vertical variation in the pay zones within these two formations. These maps and interpretations may aid in better understanding the relationship between pay zone thickness, location, and productivity as well as point to potential locations for future production.

(Oral Presentation, Session III: 2:00-2:15 PM, SSB Room 205)

Cosmopolitan Feminism: Connecting Theory to Praxis through Creative Green Genius

Cristine de la Luna – Women's Studies

Faculty Mentor: Arlene Sgoutas

If we are to consider the future generations of feminist activists and scholars, greater consideration must be given to understanding todays' contemporary cosmopolitan feminist. The concept of this form of feminist leadership requires moving beyond the models of "positional" or "formal" leadership. The person who is most highly paid or who holds the most visible power is but one kind of leader. There are many other ways of leading --- from the bottom, from the margins, and most challenging of all to understand, from a collective vision. Cosmopolitan feminism is an emancipatory form of theory and praxis that addresses the intersectionality of subject positions and the gendered dynamics of globalized power structures. Additionally, a cosmopolitan perspective incorporates collaborative approaches to leadership, not simply the "great man or great woman" approach. Thus, it also questions highly individualistic analyses of leadership. Instead, cosmopolitanism offers a more complex, though equally valid interpretation of how one or many can exhibit "feminist leadership" in the pursuit of social justice goals. This poster presentation demonstrates the ways in which cosmopolitan feminist theory and praxis addresses "precarity"; a condition of existence without predictability or security, for example, food insecurity is applied to the condition of intermittent and resultant precarious existence. The class defined by this social condition has been termed the precariat. By connecting cosmopolitan theory to praxis, a creative green solution prototype is formed that cultivates an inclusive sustainable community model to inspire environmental and social justice activism.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #23)

A Comprehensive Review of MDMA as a Treatment Option for PTSD

Jennifer L. DeLange – Psychology

Faculty Mentor: Katherine Hill

MDMA, or 3-4-methylenedioxy-methamphetamine, is a stimulant drug belonging to the amphetamine and empathogen classes. It is typically used recreationally and is commonly known by its street name ecstasy. MDMA is unique in its ability to induce feelings of intimacy, love, and community due to its empathogenic properties. For this reason, MDMA is being explored as a treatment option for posttraumatic stress disorder (PTSD; Oehen, Traber, Widmer, & Schnyder, 2013). PTSD results from exposure to trauma and is characterized by prolonged hypervigilance and exaggerated fear responses. Neural correlates of PTSD include decreased hippocampal volume, amygdala overactivation, and reduced prefrontal cortex activity (Shin, Rauch, & Pitman, 2006). The unique combination of neurobiological outcomes makes this disorder extremely difficult to treat pharmacologically; however, many of these sites are mechanisms of action for MDMA (Bremner & Vermetten, 2004). MDMA has been shown to be effective in medicating treatment-resistant PTSD in a number of trials (Bouso, Doblin, Farré, Angel, & Gomez-Jarabo, 2008). It is thought to work by several processes; for example, by inhibiting fear responses in the amygdala, allowing painful memories to be revisited and reprocessed (Oehen, Traber, Widmer, & Schnyder, 2013). Because it is not a legal substance in most parts of the world, clinical research is a difficult task, but a promising one. The current research is a comprehensive literature review on the pharmacology of MDMA, the neurobiology of PTSD, the effectiveness of previous clinical trials of the drug, and future directions for research.

(Oral Presentation, Session I: 9:45-10:00 AM, SSB Room 202)

Manumission in the Pax Romana

Paula Denton – History

Faculty Mentor: Shelby Balik

The objective of this research is to explore the concept and evolution of manumission during the Pax Romana, Rome's apex of military conquest and cultural power.* What laws germane to manumission were in place when Augustus began to convert "Republic" to "Empire" c. 30 BCE? Were those laws amended, and if so, what was the cause and effect of such legislation? This analysis will survey Rome's existing manumission law and subsequent amendments to it during the Pax Romana. What survives of manumission language is largely judicial and social commentary by contemporary Romans. Accordingly, source material from Cicero, Dio, Josephus, Livy, Seneca, Suetonius, Tacitus, and Ulpian afford the best evidence for this survey. Two modern compilations of Roman law supply more detailed evidence through surviving ancient case testimony and judicial interpretation of manumission law. This analysis shows that Roman law favored manumission as a pathway to citizenship, providing the Empire with a constant supply of bureaucrats, administrators, merchants and their families to colonize and further advance the Romanization of the known world. The Pax Romana could not manage itself without them, and emperors after Augustus merely followed his lead as manumission law appears relatively unchanged throughout the period. This research is pertinent to those interested in ancient slavery and slave law, slavery comparatives, and Roman and Christian Religion historians and sociologists.

*For purposes of this research, the Pax Romana period begins with Augustus c. 30 BCE and ends c. 180 CE with the death of Marcus Aurelius.

(Oral Presentation, Session II: 11:15-11:30 AM, SSB Room 203)

Justice Denied, Justice Delayed

Gregory Dittrich – History

Faculty Mentors: Laresh Jayasanker

This paper examines the legal cases resulting from the internment of Japanese-Americans during World War II and the impact these rulings have had on more recent legal proceedings. The paper details the mechanism of the wartime internment, its effect on Japanese-Americans and the protracted struggle to exonerate those convicted of violating the exclusion and relocation orders. The paper seeks to determine what the social and legal legacy of the wartime internment has been. The research process involved identifying and utilizing a variety of primary and secondary sources including court transcripts, presidential statements and the testimony of internees. The disposition of these cases has influenced other rulings that concern civil liberties and national security. In order to ascertain how the internment has affected current legal issues, more recent cases were examined to see how the precedents established in the internment cases were incorporated into them. The research shows that the wartime internment cases have shaped American law by introducing the concept of suspect classification as well as providing precedent in legal actions involving civil rights. Legislation that affects a group categorized under a suspect classification is subject to additional scrutiny to determine its constitutionality. The Supreme Court has also frequently referenced these cases when ruling on civil rights cases to reinforce that distinctions made on the basis of race or nationality are invalid.

(Oral Presentation, Session IV: 4:00-4:15 PM, SSB Room 205)

Effects of Logjams & Wildfires on Organic Carbon Storage in Front Range Streams

Rebecca Ellerbroek – Environmental Science

Faculty Mentor: Sarah Schliemann

The objective of this research is to examine how stream debris, such as logjams or beaver dams, affects the storage of organic carbon in mountain streams in recent wildfire zones of the Cache la Poudre Wilderness. Dissolved organic carbon is critical to several factors affecting stream ecosystems, including stream pH, food chain dynamics, metal and mineral formation, and UV protection for organisms. Approximately 32 water samples will be taken from half-mile stretches of two low-energy streams with stream debris obstructions and analyzed for dissolved organic carbon content and pH. These water samples will be drawn laterally, in the headwater, and in the backwater of stream obstructions to determine how debris affects the location of carbon storage. As wildfires are known to affect both presence of stream debris and storage of organic carbon, one of the study streams will be located in the June 2012 High Park Fire burn zone, and the other will not have been affected by recent wildfires. This research postulates that the backwaters of stream obstructions will store the most carbon, due to the slower flow allowing more carbon to accumulate. It is also expected that the wildfire stream will have higher carbon than the one unaffected by wildfire, due to the release of carbon via ash. If both of these hypotheses are correct, the highest overall carbon storage will be found in the backwater of stream debris found in the wildfire-affected stream.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #20)

Becoming Gendered: The Social Construction of Gender Identities in the Early Years

Samantha Erb – Psychology

Faculty Mentor: Annjanette Alejano-Steele

Gender is perhaps one of the most salient social categories that we have in our society today. In our sex/gender system, our biological sex is inextricably linked up with a socially constructed set of norms and expectations, which are then taught and internalized as gender. Much of this gender socialization occurs during the early years of a person's life. This research aims to analyze sex vs. gender as well as what it means to be a "boy" vs. a "girl" in our society. It looks at the socializing agents most prominent during the early years of a child's development, including inside and outside the home. Parents, peers and teachers all play a prominent role in the gender norms and expectations that children internalize as well as the way they view gender in the world. Young children learn through play, so much of this gender socializing occurs through the toys, games and activities that the children engage in during the course of their day. Media is also an incredibly powerful force for teaching gender, and in our increasingly interconnected world this is becoming a much greater concern. This social construction of gender has many significant implications for all members of society. Only by changing the norms and expectations around gender, as well as the messages that children are receiving can we truly make an impact on many of the problems facing our society today.

(Oral Presentation, Session III: 2:45-3:00 PM, SSB Room 203)

Expanding Electrochemical Bio-sensors to Detect Ricin

Lisa Fetter – Biology

Faculty Mentor: Andrew J. Bonham

Ricin toxin chain A (RTA) is a byproduct of castor oil production that can be lethal at doses as low as 3 to 5 micrograms per kilogram of body weight. Since there are currently no known antidotes for ricin, efficient detection prior to exposure is essential to avoid death. Current methods typically involve time-consuming ELISA or RIA methods13 which, on average, require twenty-four hours of wait time. In this project, we have designed and tested an electrochemical bio-sensor that is sensitive enough to detect small and bio-medically relevant concentrations of ricin. Ultimately, this bio-sensor design allows voltammetric interrogation to detect ricin toxin in complex media (such as blood serum and soup). Additionally, it is convenient in that it collects real-time data, offering applications to the monitoring processes of areas involved in castor oil production. Furthermore, it may possess diagnostic potential in assessing ricin exposure. Electrochemical DNA-based (E-DNA) sensors have the potential to be used in a variety of situations. This project exemplifies a strategy for how they may expanded to incorporate the detection and quantification of hazardous toxins.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #18)

Program Development for Cognitive Testing in Bio-Medical Research Studies

Rory Flynn – Mathematics

Faculty Mentor: Cynthia Erickson

The objective of this project is to develop a program for cognitive testing in bio-medical research studies. The researchers in psychology need a program that to measure the ability of individuals (human or otherwise) to perform short-term working and long-term visual memory tasks. Because the researchers need to test adults of all ages, the program needs to be portable, easy to use, measure a difference in skill across age groups, and store data to a spreadsheet. The program is to be used on one subject at a time, the subjects is required to select the correct image based on a specific criteria which will change for different portions of the test. For each subject tested the program generates a spreadsheet containing the subject's response time, their accuracy, their age, gender, and an anonymous identification number. No other identifying information will be included in the data file. The program created to meet these requirements uses the programming language "Processing" on the Android platform. The success of this venture will affect the outcome of the experiment, the validity of the study, and the difficulty with which the end research is achieved. The program itself may also be used as a template, or without modification, in future experiments to test memory.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #18)

Applications of Statistical Learning to Colorado Mosquito Populations

Rory Flynn – Mathematics

Coauthor: Nathanial Justin Chandler

Faculty Mentor: Nels Grevstad

Insect species that have an impact on public health, environment, and economics are of particular interest for statistical modeling because of the effects of their populations. The purpose of this research is to determine a suitable model for the Denver and Morgan county data sets from The Colorado Mosquito Survey using advanced data science and regression methods. The first of the two models attempts to predict the presence of mosquito larvae given various predictor variables (i.e. presence of water, season, location). The second model attempts to predict the wing length of mosquitoes given another set of predictor variables (primarily meteorological phenomena). To create these models various methods are implemented, including boosting, bagging, decision trees, random forests, and multivariate regression. Ultimately this study will present the optimum method and model among those analyzed for each data set. Additionally, we hope that this study will help to facilitate a better understanding of the complexity found in real world biological data, and may lead to a model that can better predict mosquito growth and proliferation. Such a model would be useful in population control measures.

(Oral Presentation, Session II: 11:15-11:30 AM, SSB Room 207)

Food Attitudes and Behaviors Before and After an Introductory Nutrition Course

Jillian Foss – Human Nutrition – Dietetics

Faculty Mentor: Ann Diker

The dietary patterns of college students has become a concern to health professionals because these patterns established are likely to be maintained throughout life and could result in more expensive health care and life-threatening diseases. The purpose of this study is to examine the effect of an introductory nutrition course (NUT 2040) on food attitudes and behaviors among college students. One survey was administered electronically in January 2015, and the second survey will be administered in May 2015 to students enrolled in NUT 2040 and ENG 1020. These surveys gather demographic information, frequency of eating various foods, and food attitudes and behaviors. We hypothesize that students enrolled in NUT 2040 will show improvement in food attitudes, food behaviors, and consumption of healthful foods from the beginning to the end of the semester. The focus of this presentation will include the differences in food attitudes and behaviors between the introductory nutrition group and the control group (ENG 1020) at the beginning of the semester.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #19)

Designing and Building 3D Printer/CNC Router Hybrid Using Stepper Motors

Jesse Freelong – Mechanical Engineering Technology

Coauthors: Nicholas Weldon, Matt Sherak, Andrew Romero

Faculty Mentor: Devi Kalla

Direct Digital Manufacturing is affecting the engineering design process due to the increasingly important role it has in the fabrication of parts. Additive (material formation) and subtractive (material removal) manufacturing technologies have been popularly employed in a variety of fields such as direct manufacturing, education and medical etc. In the past few years there has been a surge in people who build their own desktop size 3D printers or CNC mills for personal manufacturing. The kits can be expensive and are not very precise due to excessive vibrations, which are caused by their small sizes. To solve the problem, combining the two technologies into a single affordable desktop size unit that is designed to resist fluctuations in cutting dimensions would be a great improvement on existing designs as well as being a feasible machine for industry. The dual-purpose desktop machine is the result of combining 3D printer and CNC router, two popular processes, in a useful format for personal manufacturing. The machine will be an important learning tool for classrooms and a resource to expose students to manufacturing technologies. It also serves as a level of comparison to existing, available products on the market. The method of completion will follow standard guidelines including; planning, design, execution in conjunction with prototyping & process control, then testing and configuration. The expected results should be a fully functional desktop size 3D printer and CNC mill that can automatically switch between these functions. The market is open for machines that can do multiple processes as people gain more access to these technologies.

(Oral Presentation, Session II: 10:30-10:45 AM, SSB Room 206)

Validation of Tasseled Cap Transformation of Coefficients of Landsat 8 Imagery

Matthew Galbraith – Land Use

Faculty Mentor: Claire Hay, Stella Todd

With its ability to compress multiple bands of spectral information into a few bands, the Tasseled Cap Transformation (TCT) can prove invaluable for a variety of studies including, but not limited to, vegetation studies. Originally developed for use with Landsat 1 MSS in 1972, TCT has been adapted to all subsequent MSS and TM Landsat sensors. The development of the TCT coefficients for the Landsat 8 Operational Land Imager (OLI) sensor was based on the Landsat 5 Thematic Mapper (TM) TCT coefficients. These results were verified against Landsat 7 Enhanced Thematic Mapper Plus (ETM+) TCT results to determine effectiveness of the new Landsat 8 OLI TCT coefficients by means of a paired T-test. Results showed strong similarities with Landsat +ETM results but suggest the possibility that the Landsat OLI TCT coefficients may still not result in a transformation that produces spectral features that correlate as highly as desired with spectral features extracted with earlier TCTs on the previous Landsat TM sensor. Following this, Landsat OLI TCT coefficients were derived using a Principal Components Analysis with Procrustes rotation from Landsat 7 coefficients to determine if the process using Landsat TM coefficients was repeatable with Landsat +ETM.

(Oral Presentation, Session III: 2:45-3:00 PM, SSB Room 205)

Effectively Teaching Poetry in the Secondary Classroom

Ashley Gerber – English

Coauthors: Lisa Lane, Katie Scroggs, Belle Fiar, Erica Rhinehart

Faculty Mentor: Gloria Eastman

We are a panel of scholars passionate about sharing our units on teaching poetry designed for the 21st century secondary classroom. Poetry is a diverse and complex literary genre that allows teachers to be creative in the classroom while at the same time demanding mastery and excellence. Our group of preservice classroom teachers has displayed this mastery through designing learning activities and proper assessments of poems, which are all centered on a common theme. In our panel presentation, we will introduce the assignment in totality speaking on the criteria and thought process behind designing a unit of poetry. Each student will then give the audience an idea of what their unit entails by speaking about their essential question, common theme of their chosen poetry, the grade level the unit is intended for, and finally give an example of a learning activity and assessment. These diverse units will offer unique ways to teach poetry, but most importantly will provide insight on how to involve secondary students in the broad and exciting world that is poetry. Our intent is not only to provide the audience with tangible ideas about how to teach poetry- it is to share our passion and join the conversation about how to make poetry relatable to students from all walks of life.

(Oral Panel Presentation, Session III: 2:00-3:00 PM, SSB Room 206)

The Disintegration of American Hegemonic Discourse in Film Noir

Taylor Gilman – Political Science

Faculty Mentor: Sheila Rucki

In general, classic Hollywood film noir is believed to portray simple black and white messages of who is good, who is bad, what is right, and what is wrong. However, when spectators regress from the seemingly simple stories, they find that film noir illuminates humanity, society, and ideology in complex shades of grey. This paper examines these complexities and their function within film noir and argues that they exist as a counter-narrative to ideological and economic hegemony in America during the 1940s and 1990s. This study invokes Antonio Gramsci's model of cultural hegemony by analyzing the films Double Indemnity (1944) and Fight Club (1999). Though capitalist interests continue to dominate the film industry, this study finds that films such as Double Indemnity and Fight Club serve as indicators of the breakdown of American hegemony.

(Oral Presentation, Session II: 11:15-11:30 AM, SSB Room 202)

The Decrease in Species Richness During the Fermentation of Skate to Hongeohoe and the Isolation of Polyextremophiles

Ashley Greenbaum – Biology

Faculty Mentor: Helene Ver Eecke

Hongeohoe is a Korean fermented dish made from skate. Skates lack bladders and excrete urea through their skin; when they are fermented, the bacteria that are encouraged to grow are alkaliphilic, and the fermentation is alkaline rather than acidic. This assessment of microbial ecology during a fermentation process set out to research the changes in species richness and diversity during fermentation of skate to hongeohoe. Skate flesh was fermented in clay vessels under four different temperature conditions: 4° C; ~25° C; 37° C; and an alternating environment of 12 hours at ~25° C and 12 hours at ~37° C to replicate a day/night cycle. Each experimental condition was run twice for duplication. During the fermentation pH increased rapidly from 6.5 to 9 and ammonia was sensed. Samples of flesh were taken in triplicate from the fermenting fish at varying time intervals and were used as inocula for three media: general media, alkaline media, and alkaliphilic Bacillus media. The culture-based assessment showed that the microbial richness and diversity of the skate decreased dramatically during the fermentation. Initially, many different types of colonies grew, but at the end of fermentation there were very few colony morphology types visible. Pure strains were isolated from the diverse enrichments of early fermentation and of the two isolates from late fermentation. 16S rDNA sequence analysis of these isolates will identify them. It is reasonable to assume that the bacterial strains at late fermentation are polyextremophiles since they are thriving at a high pH, high salinity, and low water content.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #22)

Probability Modeling for a Taxi Station Queue

Cody Griffith – Mathematics

Coauthor: Joseph May

Faculty Mentor: Shahar Boneh

Queuing models are part of the larger field of Random Processes, where probability techniques are used to model real-life dynamic scenarios. A queuing model usually assumes that customers arrive at a service station in a random fashion and there is a single server. The model attempts to describe the long-term behavior of the queue in terms of its length, the average waiting time, etc. We extended this type of model to a more complex scenario that describes the dynamics of a taxi station. Suppose people (customers) who need a ride arrive at a taxi station and are lined up for the next available taxi. At the same time, taxis arrive at the station and are lined up for customer pick-up. The customers and taxis are matched on a first-come-first-served basis. Additionally, customers who find too many people ahead of them, leave. Likewise, taxi drivers who find too many taxis ahead of them, leave. We will show how probabilistic techniques can be used to analyze various features of this system, such as the proportion of time there are no taxis available, the waiting time for customers, the waiting time for taxi drivers, and the proportion of customers who find the queue too long and leave. These are all functions of the customer and taxi arrival rates. Anyone with an interest in probability or in management will find this interesting.

(Oral Presentation, Session II: 11:00-11:15 AM, SSB Room 207)

Java Virtual ARM Machine: An Editor, Interpreter and Debugger for Learning ARM Assembly

Guy J Grigsby – Computer Science

Faculty Mentor: Weiying Zhu

The Java Virtual ARM Machine, jvARM, is a program written in Java. The goal is to provide students with an integrated editor, interpreter and debugger for ARM assembly that share a simple interface and can be run on Windows, OSX, and Linux. ARM programming can be difficult to learn and complicated tools can add to a student's frustration. The purpose of jvARM is to reduce the complexity of the programming environment so that students can focus on learning the language of ARM. The editor portion of the project provides compile time grammar parsing to point out syntax errors. The interpreter is the major part of the project. It parses and "runs" the ARM assembly code in a Java environment. The implementation of ARM instructions is incremental and the first milestone will be the most basic instructions. These basic instruction include those for addition, subtraction, bitwise operations, and branching. This is not an emulator. The ARM assembly is not compiled into object code. Rather, it is read and interpreted by a custom Java engine designed to simplify the environment for beginners to grasp the most important parts of the process. The Java environment replicates the hardware in an ARM system, including the processor itself (ALU and registers), main memory, disk, and I/O. The design and implementation details have been chosen to facilitate ease of use, ease of learning, and maintainability not performance. jvARM will help students to focus on learning ARM without the overhead of hardware and operating system intricacies.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #27)

Critical Concepts in Introductory Nutrition Courses

Lindsay Gulley – Human Nutrition – Dietetics

Faculty Mentor: Ann Diker

Objectives: Delineate topics typically taught in introductory nutrition courses throughout the nation as essential, higher-level learning, not essential, or part of prior knowledge. Determine if there is national consensus related to skills that should be developed as part of an introductory nutrition course. *Design, Setting and Participants*: An anonymous survey asked professors at 2 and 4-year institutions nationwide (n=280) to rank 36 topics typically taught in introductory nutrition courses as essential, non-essential, higher-level learning, or prior knowledge. Professors were asked to select skills that should be developed in introductory nutrition courses. *Outcome Measures and Analysis*: Frequency ranking of topics and skills. *Results*: Carbohydrates, fats, protein, vitamins, minerals, dietary guidance tools, and reading food labels were ranked in the top 7 essential topics by professors regardless of whether they taught only an introductory course, only an upper division course, or both. The top 15 topics considered essential correlated with the top 15 topics to be explored in depth with two exceptions (physical activity and nutrients involved in energy metabolism). The top 15 topics considered higher-level were typically ranked as exposure topics. Over half of respondents considered reading food labels, applying knowledge to everyday life, designing a healthful diet, diet analysis, evaluating the validity and reliability of nutrition information, and calculations as skills to be developed in an introductory nutrition course. *Conclusions and Implications*: Results suggest a general consensus on topics that are considered essential and higher level. Additionally, respondents considered applied skills and critical thinking to be valuable.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #20)

Entomophagy

Zaira Gutierrez-Sanchez – Modern Languages

Faculty Mentor: Maria Rey-Lopez

Entomophagy is when humans consume insects, it is a practice that is not seen or accepted in some parts of the western world. I decided to look into Latin America and have found it very interesting that most of those countries to some extent consume insects. It is based in culture practices that were integrated into certain societies long before colonization occurred. My presentation will most likely focus on the insects that are ate in Mexico but will also portray information about other Latin American countries and there consumption of insects. My research is focused on Latin America but I will talk about interesting facts about entomophagy. Since our population is growing rapidly worldwide and we have used up seventy percent of agricultural land it is likely that in the future western societies will consider and adopt insects into their diet. Insects have many nutritional values and are use up less energy. Entomophagy may become our future focus in the culinary world.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #12)

The Shadow of the Wind

Andrew Haley – Modern Languages

Faculty Mentor: Maria Rey-Lopez

The Shadow of the Wind by Ruiz Zafon can be described as a gothic fable for various reasons. The reader is taken on a mysterious adventure with Daniel Sempere, easily becoming lost in eerie tales within his ultimate quest of tracing out the history of Julian Carax, the author of *The Shadow of the Wind*.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #11)

A Qualitative Analysis of Students' Perceptions of Aging and the Role of the Media

Emily Hall – Speech Language & Hearing Sciences

Faculty Mentors: Jessica Rossi-Katz, David Kottenstette

This project aims to learn about younger adults' knowledge of and attitudes towards older adults, and explore how media and culture may influence these perceptions. Participants in this study were recruited through the First Year Success Program. The study involved collecting and transcribing interviews with a small set of participants on their communicative experiences with older adults. Questions included recalling experiences with the older adults, and reflecting on difficulties that may be present when communicating with this population. Responses were then analyzed to identify themes regarding aging, communication and the role of the media. A long-term goal of this study is to establish an intergenerational communication group on campus in an effort to enhance social exchanges between younger and older adults.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #3)

From Triumph to Tragedy: A Survey of Hostages and Hostage Taking in Ancient Rome

Andrew Hamilton – History

Faculty Mentor: Shelby Balik

This paper will examine the role of hostages (obsides) and hostage-taking in Rome, and argue that seizing obsides became a catalyst for Roman imperial domination. Taking hostages served to enhance the prestige of both conquering Roman generals and the Empire as a whole, and became a type of diplomatic lubricant that ensured the cooperation of foreign nations states in all matters of international diplomacy. This work also seeks to provide new insights about the key role of hostages in the cultural phenomenon of the Roman triumph (victory celebration). The taking of hostages was an accepted consequence of defeat, and the subsequent negotiation of peace. However, the exhibition of obsides in Rome's triumphal processions became a means of demonstrating to its citizens the nation's preeminence in the world at the expense of its foes' dignity. While countless ancient hostages were subject to lives of hard labor, more in line with modern notions of slavery, many obsides played significant roles in Roman affairs. Examination of the works of ancient historians, including Polybius, Livy and Tacitus, has provided detailed descriptions of how hostages were used as pawns in negotiations and trophies in celebrations in order to efficiently enforce Roman ideals and alter the course of the ancient world to Rome's benefit.

(Oral Presentation, Session IV: 3:30-3:45 PM, SSB Room 205)

Human Trafficking's Effect on the Business World

Michel Hansen – Journalism/Technical Communication

Faculty Mentor: Donald Chang

Human trafficking is prevalent worldwide and makes an immense amount of money. It also impacts many businesses directly and indirectly. What does this mean for these businesses? How should they be acting? What are they doing to combat it or what are many companies doing to hide from the atrocious fact as they continue making a profit?

(Poster Presentation, Session I (9:30-10:30 AM), Poster #15)

Is *Culiseta inornata* the Winter Mosquito in Colorado?

David Harris – Biology

Faculty Mentor: Robert Hancock

Culiseta inornata are widely distributed in Colorado and are believed to thrive during winter months. Previous studies conducted in milder climates have found larvae during summer months but evidence of a consistent adult population has yet to be expressed. Given the epidemiological importance of mosquitoes as a potential vector in Colorado a study was conducted. Using CO_2 bated CDC mini light traps to collect mosquitoes on a weekly basis, from June 2014 to August 2014. Following the collection the mosquitoes were sorted by species and population data was recorded as part of a larger, intensive study. Adult *Culiseta inornata* were found in low, but stable abundance throughout the season, thus they are not in diapause during the summer and are potentially a bivoltine or polyvoltine species.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #16)

Life on an Inadvertent Refuge: Arthropod Transients on an Urban Green Roof

Ted Heron – Biology

Coauthors: Levi Coleman, Suzy Hiskey

Faculty Mentor: Robert Hancock

Recent trends in urban and rural residential land use have increased native ecosystem fragmentation and species isolation. Some developing urban areas have integrated the use of green roofs as wildlife corridors to support and perpetuate local biodiversity. Green roofs are an understudied characteristic of urban planning in the United States. But they have gained popularity for increasing energy efficiency. These gardens or vegetated areas aid in reducing heat, mitigating storm water runoff, and filtering pollutants. Biodiversity research indicates that green roofs can function as patches or wildlife corridors for many species that are negatively affected by land-use changes. A survey of the arthropod fauna on a two-year old extensive green roof showed evidence of many categories of use with both resident and transient arthropods being present. We present four case studies of arthropod use of the green roof: 1) residents feeding and breeding, 2) residents feeding not breeding, 3) transients attracted to the roof by present stimuli, and 4) transients intercepted during dispersal. Of the residents, Ladybird beetles (*Coleoptera, Coccinellidae*) were seen eating and breeding in the space. Ground beetles (*Coleoptera, Scarabaeidae*) were observed feeding, but no evidence of immature stages have been documented. Of the transient arthropods, Honey Bees (*Hymenoptera, Apidae*) were present, attracted by the flowering Sedum spp. and adult caddisflies (*Trichoptera, Hyropsychidae*) were intercepted on the roof.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #10)

"They Grow 'Em Big in Windsor:" How Body Size of Trapped *Aedes vexans*, and *Culex tarsalis* Varies with Seasonal Climate and Habitat

Bradley Hiatt – Biology

Coauthors: Cydney Vanderau, Toni Fuentes, Ashley Fulmer

Faculty Mentor: Robert Hancock

Adult mosquito size, as estimated by winglength, is influenced by many environmental factors including larval density, nutrition and rearing temperature. Smaller size has been shown to negatively impact survival, vectorial capacity and host seeking behavior. In Colorado *Aedes vexans* utilize a range of breeding sites with temporary shallow pools predominating while *Culex tarsalis* often breed in relatively stable cattail marshes and other wetlands. Because *Cx. tarsalis* breed in more stable and homogeneous sites than *Ae. vexans*, we hypothesized that the latter species would exhibit higher variation in size over the climatologically dynamic season. Three weekly-deployed traps near Windsor, LaSalle, and Broomfield, respectively, were picked based on topographical and hydrological variability. *Cx. tarsalis* and *Ae. vexans* shared similar trends in body size, as the season continued mean body size of both species decreased. However, *Cx. tarsalis* from Windsor actually increased mean body size as the season progressed. Using lag regressions, our results indicate that warmer post-hatch temperatures during larval development generally yield smaller mosquitoes (except for *Cx. tarsalis* in Windsor). Post-hatch precipitation effects were considerably variable depending on the trap site. These findings indicate complex relationships between seasonal climate, habitat and mosquito development with ambient temperature during larval development playing a crucial role.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #13)

The Effects of Trending Norms and Considering the Future on Water Conservation Behavior

Holly Hickman – Psychology

Coauthors: Kelsie Howell, Steven Terry

Faculty Mentor: Chad Mortensen

Previous research has demonstrated the effect norms have on influencing behavior. However, minimal research has examined the effect trending norms (i.e., norms increasing in popularity) have on behavior, especially when most people do not engage in the desired behavior. The current research examined the effect of trending norms—as well as of prompting people to think explicitly about future behavior—on water conservation. Participants were assigned to one of five message conditions: a regular norm that showed the percentage of those who engaged in water conservation behaviors, a trending norm that additionally showed an increase from the previous year, a control norm showing trends unrelated to water conservation, and regular and trending norm conditions that mirrored the previous ones, but also asked participants to predict the popularity of others' water conservation behaviors in the future. Participants were asked to brush their teeth in an ostensibly separate study, and their water usage was recorded. Results indicated no significant differences overall between trending and descriptive norm conditions, or the presence or absence of a question asking about future behavior. However, a significant interaction and simple effects tests revealed that significantly less water was used in the trending norm condition than the regular norm condition, but only after being asked about future water usage. These findings indicate that the effect norms have on behavior depends on the type of norm communicated, which adds beneficial insight to normative influence research and applied research in the area of water conservation.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #4)

Architecture in the CA8 Complex of Huaycán de Pariachi: Reflections of Cultural Interactions on the Central Coast

Heather Hill – Anthropology

Coauthors: Leah Swett, Aaron Burch, Morgan Dreesbach, Jeremiah Camp, Tyrel Sorensen

Faculty Mentor: Jonathan Kent

Initial work in Conjunto Arquetectonico 8 at the site of Huaycán de Pariachi by Metropolitan State University of Denver focused on establishing a typology of the architecture based on building materials and discernible chronology regarding occupational shifts and realigned territories between the Ychma, the Inca, and Incan allies. Utilizing topographic maps of the complex, this study interprets the observed architecture in the context of other known Ychma/Inca sites on the Central Coast. These comparisons yield valuable information regarding potential room functions, cultural affiliation, and contribute to current understandings of the diverse and possibly tumultuous culture history of Peru's Central Coast.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #17)

Some Like it Cool: Microclimates Affect Arthropod Biodiversity and Abundance on an Urban Green Roof

Suzy Hiskey – Biology

Coauthor: Susanna Brauer

Faculty Mentor: Robert Hancock

Green roofs - building tops that are partially or completely covered in vegetation - have gained popularity to reduce heat island effect, mitigate storm water runoff, and filter pollutants. Little is known about the green roof microclimates and their effect on arthropod biodiversity and abundance. Preliminary data from biweekly sampling during the 2014 season yielded a total of 1,242 arthropods from 4 classes and 13 Orders. It was noted during this survey that cooler areas, defined by daily shade and ambient temperature, had higher arthropod abundances. After defining microclimate zones using a combination of temperature, relative humidity, and light intensity, this study will examine differences in arthropod diversity and abundance between the zones present. To test the hypothesis that arthropod abundance differs according to microclimate, resident arthropods will be collected bi-weekly by pitfall, suction and hand sampling methods.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #6)

Modeling Interplanetary Hohmann Transfers Using STK Astrogator

Nicholas Hoen – Aviation & Aerospace Science

Faculty Mentor: Jose Lopez

A general method for designing an interplanetary Hohmann Transfer using STK Astrogator software is presented, and the seasonal dependence of the time of flight and total velocity change for a Hohmann Transfer orbit from the Earth to Mars is examined. An estimate of the initial conditions required for a mission to Mars is obtained by the Patched-Conic Approximation method, and the trajectory is refined using the geometric analysis tools and iterative differential corrector routines provided by the STK software to optimize the trajectory for a given launch window. B-Plane targeting techniques are also used to optimize the transfer orbit and target a specific final orbit around Mars. Trajectories are designed for seven consecutive launch windows for a mission from the Earth to Mars, spanning a period from February 2016 to December 2028. These seven trajectories are chosen to be a representative sample of the different orbital geometries associated with launch windows that fall in different seasons. Geometric characteristics will be compared across the seven trajectories and related to the required total velocity change and time of flight calculated for each. In addition to calculating the total velocity change and time of flight required for the seven interplanetary Hohmann Transfers examined here, the goal of this project is to provide a qualitative understanding of the seasonal dependence of these quantities and how they relate to the geometry of the transfer orbit.

(Oral Presentation, Session II: 11:00-11:15 AM, SSB Room 206)

Culturally Diverse Texts in the Language Arts Classroom

Michael Hoffman – Secondary Education

Coauthors: Christine DiNunzio, Michelle Larsen, Sarah Anderson, Avery Little, Lisa Lane

Faculty Mentor: Gloria S. Eastman

The presentation will delve into the idea that high-interest YA texts with a variety of cultural imprints can transform the language arts classroom into a space that honors diversity. When students have more choice in the classroom, they gain more opportunities to explore their unique identities. Much of the young adult literature written today offers students numerous chances to connect with diverse identities–a connection that encourages positive engagement in the classroom. Yet the mainstream, canonical literature studied in many English classrooms does not always align with the breadth and complexity of students' various backgrounds, so it is necessary to recommend and offer them a wealth of texts they can relate to. Some theorists refer to this as a "book flood," and regard it as necessary to the creation of life-long recreational readers–ones who will inevitably continue to confront and make meaning out of their identities well past secondary school. After all, the years spanned by secondary education are essential to teenage psychological development, so if teachers want their students' identities to include "reader," this connection is centrally important. Each panelist provides insight into a focused cultural study of an array of YA titles, presenting on possible curricular assessments, activities, and text sets to help achieve a blended learning experience for students. The panel argues that various cultural text sets have common themes that communicate with students and build intertextual reading skills. This, in tandem with the study of canonical texts, creates a unique learning experience tailored to student choice.

(Oral Panel Presentation, Session IV: 3:15-4:15 PM, SSB Room 206)

Sleep Deprivation as a Predictor of Conformity

Kelsie Howell – Psychology

Coauthors: Anastasia Bacca, Steven Terry, Kelly McCarty

Faculty Mentors: Lisa Badanes, Kristen Lyons

Numerous studies have demonstrated the deleterious effects of sleep deprivation on a number of factors, including ego depletion, executive function, and self-regulation (Christian & Ellis, 2011; Todd & Mullen, 2013). The current study aimed to synthesize and extend the previously established links between these factors by applying them to the concept of conformity. Undergraduates' sleep deprivation and conformity were tested using an online survey and the SleepCycle smart phone application. Participants were presented with various fractal images and were then asked to answer questions about them. They were also asked to complete the Toronto Hospital Alertness Scale (Shapiro, et al, 2006) to measure their sleep patterns. Upon completion of the survey, participants were asked to use the SleepCycle app every night for a week, and to come back to report their sleep data and complete an additional survey. One week later, participants were re-exposed to five of the original images, this time including a conformity-inducing message. Our measure of conformity was determined by the change in answers from the initial picture rating to the final picture rating (following the procedure of Griskevicius, Goldstein, Mortensen, Cialdini & Kenrick, 2006). Sleep deprivation was measured by scores on the THAS questionnaire, and data retrieved from the SleepCycle application. Preliminary results suggest a trend for a correlation sleep deprivation and conformity. The relationships between both self-report and objective sleep quality with conformity will be discussed at the time of presentation.

(Oral Presentation, Session I: 9:45-10:00 AM, SSB Room 203)

Spatial Modeling of COGCC Regulations on Drilling and Facilities

Emily Hueni – Land Use

Faculty Mentors: Barbara Echohawk

The state of Colorado has some of the strictest oil and gas industry regulations. Many of these regulations have spatial components that need to be taken into account when selecting surface locations for drilling and facility construction. This model demonstrates the potential that GIS has for understanding and navigating these regulations on a large scale.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #24)

Telescopic Swivel Hitch

Ziad Jabr – Mechanical Engineering Technology

Coauthors: Jacob Frederick

Faculty Mentor: Devi Kalla

Vehicle hitches have not undergone any significant changes in many years. Because of this, frustration for a single user to hitch a trailer or other vehicle to their vehicle becomes a nuisance that is only remedied through extensive practice. It is the intention of this senior project to create a new product that will be compatible with current technology while being both affordable and convenient as well as unique by using engineering knowledge obtained through Metropolitan State University's curriculum. The primary focus is to utilize a mechanism to enhance usability for a single operator as well as increase safety for both property and users. To accomplish this, a design featuring a telescoping mechanism with a single point swivel was designed. This design allows the hitch to be articulated from the towing vehicle and allow a large degree of freedom to attach the towed vehicle, reducing frustration, saving time and is much safer to use for novice drivers not used to towing. Utilizing industry standards, design analysis, stress analysis, and cost analysis, the design was created to satisfy these goals while maintaining an original concept based off of an extensive research of existing products and patents. The project itself may act as a business vehicle for mass production to bring a product to market.

(Oral Presentation, Session II: 11:15-11:30 AM, SSB Room 206)

Water Treatment Systems for Developing Countries: The Purpose of Providing Clean Water to the Community of La Piedra, Dominican Republic)

Aileen Johnsrud & Timothy Dunning – Mechanical Engineering Technology

Faculty Mentor: Aaron Brown

Water disease can have a damaging impact on community health and opportunity. Almost 2 million people die each year from preventable diseases attributed to an absence of a clean water supply. Lacking access to clean water holds many in a cycle of poor health and poverty. The research presented here focuses on creating a clean water system for 200 people living in the community of La Piedra, Dominican Republic. These people are marginalized by DR policy which denies them citizenship and associated privileges, because of their Haitian descent. Consequently, they lack work and education opportunity. A

school now exists in the community where a well supplies water. This water is not safe and available filtration options are not accessible. Introducing a low cost water filtration device can keep the community healthy and therefore might provide better prospects. To tackle this task, several water filters were built and evaluated. Work focused on porous ceramic filter designs and how to eliminate such health problems as; Bacterial diarrhea, Hepatitis A, Typhoid, Rabies, Hookworm, Ciguatera Fish Poisoning, Leptospirosis, Malaria, and Dengue. This is a collaboration with students from the Mechanical Engineering Technology Department who designed the filters, the Department of Ceramics who contributed their ceramics knowledge, and the Department of Biology who will test for filter effectiveness in their EPA certified lab (expected to occur in April,2015). This presentation intends to share the findings of this work. Explicitly demonstrated will be the design and testing of the filters for flow rate and filter capacities.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #25)

GIS Analysis of Colorado Rock Glaciers

Nicholas Karl – Land Use

Faculty Mentor: Barbara EchoHawk

Colorado has an extensive network of rock glaciers occurring in many of the high mountain ranges throughout the state. This research is a preliminary look into the factors that contribute to the distribution of rock glaciers within Colorado. Several spatial technology tools are utilized in this investigation. GIS analysis using Google Earth in combination with ArcMap is used to identify and locate rock glaciers and to make measurements of rock glacier shape, extent, directional aspect, elevation and gradient. Linking these data to a digital elevation model (DEM) investigates the relationship of rock glacier distribution to a range of topographic and geological variables in order to determine which factors, or combination of factors, best define the distribution of rock glaciers throughout Colorado.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #26)

A Brief Historiography of the Contemporary Scholarship on Roman Sexuality

Madeliene Kattman – Art

Faculty Mentor: Summer Trentin

This paper is a critical historiography of mid- to late twentieth-century scholarship on Roman sexuality. By navigating the shifts within historical scholarship, one can see the epistemological development of thinking about Roman sexuality through the each of the scholars' use of Roman visual culture and Roman literature. This historiography looks at specific works published between 1964 and 1998, and explores the ways in which various epistemes surrounding sexuality have shaped Roman scholarship to fit the scholars' contemporaneous ideals. Through the use of subtle biases in scholarship, scholars produce work that fits the standard of thinking about that issue of the time thus verifying biases and often misconceptions about Romans and their sexualities. This brief analysis presents the problems of the representation of Roman sexuality in historical scholarship as well as the development toward improvement of this representation in academia with time.

(Oral Presentation, Session II: 11:00-11:15 AM, SSB Room 203)

The Lost Boatmen: Investigating Aquatic Stream Dwelling Insects Captured on an Urban Green Roof

Alexander Kelley – Biology

Coauthor: Christopher D'Arcy

Faculty Mentor: Robert Hancock

Urban Green Roofs act as habitats important to conserving biodiversity and provide a unique environment for diverse communities of arthropods. An urban green roof on the Auraria Campus centrally located in Denver, CO sits within 1 km of South Platte River and Cherry Creek and therefore provides an opportunity to study how aquatic insects participate in this dynamic. Preliminary results from light trapping using a 250W mercury vapor lamp during June of 2014 have shown an initial collection of adult water boatmen (*Hemiptera*: *Corixidae*) of the phytophagous genus *Hesperocorixa*. These results, in the context of the known behavior and habitat of *Hesperocorixa*, are indicative of a natural pattern of dispersal from nearby lotic environments, driven by phototactic behavior. Regular weekly collections will be performed beginning in April of 2015 by both this same light trapping method and by deploying special traps consisting of highly reflective black plastic sheets that polarize light from either mercury vapor lamps during night collections or natural sunlight during day collections. In this study we will attempt to determine if there is a population of water boatmen residing on or around the Auraria Campus and how they are utilizing the green roof habitat.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #27)

Mindfulness based interventions and the brain changes that take place as a result of specifically practicing mindfulness based stress reduction techniques

Tori Kenyon – Electrical Engineering Technology

Faculty Mentor: Brian Bagwell

Mindfulness based interventions have been shown to alter brain structure. Through dicipline on the parts of the participants in mindfulness studies, data has shown through the practice of Mindfulness Based Stress Reduction (MBSR) techniques that these practices can alter areas of the brain. Through many different contnrols on test participants and the measurement determining these changes being MRI's and FMRI's, changes such as increased gray matter has been found in different areas of the brain like the hippocampus, the posterior cingulated cortex (PCC), the temporoparietal junction (TPJ), and the cerebellum. Each of these areas of the brain is associated with a function that has been shown to be improved on when mindfulness practices are conducted. For example the hippocampus and cerebellum help to regulate emotions while the TPJ plays roles in social cognition. This evidence supports the theory that mindfulness based interventions are not only good for emotional regulation and processing in the spiritual aspect of the mind but also the physical.

(Oral Presentation, Session I: 9:00-9:15 AM, SSB Room 202)

Foraging Behavior of Rainbow Trout in Invertebrate Rich and Poor Waters

Eric M. Klein – Biology

Coauthors: Corey A. Engle, Madison McDonnell

Faculty Mentor: Robert G. Hancock

Foraging behavior was examined to inform the management and conservation of trout species. Previous research suggests that such behaviors may be governed by central place or optimal foraging theories, making relevant the energy necessary to consume benthic invertebrates, as well as their availability. To reconcile both perspectives, the hypothesis of this study was that trout would spend more energy moving further from their lie, to forage an adequate diet of benthic invertebrates in rivers with lower food availability. While in food-abundant rivers trout would move shorter distances. Using GoPro® cameras, underwater video of 24 *O. mykiss* was collected from The South Platte and Blue Rivers, and then examined for foraging take distances. A Mann-Whitney *U* Test revealed that fish were moving significantly further from lie in the invertebrate rich river versus those recorded from the less abundant river (z = -18.748, $p < .001$). To further parse sample variance, from each sample location: altitude, water temperature, water velocity, and sampled invertebrate dry mass were entered into a stepwise regression predicting average take lengths. The significant predictor found was elevation $F(1,22) = 10.99$, $p = .003$, where fish moved shorter lengths at higher altitude ($R = .58$, $R^2_{adj} = .30$, $\square = -.58$). The results suggest that contrary to the hypothesis proposed, not only do trout spend more energy foraging in food-abundant streams, but also that the energy spent to forage is likely influenced by multiple factors. Future research could more closely examine the effect of altitude and other related factors.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #6)

Benthic Invertebrate Taxa in the Blue River and South Platte River as a Bioassessment of Stream Health

Eric M. Klein – Biology

Faculty Mentor: Christopher R. Cooley

The construction and operation of dams has been shown to have altering effects on riparian landscapes. The present study sought to examine the ecological impact of the Cheesman Reservoir Dam and the Dillon Reservoir Dam through analysis of invertebrate fauna within their corresponding rivers. Certain benthic invertebrates, particularly those of orders *Ephemeroptera* and *Plecoptera* can be sensitive to unnatural disturbance in stream flow, temperature, sediment displacement, and chemical pollution. Orders *Diptera*, *Trichoptera* and *Coleoptera* tend to resist such disturbance. Thus the relative abundance of various benthic invertebrates has proven useful in the bioassessment of stream health. In the present study, a model of expected relative abundance of invertebrate orders was created based on previous surveys of metarhithral and hyporhithral streams in Colorado. Samples of invertebrates from the Blue and South Platte rivers were collected downstream from their respective dam obstructions. These samples were then sorted for order and compared to the expected relative abundance values. The distribution of invertebrate orders in both rivers was found significantly different than the predicted model. In the South Platte River below Cheesman Reservoir, orders found to be relatively scarce were those known to be resistant to disturbance (*Diptera*, and *Coleoptera*). However in the Blue River below Dillon Reservoir, disturbance sensitive orders (*Ephemeroptera*, *Trichoptera*, and *Plecoptera*) were scarce or missing, while *Diptera* and *Coleoptera* were in excess compared to their expected values. The results suggest that further bioassessment of the Blue River may be needed to advise stream management.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #6)

Analysis of Learned Bias During Motion Discrimination in the Sensory Cortex

Eric M. Klein – Biology

Faculty Mentor: Mark Mazurek

Previous research has linked neuronal activity in areas of the sensory cortex to motion discrimination task decision making. This process begins with visual input to the sensory cortex, a decision process in an association cortex, and a motor cortex output. Reliable unequal probability of stimulus events in motion discrimination has resulted in biased decisions favoring the higher probability selection. This study investigates the sensory cortex as a possible origin of this bias. Participants in this experiment complete a motion discrimination task where they judge the overall direction of computer generated moving dot fields. To induce a bias, dots in the first block of trials occur in an unequal proportion of fields moving in each direction. To explore whether sensory cortex neurons have been biased, in alternate trials the dot field is presented at a different location onscreen. Neurons in the sensory cortex are topographically mapped to cells in the human eye, thus specific neurons will be stimulated depending on the viewing angle. The hypothesis of this experiment is that if alternate trial decisions are not biased, evidence suggests that bias originates in the sensory cortex. If the bias is observed in alternate trials, bias is likely not generated in the sensory cortex, and thus must be generated elsewhere in the brain. Trials are currently ongoing. Experimental results and implications for further research will be discussed.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #10)

One Dimensional Sound Wave Resonant Transmission through an Acoustical Duct

Jasmine Knudsen – Physics

Faculty Mentor: Richard Krantz

The physics of wave transmission is essential to understanding several facets of the world around us. In particular, studying resonant acoustical wave transmission gives rise to a better understanding of resonant tunneling of quantum mechanical waves through potential barriers, resonant electromagnetic wave transport in coaxial-cables, and various other types of wave transmission. In this experiment, we focus in on a one-dimensional sound wave traveling through a pipe with a series of resonators, called Helmholtz resonators, attached. The Helmholtz resonators are glass bottles that cause reflections and transmissions based on the frequency of the wave and the size, shape, and most importantly the position of the resonators. We are able to solve a complex partial differential equation with appropriate boundary conditions by modeling the resonators as delta functions (spikes representing stylized Helmholtz resonators) positioned at precise locations along the tube. Using the model we can predict the driving frequencies that would maximize either the transmission or the reflection of the acoustic wave and then experimentally test the model. These concepts are crucial in fluid dynamics and can be applied to any type of one dimensional wave transmission. Further understanding of these effects based on the resonator configurations can even be used to study data transmission in optical fibers and for something as simple as suppression of acoustic waves generated by high speed trains traveling through a tunnel.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #9)

Evidence for gender influenced mating strategies in an online social ad platform

Nicholas Kraus – Biology

Faculty Mentors: Cynthia Erickson

Current behavioral psychology research posits a correlation between gender and mating strategies seen in humans, ranging from the promiscuous (unrestricted sociosexual orientation) to the monogamous (restricted sociosexual orientation). This study seeks to identify a correlation between gender and sociosexual orientation in human interaction through an online social ad platform (Craigslist) to show distinct . Data collection involves tracking personal ads for men seeking women and women seeking men in the Denver metro and San Francisco Bay areas. Blind ratings of personal ad statements rank social orientation in a matrix for comparative analysis. Of the 48 males sampled, ages 21 to 58 ($\bar{x}$=38.5), results showed that 29 (60.4%) of them sought a short-term relationship and 18 sought a long-term relationship (37.5%). Of the 25 females sampled, ages 23 to 60, ($\bar{x}$=39), results showed that 17 (68%) sought a long-term relationship while only 5 (20%) sought a short-term relationship. Several members of each gender did not specify a restricted or unrestricted sociosexual orientation. There is a correlation between gender and online sociosexual orientation, as determined by this study. The putative sociosexual orientation for males is unrestricted whereas it is restricted in females. These orientations are observed on the Internet ad profiles of both men and women, and contribute to the growing body of research supporting mating strategy disparities between males and females.

(Oral Presentation, Session IV: 3:45-4:00 PM, SSB Room 203)

The Presence and Diversification of *Wolbachia* Symbionts in Colorado Mosquito Populations

Lukas Kruidenier – Biology

Coauthors: Rikki Jonnsson, Joanne Odden

Faculty Mentors: Robert Hancock, Sheryl Zajdowicz

Wolbachia is an inherited bacterial symbiont identified in various arthropods, including mosquitoes. This symbiotic relationship between *Wolbachia* and its mosquito host has become an important topic in relation to vector disease transmission and control. *Wolbachia* infections can lead to cytoplasmic incompatibility in mosquitoes, thereby limiting mosquito reproduction. Essentially, *Wolbachia* strains must be the same within a given species of mosquitoes for successful reproduction; mosquitoes having differing strains of *Wolbachia* will be unable to reproduce. Introducing different strains of *Wolbachia* potentially provides a way of controlling disease transmission by mosquito vectors. In this study, we conducted a preliminary survey of *Wolbachia* prevalence in mosquitoes collected from at least four locations in the Denver area. The *Culex pipiens*, *Culex tarsalis*, and *Aedes vexans* mosquitoes used in this study were initially collected in ethanol or frozen at -20°C. DNA was isolated and *Wolbachia* bacterial endosymbionts were detected through PCR amplification of the *Wolbachia* 16s rRNA. From this analysis, we showed 98% infectivity of Cx. pipiens (47 out of 48 screened) and no infectivity of *A. vexans* or *Cx. tarsalis* (0 of 12 screened and 0 of 32 respectively). Our results indicate that the prevalence of *Wolbachia* in *Cx. pipiens* is consistent with world-wide trends, having nearly 100% prevalence. *Cx. tarsalis* and *A.* vexans in our screen is negative for *Wolbachia* thus far. Future efforts will involve sequencing the *Wolbachia* 16s rRNA isolated from *Cx. pipiens* to examine whether *Wolbachia* strains have diversified, specifically comparing samples collected in 2009 to 2014.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #11)

The Conversion of Anilines to Aryl Halides

Nicholas Kuehl – Chemistry

Faculty Mentor: Ethan Tsai

The conversion of anilines to aryl halides is a valuable synthetic tool for syntheses relying heavily on metal catalyzed coupling reactions. The traditional method used for this conversion, known as the Sandmeyer reaction, requires the use of cuprous bromide and in situ generation of nitrous acid. Cuprous bromide, however, is only slightly soluble in aqueous and the conversion to the aryl halide is dependent on the ability for the diazonium salt intermediate to come into contact with this compound. This investigation aims at realizing the viability of other synthetic routes for the aforementioned conversion analogous to the Sandmeyer, but with the use of potassium iodide rather than cuprous bromide. The generation of the aryl iodide was successful with acceptable yields without the difficulty of dissolving the copper salt.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #14)

Tensile Testing 3D Printed Materials

Eric Lani – Mechanical Engineering Technology

Coauthors: Kyle Raney, William Adamson

Faculty Mentor: Devi Kalla

With the continual and rapid growth in the field of additive manufacturing products, there is an ever present need to know the limitations, and expectations of material mechanics of 3D printed parts. If a 3D printed part has an internal channel, it produces a different internal build pattern than the same shaped part without the internal channel. In this research, build orientation and the existence of an internal channel were evaluated for their influence on tensile strength. The experiment uses the uPrint SE 3D printer for ABS plastic. The samples will be tested following ASTM D638 standard for plastic. The printed pieces are tested to failure using Instron materials testing machine, and a strain gauge extensometer that measures the amount of elongation in the pieces until failure. These standardized pieces will be compared to know values of traditionally manufactured materials. This test will show the strength loss of materials through the 3D printing process and traditional manufacturing methods. The experiment for plastics is designed around two key criteria, orientation of the pieces during the printing process, and the percent of infill that is used in the printing process. The experiment for metals is designed around comparing strength of 3D printed parts to traditional manufacturing methods. From the initial planning process it is clear that the tensile testing of 3D printing materials experiment is capable of being carried out within the time frame and budget.

(Oral Presentation, Session II: 11:30-11:45 AM, SSB Room 206)

A Walkability Study of East Denver

Amy Larson – Land Use

Faculty Mentor: Stella Todd

The study of walkability in Denver is of growing interest as the city continues to grow and areas of the city are re-built, or expanded to meet our growing population. This interest is what led to the completion of this study, which will provide a comparative analysis of walkability in five East Denver neighborhoods (East Colfax, Lowry, Montclair, North Park Hill, South Park Hill, and Stapleton). Each of these neighborhoods varies in age and demographic makeup, which will allow for a comprehensive review of how walkability varies across relatively small geographic areas of different demographic constituents. For the purpose of this project the term walkability has been defined as the ability of persons within a designated geographic area to safely travel from point to point by ambulatory means. This designation of the term has been used within the context of a neighborhood within the city of Denver. A partial Walkability Index has been developed for this study to measure walkability within each of these neighborhoods. The elements of this index are as follows: sidewalk connectivity, linear feet of sidewalk per person per neighborhood, and average distance from neighborhood centers to RTD bus stops. Additionally, income and family census data will be used to provide background information for each neighborhood. The results of this study will provide insight into how walkability varies across small geographic areas within Denver, and what assertions can be made based on the varying demographics that exist within these areas.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #18)

Myth-Use and Mythmaking: Supernatural and the Creation, or ReCreation, of Mythology

Alyson Lawton – English

Faculty Mentor: Charles Hoge

It is a common use in the arts to explore the themes, character, and plots from various mythologies as part of the stories they are creating. In today's pop culture this has become a popular aspect for stories. From comic books to mass-market fictions parts of the gods and goddess that dot ancient cultures show up in new characters and plot lines. In this paper I will focus on the long-running television series "Supernatural" in two ways. First, I will be looking at how the show's writers use known urban legends, mythology, and religion as the basis for the show. Leaving no culture untouched the focus of the show begins with well-known urban legends explores the idea of belief and how the worlds of stories is interconnected. Secondly, I will explore how over the course of the series ten seasons the writers have begun creating its own mythology that discusses the modern sensation of fandom and belief. Part of this is the overarching subplot of the Gospel of the Winchesters that intertwines all the mythological figures to answer the question: What makes the supernatural exist? The reason for doing this is to understand the importance of looking at the connection between the large religious and mythologies also connect the television show with the ever evolving world of literature.

(Oral Presentation, Session II: 10:30-10:45 AM, SSB Room 202)

Correlation between Nucleotide Polymorphysim in TAS2R38 Gene and the Ability to Taste Bitterness

Vivian Le – Biology

Faculty Mentor: Hsiu-Ping Liu

In Humans, the ability to taste phenylthiocarbamide (PTC) is controlled by the TAS2R38 gene. There are three known nucleotide polymorphisms that differentiate from those individuals designed as strong tastes (Cytosine, Cytosine, and Guanine) from non-tasters (Guanine, Thymine, and Alanine). This study investigated whether individuals who self-described their ability to taste PTC test paper could be grouped as strong, moderate, or non-taster based on their nucleotide polymorphism. To conduct the study, DNA obtained from cheek cell samples was used as the template in a PCR Reaction using TAS2R38 specific primers. Primers were designed and optimized to amplify the entire TAS2R38 gene. PCR products are sequenced and analyzed for both nucleotide polymorphisms. The goal will be to correlate nucleotide polymorphism with the ability to taste.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #13)

The Importance of Communication with Law Enforcement Will Not Only Make for a Safer Environment and Community But Will Establish a Trust in Our Police Who Fight for Our Protection

Diamond Lottie – Speech Communication

Faculty Mentor: William Huddy

In recent news the U.S judicial system has been under fire do to the unjustified shootings in the past couple of years. The local police departments in multiple states have experienced UN justifiable shootings when involved in a situation. In some cases it involved lethal force when unnecessary. When multiple Police officers were asked about the issues with lethal force, the majority of officers responded with the term “communication skills”. Communication skills are lacking between citizens and police officers. Many citizen are wondering why today’s police officer’s will not communicate, some ask is lack of “communication teaching’s in schools” or is that some were not taught and don’t know what communication skills are. Police have said in some cases that they were told to never indulge in conversation with citizens. Many retired officers have stated when they were younger in their career, communicating with fellow citizens made their job a lot easier, it resulted in less stress and less fear. Citizens who knew they were able to communicate with fellow officers truly felt comfortable talking with police when involved in a crime or standing as witnesses. In today’s issues with police, many cases involve footage of police actions that usually result in aggression with words and actions. However in these cases the situation may involves serious injury or death due to a miss communication of words. “Cops can be nice” said by an American citizen, the citizen also stated I want my fellow police to trust me.

(Oral Presentation, Session IV: 3:15-3:30 PM, SSB Room 205)

Establishing RNAi in *Tribolium castaneum* at MSU Denver

Chanda Lowrance – Chemistry

Faculty Mentor: Emily Ragan

RNA interference (RNAi) is a mechanism by which double-stranded RNA can trigger the degradation of mRNA with a matching sequence, leading to the silencing of the gene. The target of this research is to inject double-stranded RNA into a red flour beetle, *Tribolium castaneum*, to trigger a change in its eye color. This double-stranded RNA will be a positive control used to help establish the use of RNAi in *T. castaneum* at Metropolitan State University of Denver. The gene responsible for eye pigmentation in *T. castaneum* is vermillion. The central part of this research is to successfully synthesize double-stranded RNA for silencing the vermillion gene. The research group is currently using a buffer solution of sodium phosphate and blue dye to establish a baseline for the volume of injection material. Furthermore, the group is establishing injection techniques to decrease the mortality rate of the beetles. Once the group has ascertained the appropriate methods and quantitative values necessary for the experiment to be as efficient as possible, the injections of double-stranded RNA will commence.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #7)

Effects of Mine Drainage on Stream Water Quality

Michael Lundock – Environmental Science

Faculty Mentor: Randi Brazeau

Mine drainage is known to have adverse effects on the quality of water to which receives it. There are many abandoned mine projects throughout Colorado that have discharges into natural stream systems, one of which is located near the head waters of the Rio Grande in Mineral County. This discharge flows year around into Miners Creek, which feeds into the Rio Grande. In order to determine some basic effects to Miners Creek due to this discharge, stream flow, pH, alkalinity, hardness, dissolved oxygen, phosphate and nitrate tests were taken from upstream, downstream and from the point source discharge. Due to the remote location of the area of interest, a Hach field testing kit was used to collect data. Results yielded a surprisingly low impact to the receiving stream, and considerably fair water quality of the mine discharge itself. The results may be affected by increased runoff and groundwater infiltration from snow melt. Seasonal or quarterly sampling would be necessary to yield more descriptive impacts to Miners Creek due to this Mine Drainage.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #7)

Synthesis and Properties of Paintbrush Terminated Nematic Twist Bend Material

Mitch Magrini – Chemistry

Coauthor: Nick Kuehl

Faculty Mentor: Ethan Tsai

The synthesis of novel mesogens, whose architecture was based on a previously-reported nematic twist bend (NTB) material, was affected. The **CB*X*CB** molecular structure of the NTB mesogen (Chen et al 2014) was modified by replacing one of the cyanobiphenyl units with a trialkoxy gallate phenyl ester, yielding a “paintbrush terminus”. The synthesis of the paintbrush terminated NTB material, and the

intermediates required, were synthesized with a variety of techniques including a modified Sandmeyer coupling, and multiple Suzuki-type coupling reactions. These paintbrush-terminated molecules displayed electrooptical behaviors that deviated from that of expected NTB mesogens. It is hoped that the behavior of materials such as this will prove useful in developing theoretical calculations to predict the supramolecular structure of liquid crystalline materials.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #26)

Male Choice and Pair Bond Success in the Monogamous Biparental Convict Cichlid (*Amatitlania nigrofasciata*)

Alexandria Martini – Biology

Coauthors: Leah Rice, Cynthia Mawe, Ashleigh Nakata, Alyssa Herrin

Faculty Mentor: Jennifer Gagliardi-Seeley

Most studies of sexual selection in convict cichlids, *Amatitlania nigrofasciata*, have focused on female mate choice. Previous research has suggested that male choice is just as important in biparental species (Gagliardi-Seeley, in prep). Two predictions regarding the reproductive success of convict cichlids are that males that prefer higher quality mates will choose the larger female and the rate of pair-bond formation will differ depending on their treatment group. In our experiment, a male was allowed to choose between two females of differing sizes. Each replicate had four treatment groups that had increasing levels of interaction, and male observation. The replicates lasted 21 days, with 20-minute recordings taken on Day 0, 1, 7, 14, and 21. The male's choice and the rate that the choice was made were calculated from the daily observations taken five times a day, at least an hour apart. The Control and Group 3 made a choice 100% of the time and chose the fastest of the four treatment groups. The males typically preferred the larger females to the smaller females. Although our sample size is small, we are beginning to see a trend that female competition increases the rate of pair-bond formation. This rate appears to be further increased by the male observing the interaction between the females.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #14)

Self-Control, Social Conformity and their Relation

Ian Maxwell – Psychology

Coauthors: Anastasia M. Bacca, Jennifer L. DeLange, Christine Rudzinskas

Faculty Mentors: Kristen Lyons, Lisa Badanes

This study examined how the pressure to socially conform is related to individual differences in self-control ability. Individuals need to use self-control while performing tasks or being in environments that require inhibition of automatic or tempting behaviors (Hagger, 2010). Individuals who have low self-control are more likely to exhibit socially troublesome behaviors such as higher levels of crime, impulse buying, promiscuity and dishonesty (Burkley, Anderson, & Curtis, 2011). We predicted that individuals with low levels of self-control would also be less likely to resist social pressures to conform. Thus it was hypothesized that self-control would predict a tendency to conform. Because differences in an individual's level of self-control can be measured using self-report data (Tangney, Baumesiter, & Boone, 2004), we measured self-control using an online self report survey (Self-Control Scale; Tangney et al.,

2004). We measured social conformity using change scores on an online picture ratings task (Griskevicius, Goldstein, Mortensen, Cialdini & Kendrick, 2006). Participants included 251 undergraduate students of which 63% were female and 67% were white. Results of a regression analysis supported the hypothesis that self-control is negatively related to conformity. Results also showed that female participants were less likely to conform than male participants. Implications regarding individual behaviors in social situations as well as gender effects will be discussed.

(Oral Presentation, Session IV: 3:30-3:45 PM, SSB Room 203)

Understanding Education and Health Trends in Homeless Youth

Rachel McGill – Human Development

Coauthors: Timothy Mann, Theresa Zook, Lindsey Sitz

Faculty Mentors: Bethany Fleck Dillen

The purpose of this project is to better understand trends of homelessness in Denver. Specifically, this study aims to understand the education and health of homeless youth (under 26-years-old). It will work to further describe differences that might exist between homeless individuals who are over 26-years-old. Raw data for this study was received from Project Homeless Connect (PHC), who provided two separate years, 2011 and 2014, worth of research, totaling over 1,300 participants. PHC "is a one day, free event where individuals and families experiencing homelessness can access services and resources including medical care, Homeless Court, benefit assistance, employment services, haircuts, clothing and other community resources" (Denver's Road Home, 2014). Each year the project collects data from the homeless participants via surveys. This year the program utilized Metropolitan State University of Denver students to help enter the data. The original excel files have been converted into SPSS and have been coded. Data analysis is currently underway. Upon completion, this project will aid in future research and deeper understanding the trends in homeless youth in Denver. This understanding could lead to better preventions and interventions of homeless youth.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #8)

A Comparative Study of Astronomical Databases and Software

Di Ana Teresa Mendiola – Land Use

Faculty Mentor: Stella Todd

Leaps in technology and open data have aided the continuation of the exploration and understanding of our universe. The combination of technological advancement and the availability of open data have permitted the creation of free, public databases which contain information acquired from space missions. The data provided can be analyzed through each database's user interface. However, it may also be possible for the data to be exported into and manipulated by a number of alternative public applications such as Celestia and Stellarium. Each application differs in their ability to navigate through celestial bodies and perform functions, yet there does not appear to be an application that enables the ability to perform spatial analysis of our universe. At most, many of the alternative applications are able to provide details such as how far a celestial object is from Earth and the object's primary composition. The databases permit the user to view a time series of astronomical bodies, create graphs and interactive tables, and a few other functions. The applications and databases are useful in their own right; however,

combining them may prove to be a useful solution to performing strong spatial analysis that will enable a stronger understanding of the universe.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #15)

Resistivity of Common Commercial Building Stones

Kathleen Meyer – Environmental Science

Faculty Mentor: Barbara EchoHawk

A study of the resistivity of common commercial stones due to chemical and physical weathering, as well as determining the cause of radiation found in the building stones.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #9)

Incorporating Low-Cost Instrumentation for Increased Electrochemistry Exposure in General Chemistry Laboratories

Ebony Miller – Environmental Biology

Faculty Mentor: Andrew J. Bonham

Electrochemistry is an industrially, analytically, and medically important field of chemistry; however, electrochemistry concepts and techniques are rarely introduced in the general chemistry curriculum. Two factors contribute to this lack of incorporation. The first factor is that electrochemistry is widely viewed as non-intuitive, requiring additional physics preparation. The second factor is that largely reliable electrochemistry instrumentation is outside the budget of student laboratories. In this work, introductory electrochemistry experiments are being investigated for incorporation into the general chemistry curriculum. These guided-inquiry lab experiences will utilize a low-cost electrochemistry device‒the CheapStat‒that Dr. Bonham et al. have previously developed. This will allow the development of self-guided labs that use the CheapStat, where the student can learn independently instead of using limited time on a single classroom machine. These experiments will use electrochemistry to investigate relatable concepts, such as verifying the concentration of pain relievers in common cold medicine. It is hypothesized that students who complete these self-guided labs will gain a deeper insight into electrochemical theory and techniques. Currently, labs are being developed and verified to ensure they are reliably reproducible, engaging, and incorporate best practices for self-guided lab experiences. In the future, we plan to assess general chemistry laboratories that complete or do not complete these modules and assess the impact that they make on the educational experience and knowledge of electrochemistry.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #16)

Bio-Diesel Reactor

Graham Miskella – Mechanical Engineering Technology

Coauthors: Brenden Burg, Francisco Vasquez, Tyler Lira

Faculty Mentor: Devi Kalla

The purpose of our project is to improve the efficiency and safety of the MSU Denver Chemistry departments existing bio-diesel reactor. Our mission is to take the existing setup, which has multiple safety issues and does not create a high enough quality end product, and create an industrial grade setup which will produce a high quality product. A short list of improvements being made are; mounting new heaters, condensers, and two new 15 gallon conical tanks. In addition the process will be controlled via PID controllers in stead of plugging and unplugging a heater to obtain the proper temperature. Our primary objective is prioritizing the safety of the operators. Our secondary objective is to allow the operators to produce a product which will be able to be used in on campus generators.

(Oral Presentation, Session II: 10:30-10:45 AM, SSB Room 205)

An Investigation into the Lack of Climatically-Driven Variation in Internal Nasal Fossa Breadth

Elizabeth Moore – Anthropology

Coauthors: Arielle Dening, Nathan E. Holton

Faculty Mentor: Todd Yokley

Previous studies have analyzed variation in recent and fossil human samples using a series of linear skeletal measurements, concluding that populations from cold and/or dry climates have narrower, taller, and deeper nasal cavities than populations from hot, humid climates. This pattern has been suggested to reflect a climatological adaptation. However, these studies did not find significant differences in internal nasal fossa breadth (INFB), defined as the greatest distance between the lateral walls of the nasal cavity, at the inferior portion of the nasal cavity in modern humans. A methodological issue with measuring INFB is the metric only measures the widest point of the internal nasal cavity. Therefore, INFB may not be a good indicator of the average breadth of the nasal cavity from anterior to posterior, which is hypothesized to be physiologically relevant for climatic adaptation. To test this hypothesis, we assembled a sample of CT scans of 25 living humans and, for each individual, measured the maximum nasal cavity breadth on each of 100-150 coronal slices spanning the anterior-posterior extent of the nasal cavity. Using the measured maximum breadth from each slice we calculated an average nasal cavity breadth and compared it to the maximum INFB for each individual. Regression analysis revealed an R2 of .908 indicating that INFB is a good reflection of the average breadth of the nasal cavity anterior to posterior. These results do not support our hypothesis, and suggest that selection may be stronger on the middle and upper portions of the nasal cavity.

(Oral Presentation, Session III: 2:00-2:15 PM, SSB Room 203)

Oaxaca, A Collection of Cuisine and Culture

Thomas Mortensen – Hospitality Tourism & Events

Coauthor: Jason Rice

Faculty Mentor: Jackson Lamb

The opportunity to participate in the VII Congresso Internacional de Gastronomia y Turismo in Oaxaca, Mexico had the billing to experience a unique culinary scene and culture far away from Colorado. But it produced much more then expected. The original purpose of participating was to compete in a two course, timed cooking competition, learn about technics and ingredients being used by chefs from eight different Latin and South American countries, and experience the Oaxacan culture first hand. While preparing, in Oaxaca, for the competition simple ingredients were not commonly available. Unexpected competition parameters were introduced making past preparation inadequate. Cooking demonstrations put on by guest chefs were insightful and innovative. The exposure to Oaxacan culture provided the most rewarding learning experience of the whole trip. Introduction to native costumes, dances and foods that are associated with different regions was a welcomed surprise. The simplicity of cooking techniques using open fires and fresh indigenous foods could be easily be duplicated on the streets in the states if not for the sanitary regulations, zoning laws or building codes that are already in place. The 450-year old colonial historical section of the city built in Old Spanish architecture was maintained and added an amazing backdrop to the downtown. There is a drastic difference in the feel of Downtown Oaxaca and the suburban ghettos throughout the valley. With all of these enriching activities and experiences in Oaxaca, the participation in the VII Congresso Internacional de Gastronomia y Turismo is considered a wonderful success.

(Oral Presentation, Session II: 10:45-11:00 AM, SSB Room 203)

Colorado Prairie Grassland Restoration: an Analysis of Land Management on the Rocky Mountain Arsenal National Wildlife Refuge

Jennifer Mueller – Biology

Faculty Mentor: Christy Carello

The Rocky Mountain Arsenal National Wildlife Refuge (RMANWR) is located in a grassland habitat that has been highly altered as a result of military activities. In the last few decades efforts have been made to restore potions of the RMANWR to a healthier grassland, facing the challenge of fighting invasive weed species. Parcels of habitat have been delineated based on the location of prairie dog (*Cynomys ludovicianus*) colonies. Controlled burning and herbicides have been used in an effort to control Cheat grass (*Bromus tectorum*) on some colonies at RMANWR. I compared two colonies on the arsenal; one that has received little to no management (control) and one that has received high levels of management to control the invasive cheatgrass. The vegetation present on each colony was analyzed in order to determine if the management applied to the treated colony has led succession in a more "native" direction. Eight to ten one-meter squared quadrats were randomly sampled for species richness and abundance at each location. Statistical analyses determined the presence or absence of a statistically significant difference in various categories between the two colonies. My findings suggest that the treated colony has not begun to progress to a more "natural" state but instead showed statistically more Black bindweed (*Polygonum convolvulus*) and Slender russian thistle (*Salsola collina*), both an invasive species. This implies the management applied has not had the desired effect on the habitat, and that further management techniques will be required to restore the site to a more "native" state.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #27)

Care Provider Educational Role in Pregnancy Management

Amy Murlowski – Nursing

Coauthors: Veronica Ceniceros, Jennifer Lujan

Faculty Mentor: Alexis Newton

Purpose: The purpose of this proposed research study is to identify current patient education regarding pregnancy activity, nutrition, and weight gain. *Background*: The importance of informing pregnant women regarding lifestyle management during pregnancy is crucial in order to enhance pregnancy outcomes, yet not all women report receiving adequate information. Pregnant women are not always counseled on weight gain or lifestyle management during pregnancy, which leads to women drawing their own conclusions. This study intends to examine what care providers are actually advising and how much time is spent counseling patients. *Methods*: This study will request that mid-level providers read a case study and fill out a short-answer survey describing nutrition, exercise, and stress management guidance. The data collection will include care provider role, length of practice, and qualitative responses to the case study. *Discussion*: This research is important, as it will clarify how many providers are adhering to current recommendations and assist to identify areas for further study.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #20)

The Effects of Colonialism and Communism on Post Transition Economies

Alysa Nance – Finance

Faculty Mentor: Adrian Shopp

There is no denying the effect of government on economy. For centuries, governments have effected, influenced and shaped economic conditions through policy decisions. My paper, discusses the lasting effects of government on economy. The paper discusses differences between Colonialism and Communism, and their effects on economies. I explore the effects of communism and colonialism on economies. Using examples of transitional economies, we seek to examine what makes some flourish while others fail.

(Oral Presentation, Session II: 10:45-11:00 AM, SSB Room 207)

Mimicking the Extracellular Matrix for the Differentiation and Delivery of Neural Cells to Areas of CNS Disease and Injury

Nickolas Nelson – Biology

Coauthor: Michelle Desmarais

Faculty Mentor: Douglas Petcoff

In disease and injury to the Central Nervous System (CNS), mechanisms of damage and inhibition of regeneration occur alongside permissive and reparative mechanisms. In order to effect clinical recovery and regeneration of CNS tissue, a mechanism for the staged delivery of factors to mitigate the glial scar and provide maturing neural end lineages for regrowth and remyelination is essential. Three-dimensional culture scaffolds recapitulate aspects of the native cellular microenvironment for *in vitro* cell culture, including critical mechanical and biochemical cues that occur in the native extracellular matrix (ECM) while facilitating hierarchical processes such as end neural lineage maturation, migration and tissue

organization. In this study, synthetic peptide-based hydrogels were utilized to provide an active 3D matrix in support of the differentiation of mouse neural precursor cells into neural end lineages and the delivery of those maturing cells to areas of CNS injury. The peptides utilized have a balance of hydrophobic, hydrophilic and charged segments which contribute to the material stability in neutral pH and different temperatures and allow for the natural exchange of nutrients, growth factors, and oxygen between cells. Different formulations of the hydrogel matrix were tested to determine the hydrogel concentrations that provided the mildest cytocompatible conditions and that were easily modified to possess cell adhesion ligands, desired viscoelasticity, and degradability. The delivery of the intact matrix containing the appropriate growth factors, reagents, and maturing neural cells, affords the opportunity to foster the repair and replacement of neural tissue and remyelination of CNS tissue and the recovery of CNS function.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #11)

Utilizing the ND5 gene to Genetically Characterize Cutthroat Trout

Nickolas Nelson – Biology

Coauthor: Christina Hall

Faculty Mentor: Douglas Petcoff

The Cutthroat trout, *Oncorhynchus clarki*, is a complex that contains four infra-species and 14 sub-species. Overall, populations of Cutthroat trout have been greatly reduced throughout the West and two sub-species are considered extinct. Decades of habitat alteration, over-harvesting and competition from introduced salmonid fish are the main causes. In this study, the effort has been focused on the isolation and sequencing of the ND5 mitochondrial region, a highly conserved and an essential subunit of the respiratory NADH dehydrogenase (Complex I). Mitochondrial DNA was extracted from fresh samples obtained from a number of diverse locations in Colorado. Primers specific for the ND5 gene were employed to provide samples for sequencing and comparison with previously described sub-species specific single nucleotide polymorphisms (SNPs) obtained from ND2 and CO1 gene sequences from the same sample population. Genomic and bioinformatic studies have been employed to assess the correspondence between SNPs from the respective gene sequences in order to assess the reliability of the mitochondrial markers currently in use. Sequenced mitochondrial genome products were aligned, queried against existing published sequences, and analyzed for maximum parsimony, pattern heterogeneity, within group mean distance and between groups mean distance, mean diversity within subpopulations, maximum likelihood, minimum evolution, amino acid, and nucleotide composition. Several measures of DNA sequence variation have been calculated within and between populations. The effective restoration of native populations depends entirely on the reliable identification of remaining indigenous populations of cutthroat trout. The ND5 gene is proving to be a reliable marker for the determination of sub-species status.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #10)

Brain Waves and Blood Pressure of Meditation and Mirthful Laughter

Angelica Neuschaefer – Psychology

Faculty Mentors: Jovan Hernandez, Cynthia Erickson

What is the relationship between the mind and body? As research progresses we continue to find evidence supporting a direct mind and body connection. It may be that our thoughts and experiences cause

physiological responses which are either beneficial or detrimental to our health and wellness and vice versa. In a recent study it was found that mirthful (warm and tender) laughter and meditation created similar patterns of brain activity. Other recent studies showed a correlation between reduction in blood pressure from performing a guided meditation as well as after an episode of mirthful laugher. Furthermore, there may be a connection between meditation, mirthful laughter and increase in immune functioning. The current study builds upon previous research by measuring both brain waves as well as blood pressure during mirthful laughter and guided meditation videos. Conclusions to this study will be demonstrated by proposing data gathered from a four electrode electroencephalography (EEG) attached to the scalp of the participant, as well as an automatic blood pressure cuff, during a control (sitting still and doing nothing) reading, a guided meditation video reading, and a mirthful laughter video reading. It is proposed that the mirthful laughter and guided meditation stimulus will produce similar brain waves as well as a reduction in blood pressure readings and that this may be correlated to health benefits. If this is the case, it may be that laughter and meditation could be valuable options for preventative health measures.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #25)

"Is There a Mosquito BMI?" Field Evidence that Populations of *Aedes vexans* and *Culex tarsalis* Maintain a Seasonal Nutritional Stasis

Ngoc Nguyen – Biology

Coauthor: Duyen Tran

Faculty Mentor: Robert Hancock

Energy, as carried from larval stages into adulthood and then acquired by feeding on plant juices is an important key for the survival and reproduction of mosquitoes. Much remains unknown about energy accumulation by mosquitoes as it relates to seasonality and habitat. The goal of this research was to compare energy status as measured in individual mosquitoes as a sum of the calories of lipid, glycogen and crop sugars in *Aedes vexans* and *Culex tarsalis* mosquitoes collected weekly in CO_2-baited CDC mini light traps set in 2 different Northern Colorado locations. We predicted that energy status, expressed as an index related to body size, varies between different species, habitat type and throughout the season. Comparisons of 20 mosquitoes/week/species indicated a lagging relationship between lipid and carbohydrates: high carbohydrate in 1 week followed by high lipid the next. Although body size decreased in both species throughout the season, energy index, as determined by total calories divided by winglength remained stable. These results support an hypothesis that in nature, non gravid mosquitoes acquire nectar as needed (when their lipid levels are low).

(Oral Presentation, Session II: 11:00-11:15 AM, SSB Room 205)

Comparing Two Different Methods for Teaching Nuclear Magnetic Resonance Spectroscopy

Sean Norris – Chemistry

Coauthors: Mitch Magrini, Joe Salazar, Samuel Gordon, Nick Kuehl, Devin Rourke, Alicia Gamble

Faculty Mentors: Connie Gabel

The Supplemental Instruction (SI) program has developed two different methods for helping to teach nuclear magnetic resonance (NMR) spectroscopy to students learning about NMR in organic chemistry classes. The first approach involved using a reverse engineering method that worked backwards from the molecular structure to predict the NMR spectra. The focus of this method was to help students understand how to draw the various pieces of the NRM spectra, gain experience with the more complex aspects of reading NMR, and then piecing each individual part back together to form a coherent answer. The second approach was a systematic neural scaffolding method that built up knowledge in a stepwise fashion that became increasingly more difficult as the base knowledge was understood. These methods were compared using pre- and post- testing with results being compiled for specific questions pertaining to NMR. Both methods worked equally well, but the feedback from students and SI Leaders indicated a preference for the later neural scaffolded approach.

(Oral Presentation, Session II: 11:15-11:30 AM, SSB Room 205)

Cuatrocienegas: A Treasure on the Edge of Extinction

Ariadna Ochoa Magallanes – Modern Languages

Faculty Mentor: Roberto Forns-Broggi

The purpose of this research is to explain and illustrate the importance of the Cuatrociénegas valley, and why should it be protected. The valley is located in Coahuila, México. It is a system of springs, streams, and other water bodies, each of them containing a unique ecosystem. The valley is home of hundreds of endemic species, and its diversity can only be compared to that of the Galapagos Islands. According to researchers in the area, Cuatrociénegas can help scientist understand Earth and other planets' evolution. It can also allow them to find a way to revert the damage that the Earth has suffered. This research was conducted with the help of Dr. Valeria Souza, who is in charge of the investigation at the valley. Studies made by the Mexican and American scientists were used in this research, alongside scholarly articles, and a direct communication with Dr. Souza, who provided the information about her newest discoveries, and the images used in this research. After conducting this investigation, it was concluded that the Cuatrociénegas valley is crucial for the survival of our planet, and the over-exploitation of its resources must stop. If the valley disappears, it would cause the extinction of hundreds of endemic species, alongside with the impoverishment of its inhabitants, and the scientific community would suffer a great loss because the secrets contained in the valley will vanish. Cuatrociénegas has a life expectancy of only five years. Something must be done to save this treasure on the edge of extinction.

(Oral Presentation, Session II: 10:30-10:45 AM, SSB Room 203)

Directional Comparison of the Grand Monocline and Surrounding Fault Zones

Jessica Olnhausen – Applied Geology

Faculty Mentors: Uwe Kackstaetter, Barbara EchoHawk

Monoclines are a geological feature as a result of reactivation of a steeply dipping pre-existing basement block fault zone. This type of a disturbance causes the horizontal rock strata to drape over a single limb structure at a relatively gentle slope. Such structures are associated with a trending direction and a slope direction, otherwise known as strike and dip. From this it can be investigated as to what direction the actual fault trend so it can be related to the geographic alignment of other structures in the area. The trend of the Grand Monocline in Redlands, CO, has a strike of NW-SE and a dip of 45NE. The underlying fault, known as the Redland Fault Complex, also follows a similar trend. In relation to the monocline, research of the local region for other known fault zones was attempted in order to find out if they follow a similar trend. The purpose of this study was to find out if there is a relation of direction between the Grand Monocline and the surrounding fault zones. Research was done using the referenced materials and online map sources and compiling the information of the fault zones into a spread sheet, as well as cross section stratigraphy to better visualize the fault structures. In conclusion, local fault zones of Western Colorado share similar structural trends with the nearby Grand Monocline. These features have an approximate NW-SE strike and a dip direction of NE. Therefore fault zones in an area can be related to each other directionally and also associated with local geologic structures. This provides a tool to better understand local landscapes and enable researchers to find similarities between different geologic structural trends surrounding fault zones.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #22)

"To Find Oneself is to Find Our Humanity" (Deredia y Amoretti, 2013) Two Dimensional Craniofacial Forensic Reconstruction, Isla San Lucas, Costa Rica

Faye Olsgard – Anthropology

Faculty Mentor: David Hill

San Lucas Island was the location for the most notorious prison institution in Costa Rican history. Since 1873, the prison known as the "Alcatraz" of central America operated under brutal conditions until it closed in 1991. Various excavations on the island were conducted by the Museo Nacional de Costa Rica archaeologists including a cemetery site associated with the prison by artifact typography. However, the time period for the burials is not established. Pre-Columbian archaeological sites on the island have been reported as well therefore, the pre-Columbian or historic context of the individuals recovered from this site are undetermined. Forensic methods of osteologic analysis including the establishment of a biologic profile, ancestral estimation from craniometric data and two dimensional forensic facial reconstruction illustration were conducted on a selected individual specimen. The results support the conclusion that the remains of individual #10 are of historic context and relative to the prison occupation. This independent study provided a valuable exchange of training in the use of multi-disciplinary craniofacial identification methods for students and researchers in the United States and Costa Rica serving as a model for future collaborative opportunities.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #23)

Testing "Frest" *Fluminicola* Species With Mitochondrial DNA

Joshua Pedrick – Biology

Faculty Mentor: Hsiu-Ping Liu

This project uses molecular data to test "Frest" morphological based species concepts of *Fluminicola* from the Upper Klamath Lake. The mitochondrial cytochrome-b gene marker was selected to detect genetic variations within and between the populations surrounding the lake. Preliminary results show molecular based species concepts disagree with the "Frest" morphological based species concepts.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #21)

Small Engine Dynamometer

Michelle Plarina – Mechanical Engineering Technology

Coauthor: Dakotah Mann

Faculty Mentor: Aaron Brown

Knowing the horsepower and torque that an engine produces is essential to raise the efficiency of the engine. Efficiency is very important, and off the shelf solutions can be bulky and expensive. There is a need for a smaller and more cost effective dynamometer to make the ability to raise efficiency of engines more accessible. Small engines are not subject to most smog output restrictions. If more people had access to dynamometers, it might aid in lowering greenhouse emissions worldwide, helping to combat climate change. This research explores using the engine to drive water or oil through a positive displacement pump. From measuring the output the horsepower and torque output of the engine can be calculated and this can be related to efficiency. Utilizing a Hypro positive displacement pump, a pressure gauge, 2 bicycle sprockets, a bicycle chain, leftover steel for a frame, and a modified homer bucket a dynamometer was constructed that can measure horsepower ratings up to 4.7 horsepower. It costs approximately $310 in parts to construct and weighs about 30 lbs. This makes this design more portable and user friendly. The user friendly nature and inexpensive design of this dynamometer make it more accessible to the average consumer and more applicable to small engine performance enhancement which can lead to reduced greenhouse gas emissions.

(Oral Presentation, Session I: 9:30-9:45 AM, SSB Room 206)

The Origin Of The Spanish Language

Austin Plunkett – Modern Languages

Faculty Mentor: Maria Rey-Lopez

Have you ever wondered how the Spanish language was originated? How it developed throughout the centuries? Who its first speakers were? For this research, I will investigate the impacts of other languages on the evolution of the Spanish language. Its development can be divided and studied into four stages, being the first one the occupation of the Iberian Peninsula in the 17th century before Christ by certain groups of people of Germanic origins, who spoke Indo-European languages, of which one is still spoken today in certain parts of Spain. The second stage of development occurred with the arrival of the Roman people, more specifically from Italy and Greece, who made Latin the most widely spoken language in the region. Soon, other Germanic groups from Eastern Europe migrated to the region, characterizing the third

stage of development of the language. With the invasion of these Germanic groups, there was a period of complete isolation of the areas where the Latin language was spoken, therefore leading to the differentiation of the Latin language into several dialects, being Spanish one of them. Finally, the fourth stage was characterized by the occupation of the Arabs, whose language contributed significantly not only to the linguistic aspects of the Spanish language, but also to the Arts and Culture of the entire Iberian Peninsula. I will explain how these occurrences influenced/contributed to the evolution of the Latin language into different Romance dialects.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #27)

Toxicity of Heavy Metal Absorption by Plants Near Medieval-Aged Mine Tailing Materials in Erzgebirge, Germany

Misty Porter – Biology

Faculty Mentors: Uwe Kackstaetter, Michael Ketterer, Tobias W. Höfig

There is a story about a hillside in the Erzgebirge Mountains of Germany where livestock can safely graze on one side of the hillside, but become ill if they graze on the other side of the hillside on which sits a mine. This scenario is unique because many mines in the Erzgebirge mountain range were established between 600 to 1000 years ago and this extensive amount of time has possibly allowed heavy metals leached from the mine tailings to migrate into the soil now covered in vegetation. In a study conducted in 2012 on the geochemical composition of mine materials in the Freiberg mining district, Stockman et al. found that while the mines were primarily mined for Pb, Zn, and Ag, the dumps also contained mining-related elements of As, Cd, Cr, Cu, Fe, Mn, Ni, Pb, S, and Zn. Oxide weathering of these elements yields free acid and dissolves soluble metals from sulfide minerals, mobilizing the indicated chemical elements. Soil can be transformed to include heavy metals; the degree of transformation is due to factors including the cation exchange capacity, the pH, and the content of clay minerals, carbonate minerals, oxides, organic matter, and oxygen (U.S. Department of Health Services, 1993). When considering that these processes have been occurring for such an extended time period, the surrounding soil has probably been significantly affected and altered. This study investigates the absorption of heavy metals by the hair grass, Deschampsia flexuosa, growing around various mines throughout the Erzgebirge.

(Oral Presentation, Session I: 9:15-9:30 AM, SSB Room 205)

Alterations in Lung Microbiome in HIV Infected individuals with Elevated Pulmonary Artery Pressures

S. Lucero Portillo Contreras – Biology

Coauthors: Adela Cota-Gomez, Sonia C. Flores

Faculty Mentor: Sheryl Zajdowicz

HIV-associated (HAPAH) Pulmonary Arterial Hypertension (PAH) is a long-term complication of HIV patients on effective antiretroviral therapies. PAH is characterized by the occlusion of lung vessels that increase pulmonary vascular resistance causing right ventricular hypertrophy leading to heart failure. PAH is 1000 times more prevalent among HIV patients than the general population; affecting 1:200,000 uninfected people versus 1:200 HIV patients. HAPAH pathogenesis remains unclear, but one endeavor of

the Lung HIV Study focuses on alterations of the lung microbiome. We used Illumina MySeq to sequence bronchoalveolar lavage (BAL) specimens to compare lung microbiota of HIV patients with and without PAH. Mock extraction controls were also sequenced to determine environmental contamination during DNA extraction. BAL specimens were subjected to low speed centrifugation to collect eukaryotic cells (BALc) and the supernatant was centrifuged at high speed to collect the bacterial cells (BALf). The core microbial diversity between BALc and BALf was similar but different from mock extractions, indicating that there is a lung-specific community. However, there was no difference in diversity based on HAPAH diagnosis. The distinguishable communities of HIV patients and mock extractions contained high abundance of *Tropheryma whipplei* and *Pseudomonas sp*. respectively. Common oral microbes were not abundant in the lungs indicating no contamination from the oral cavity. *T. whipplei* abundance in HIV patients did not correlate with HAPAH diagnosis, CD4 count or viral load but trended toward correlation to smoking status. Ongoing longitudinal studies will continue to investigate the potential role of lung microbiota in pathogenesis of

HAPAH.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #21)

A Pilot Study Regarding An Exploratory Study of the Punitive Attitudes of Current College Students

Nicole Pyfer – Criminal Justice & Criminology

Coauthors: Maria Deleon Marquez, Anthony Cook, Madison Fischer, Michelle Schlindwein

Faculty Mentor: Rebecca Trammell

For this study, we collected anonymous surveys with current Metropolitan State University of Denver students to examine their attitudes regarding crime and punishment. We collected surveys from a small sample of students (n=123) asking about their attitudes regarding harsh punishment (favoring capital punishment, opposing early release and parole) and the harsh punishment of juvenile offenders. We found that very few people surveyed favor harsh punishment. A total of nineteen respondents favor harsh punishment and fifteen respondents favor harsh punishment for juveniles. Those who do are more likely to be between twenty-one and thirty and white. Respondents who stated they had more faith in the police also favor harsh punishment. This could indicate that more punitive respondents have faith in the criminal justice system, as a whole. They have faith in the police and believe in the principles of harsh punishment. Also, prior studies focus on the fact that White people are more likely to favor capital punishment (Soss, Langbein, and Metelko, 2003) and believe that the legal system protects them (Kennedy 1998) . However, this is a very small sample size and we use this as a pilot study. Further research should focus on the attitudes of college students regarding the criminal justice system as a whole.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #22)

The Criminal Justice System: An Ineffective Institution for Victims of Sexual Assault

Nicole Pyfer – Criminal Justice & Criminology

Faculty Mentor: AnnJanette Alejano-Steele

The purpose of this research is to explain why sexual assault cases rarely go to trial and are instead dismissed. Because the Criminal Justice System in the United States is a patriarchal, capitalist institution heavily influenced by politics, the majority of sexual assault victims are at a disadvantage when seeking justice for the crime committed against them. Other avenues outside of the System, such as Restorative Justice Programs, can be more empowering because of the focus on the victim, rather than proving beyond a reasonable doubt that a crime occurred. The following three sections will examine the history and implementation of patriarchy, politics, and capitalism, respectively, in the United States, and how they have evolved within the Criminal Justice System. The fourth section will analyze how all of these influences alienate victims of sexual assault. Lastly, alternative options for victims seeking justice will be explored, specifically restorative justice programs.

(Oral Presentation, Session IV: 4:00-4:15 PM, SSB Room 202)

Mindfulness and the Ironic Nature of Thought Suppression

Bahroze Rakeen – Psychology

Coauthor: Christina Erpelding

Faculty Mentor: Jovan Hernandez

The purpose of this study is to explore the ironic nature of thought suppression, cognitive processes that facilitate it, and to determine if mindfulness meditation could be used to effectively suppress unwanted thoughts without producing ironic effects. Skin conductance sensors were used to indirectly measure activity of the sympathetic nervous system in response to stressors and effectiveness of mindfulness meditation in reducing distress.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #25)

Investigation into the Feasibility of Creating a Warp Bubble Using Undergraduate University Physics Laboratory Equipment

Jonathan Rasmussen – Physics

Faculty Mentor: Kamran Sahami

For the past few years, Dr. Harold White of NASA's Johnson Space Center has been performing experiments that attempt to create and measure a small space warp bubble. This is in an effort to confirm his theoretical work on the Alcubierre warp theory. This study is an investigation into the feasibility of performing those same experiments using standard laboratory equipment available to an undergraduate physics student. I first examine the physics behind the theory in order to better understand it. Then a look at how White has performed his experiments will guide my setup and procedures. Finally, I investigate possible improvements to the experiment or alternative experiments that could also validate the theory.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #19)

Utilizing Mitochondrial DNA to Delineate Maternal Heritage in Desert-Dwelling Elephants of Namibia

Victoria Ratcliffe – Biology

Faculty Mentor: Hsiu-Ping Liu

Within the savanna elephant population of Africa, there exists a subgroup that lives almost exclusively in the desert of north-western Namibia. This desert-dwelling population not only faces the common threats that most elephants face, such as poaching and culls, it also faces the unique environmental pressures of the desert (Viljoen, 1988). In a previous study, (Leggett et al. 2011) mitochondrial DNA revealed that some of familial units of this dessert-dwelling population were not matrilineal, but formed loosely from more than one maternal line. The purpose of this study is to look at sequences of three genes from 105 fecal samples taken from various elephants along the two main rivers in the Kunene province, Hoarusib and Hoanib by using mitochondrial DNA for the genes. The results of this project will better clarify the maternal heredity lines within the desert populations and offer evidence for better support of conservation efforts.

(Oral Presentation, Session III: 2:30-2:45 PM, SSB Room 205)

Linking the Extreme Cold Weather Outbreaks during the U.S. 2013-14 Winter to Arctic Amplification

Erin Regan – Meteorology

Faculty Mentor: Keah Schuenemann

The 2013-14 winter brought numerous arctic air outbreaks and an outpouring of media coverage, which sensationalized those events in the United States. Although it was only the 21st coldest winter for the nation on record, it was considered anomalous among the population who was eager to blame the warming climate. Research has proposed a possible connection between these mid-latitude extreme weather occurrences and the warming arctic by way of Rossby wave amplification and the increasing loss of arctic sea ice; suggesting that an excess of heat being released into the atmosphere from the ocean can change geopotential heights and, in turn, tropospheric circulations. This study will look for evidence of that hypothesis to link the abnormalities during that season to amplified synoptic waves. Data from the NCEP-DOE Reanalysis 2 model will be used to plot variables such as geopotential heights, surface temperatures, sea surface temperatures, and latent heat fluxes, for the time before, during, and after each event to determine if it can relate back to a specific change in latent heat flux. Then comparative analysis between the specific outbreaks and climate averages will be performed to detect any anomalies during that season. This study will focus on North America and its surrounding oceans.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #26)

Seasonal Variations of Stream Parameters and Riparian Zone at Bear Creek in Lakewood, Colorado

Ron Reinfort – Environmental Science

Coauthor: Krystal Honahni

Faculty Mentor: Randi Brazeau

Annually, temperatures rise during the seasonal transition from winter to spring. As a result, accumulated snowpack in the nearby eastern slope melts, and a portion of this snowmelt is discharged through Bear Creek, eastward toward its confluence with the South Platte River downstream. An observation point was selected, near where Bear Creek passes under Kipling Street in Lakewood, CO. From this single location, a study was conducted to determine what observable effects seasonal climate changes has on stream parameters and development of flora and fauna in and along the stream bank, or riparian zone. During the observation period from mid-January to late April 2015, determination of stream parameters, including Temperature, Discharge, pH, Dissolved Oxygen, Alkalinity, Hardness, and Oxidation-Reduction Potential, are periodically performed using methods as practiced by Colorado River Watch, a volunteer program operated by the Colorado Watershed Assembly in cooperation with Colorado Parks and Wildlife. Additional analysis of levels of Sulfate, Nitrate, Nitrite, Ammonia, Phosphate, and Chloride concentrations in stream water is performed using HACH Standard Methods using meter model D900. Additional data is provided by the USGS. Photographic visual evidence of stream and riparian zone changes, with associated chemical changes, will be presented chronologically. The study determines what, and to what extent, are the relationships between winter-to-spring seasonality and observable physical, chemical, and biological stream characteristics.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #24)

Hymenopteran Richness and Abundance as a Possible Indicator of Ecosystem Recovery After Change

Kimberly Richard – Biology

Faculty Mentor: Robert Hancock

There has been research suggesting that some particular species of animals can be used as bioindicators of health and stability in ecosystems. Because of their role in the ecosystem, changes in population size and composition of bioindicators can give a general estimate of the state of the complex system in question. By using solitary parasitoid wasps (Order *Hymenoptera*) with host specificity, it may be possible to assess the general state of an ecosystem without having to do a full-scale biodiversity study. A significant flood in October of 2013 radically changed the landscape in some places along the Coal Creek corridor in Lafayette, Colorado. With the specific goal of establishing a post-flood baseline of biodiversity there, I deployed a combination of 3 standard sampling techniques to conduct an intensive survey of solitary parasitoid Hymenopteran through the 2014 season. All combined, I collected 157 individuals (from 12 families and at least 40 species) which yields a relatively low species diversity on the Simpson index when compared with other sites. In future years, I hypothesize that solitary parasitoid *Hymenopteran* diversity and abundance will dynamically increase thus supporting their use as a metric for ecosystem recovery and stability.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #23)

Subsurface Analysis of Oil and Gas Distribution in the Great Plains Field in Lincoln County, Colorado

Allison Richards – Environmental Science

Coauthor: Thomas Goldman

Faculty Mentor: Barbara EchoHawk

A trend in oil and gas exploration in Eastern Colorado has been a shift to unconventional exploration in deep Pennsylvanian layers. Previously, oil and gas exploration in Eastern Colorado has focused on significantly higher Cretaceous strata, including the Dakota and Niobrara Formations. The focus of this paper is subsurface stratigraphic and structural interpretation of the Great Plains Field in Lincoln County, Colorado. The producing zone in this field occurs primarily in the Cherokee Group, found over 7,000 feet below ground level. Formation depth and thickness are interpolated using data from well logs and scout cards. Analysis of a core sample from an adjacent field is used to describe the producing layer. Preliminary interpretation and observation of the core sample, in conjunction with previous research, suggests interbedded shale and sandstone deposits result in the primary stratigraphic control for the distribution of oil and gas within the strata. Interpretation of maps created from collected data suggests deformation of the Cherokee Group has created a series of adjacent anticlines and synclines allowing for updip migration of hydrocarbons through the sandstone facies, acting as a structural trap.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #24)

Crossing the Chemical Ocean in General Chemistry Courses

Jonathan Richards – Chemistry

Coauthors: Laura Roon, Jessica Daniel, Melanie Flores, Drue Hyde, Valerie Wolf

Faculty Mentor: Connie Gabel

General chemistry provides a critical foundation for students interested in a science-related career. The chemical ocean is a term that encourages students to get help early, to stay on top of concepts, and to avoid getting overwhelmed with material when incorporating previous concepts to new topics such as stoichiometry. Due to the vast amount of material introduced in general chemistry, it is vital that students prepare adequately in order to get across the chemical ocean. Supplemental Instruction (SI) is a program that provides peer-led sessions that help students obtain the tools necessary to successfully cross the chemical ocean. Through a multitude of techniques, SI leaders assist students to better understand core concepts in order to build a strong foundation in general chemistry. Chemistry students' knowledge was assessed by administering pre-and post-tests. Results indicate that students who attended SI sessions were able to develop a stronger knowledge base than students who did not attend.

(Oral Presentation, Session III: 2:15-2:30 PM, SSB Room 205)

Electrochemical Biosensor Development for Botulinum Toxin A

Jonathan Richards – Chemistry

Faculty Mentor: Andrew J. Bonham

Effective methods for the detection of biological toxins are vital for food safety, human medicine, environmental maintenance, and safeguarding against biological warfare. In this project, we are developing DNA-based electrochemical biosensors to sensitively detect botulinum toxin A (BoNTA), the target involved in the life-threatening paralytic disease botulism. We are utilizing rationally designed and synthesized oligonucleotide biosensors to bind to this target, generating measurable electrochemical changes upon binding the toxin in a potentiometric analysis. These biosensors are based on BoNTA binding aptamers discovered through modified SELEX procedures. They are uniquely able to capture these data in real-time in complex fluids, making them advantageous over current detection techniques. This approach should enable the detection of minute levels of BoNTA in media such as foodstuffs, blood, or water, improving both prevention and diagnosis of botulism disease. Together, development of a BoNTA biosensor will allow for detection in safety, research, commercial, and/or at-home applications.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #21)

Not the City's Number One Priority: The Story of a Homeless Organizing Group, a GIS Student, and All the Public Restrooms in Denver

Kate Rigot – Land Use

Faculty Mentor: Stella Todd

This presentation highlights one of several GIS-based geospatial projects carried out as part of an ongoing collaboration between a (GIS/geography/anthropology) university student and a local grassroots organization of homeless individuals and their allies (Denver Homeless Out Loud). The project involved collaborating with homeless individuals to not only map all of the publicly available restrooms in Denver (by creating a GIS shapefile with spatial information on each data point), but also to affix and visually represent attribute information corresponding to metrics relating to how accessible each restroom is for homeless people. The final map, constructed using ArcGIS and Adobe Illustrator, comprises a visualization of the public restroom landscape in Denver (with a focus on homeless access), and will likely be used by DHOL in their ongoing campaign for an “urban rest stop” to be constructed somewhere in Denver.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #12)

Culture Dependent and Culture Independent Analysis of Barrel-Aged Beers

Alec Rippe – Biology

Coauthors: James Richardson, David DuMoulin, Sara Ferber

Faculty Mentor: Helene Ver Eecke

Berliner-Weisse is a German beer style that ferments in wooden barrels and imparts a microbial population of both yeast and bacteria that creates complex flavor profiles. These barrels are inconsistent in microbial make-up, which can lead to an unpredictable product. Avery Brewing Company, from Boulder, CO, – contributed 13 samples from their barrel-aged Berliner-Weisse project. Our research aims

to identify the microbial population within the samples in order to better understand what metabolic processes may be influencing the fermentation process and the beer's flavor. Identification of as many members of the microbial community as possible, and using the known characteristics of these organisms could expose the metabolic processes and byproducts that impact the beer. In order to identify the microbial community present in the samples, our research employs culture dependent and culture independent analyses. Culture independent techniques included phylogenetic analysis of the bacterial community present in the beer samples via creation of a clone library targeting the bacterial 16S rDNA sequences. Culture dependent techniques included analysis of samples plated at various concentrations on 6 varieties of selective and differential solid media chosen to enrich a breadth of both yeast and bacterial species: LWYM, MYPG, WLN, HLP, GCM, and GCM+Cycloheximide. Primary enrichments were observed weekly and were propagated to isolate pure cultures that will be identified based on colony morphology and 16S rDNA sequence analysis. Further experiments may be conducted to characterize the metabolic processes of the isolates, which could link specific microorganisms to sensory and chemical analysis of the product.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #11)

The Effects of Expertise on Visual Memory

Holly Roberts – Psychology

Faculty Mentor: Cynthia Erickson

The purpose of this study is to evaluate the relationship between expertise and visual memory. Previous studies have shown that experts in a particular task or field have better memory for images related to their expertise, but recent studies have found results that are not compelling. In this study, researchers intend to improve upon recent studies by using images directly related to the expertise of two distinct fields, and will compare two separate expert groups in their memory for images related to their expertise. We expect that experts will have better memory for images related to their field than persons with different expertise, or persons in a control condition (no expertise related to either field studied in this project). The results of this study have the potential to impact educational processes and our current understanding of learning and memory.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #16)

Optimization of Electrochemical Biosensors of the Transcription Factor c-Myc for Point-of Care Cancer Diagnosis

Laura Roon – Biology

Faculty Mentor: Andrew J. Bonham

DNA-based electrochemical biosensors offer a unique method for the selective detection of a protein. We have developed and optimized a sensitive, electrochemical biosensor to detect the presence and concentration of the transcription factor c-Myc. c-Myc plays key roles in regulating many aspects of cellular replication and growth; as a consequence this transcription factor is crucially misregulated in many breast and kidney cancers. Several review studies have indicated a correlation between elevated intracellular levels of c-Myc and the presence of cancerous tissue. Although prior oligonucleotide-based biosensors against c-Myc have been developed, they rely on fluorescence spectrophotometers--equipment generally unavailable in point-of-care applications. In response, we have expanded this detection into an electrochemical format suitable for use with portable instrumentation, small volumes,

and pre-fabricated patterned microelectrodes. This biosensor has the potential to serve as an affordable, quantitative, and point-of-care tool for clinical diagnosis and academic research. Here, we demonstrate their function on conventional and microelectrodes in buffer as well as crude samples (e.g., blood serum), achieving sensitive and quantitative detection of c-Myc. These designs can be rationally extended to detect other transcription factors of interest. Thus, these electrochemical biosensors are poised to serve as potent point-of-care diagnostics in biomedical applications.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #17)

Portable Wind Turbine

Francisco Sanchez – Mechanical Engineering Technology

Coauthors: Ceana Prado Nickel, Taylor Livingston

Faculty Mentor: Devi Kalla

Our proposed project will create a wind generator that is affordable, reliable and capable of operating in a wide array of conditions. Due to the lack of reliable power grids around the world, and the wide availability of portable electronic devices there is a need for portable and reliable energy. Our wind turbine will fill a need for low budget power generation to people wishing to power portable devices while off the grid and more importantly for those in developing countries where people may not have access to a reliable grid. Using simplistic materials and design parameters, we intend to make harnessing the power of the wind a reality for a vast number of people who previously could not have afforded to purchase or maintain a wind turbine unit.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #13)

Climate Change by Ecoregion in Colorado

Stephanie Saunders – Land Use

Faculty Mentor: Stella Todd

Climate change is typically presented by politically defined boundaries. However, it is important to analyze the change by ecoregion as environmental resources are more likely to change with the ecoregion than with state boundaries. The purpose of this project is to identify if there is any change in climate variables for Colorado's EPA defined ecoregions. This research is important because climate is one of the key variables that can differentiate one ecoregion from the next. Environmental factors such as water, soil, vegetation, and wildlife are intrinsic to each region and any change in the system could have significant consequences. The data gathered for this research includes monthly averaged weather data and ecoregion polygons from the Environmental Protection Agency for the state of Colorado. The weather data which contains information regarding average monthly temperature and precipitation was gathered from the GCHN/NOAA climate records. The EPA ecoregion data was gathered from the Metro State GIS department data catalogue. The data will be analyzed using ESRI mapping software (ArcMap 10) over a 30 year period. Understanding how the climate will change within an ecoregion can help in determining how other environmental factors will be effected. This includes how the hydrology will change, how a species range or migration patterns change, or how vegetation will be affected.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #8)

Discounting History: Contemporary Imperial Japan

Alex Scarpitto – History

Faculty Mentor: Rebecca Forgash

This research examines divergent viewpoints throughout Japan regarding World War II, as presented in privately-owned or government-sponsored museums and shrines. Despite the factuality of events such as the "Rape of Nanking" and the Battle of Okinawa, the Japanese government's interpretations of the war vary greatly in comparison to those of other nations' and non-government interpretations within Japanese territory. Drawing on data collected at museums in Tokyo, Hiroshima and Okinawa, I investigate how the museums' historical narratives reflect major government interference in an attempt to justify the actions of a dead imperial regime. Contradictory memories of wartime events cause rifts between countries, both socially and politically. The Japanese government has yet to take responsibility for its actions, and continues to push its ideals on the citizens of Japan; even formal "apologies" to nations such as China have been less than genuine. I argue for further inclusive views of the past, in the interest of promoting more effective foreign policy, more accurate scholarship, and historical claims.

(Oral Presentation, Session IV: 3:45-4:00 PM, SSB Room 205)

Depression and Color Perception in College Students

Michael Schroeder – Psychology

Faculty Mentor: Lisa Badanes

This study examined the ways in which depression may change the way an individual perceives color in photographs. We hypothesized that students with higher levels of depressive symptoms would see colors in photographs as lacking vibrant colors. We also examined the relationship between stressful life events, cognitive vulnerability (interpreting stressful life events as being your fault), color perception and depression, and we hypothesized that color perception would serve as a moderator. A sample of 181 undergraduates (66% female; M age = 25) completed questionnaires assessing depression, cognitive vulnerability, and stress. Participants manually manipulated the color saturation levels on twenty photographs (10 stressful images, 10 landscape images) to accurately represent how they think the color in the photo should be represented. Results suggest that cognitive vulnerability ($r = .46$, $p < .001$) and negative perceptions of stress ($r = .78$, $p < .001$) are both associated with increased depression. Overall levels of picture saturation were not significantly related to depressive symptoms ($r = .18$, $p > .05$). However, when you separated the pictures into different type, the saturation levels of the 10 landscape pictures were associated with depression ($r(170) = -.17$, $p < .05$). Linear regression models predicting depression showed that cognitive vulnerability to depression moderated the association between stress and depression, but that color perception was not a significant moderator. Discussion will focus on the importance of understanding cognitive vulnerabilities in our models for depression and on color perception as a new mechanism of risk.

(Oral Presentation, Session I: 10:00-10:15 AM, SSB Room 203)

Influences of the Palmer Divide on Convective Storm Initiation

Andrew Schwartz – Meteorology

Coauthors: Reid Hansen, Dwight Blanche, Brandon Thorne, Joel Hansen, Dominic Carcagno, Katie Steinmann, Alex Trellinger, Tyler Croan

Faculty Mentors: Keah Schuenemann, Sam Ng, Scott Landolt

The Palmer Divide, a region of higher terrain oriented west to east in central eastern Colorado, has long been known for its impacts on mesoscale and synoptic-scale processes that affect the Denver and Colorado Springs areas. While studies have been conducted to determine the Palmer Divide's effects on surrounding weather processes such as the Denver Cyclone and Denver Convergence Vorticity Zone, unexpected storm initiation and development above the Divide is not fully understood. This research attempts to address and identify what meteorological parameters cause convective thunderstorm development along and above the Divide. In order to better understand storm development along the Palmer Divide, students in the Metropolitan State University of Denver's meteorology program deployed a surface weather station on the Divide to augment the surrounding surface station data. This data as well as radar, satellite, numerical model output, and Rawinsonde data were used to analyze case studies of convective thunderstorm development that occurred during the summer of 2014. The data obtained illustrated that in eighty percent of the convective cases analyzed, surface dewpoint depressions were greater than eighteen degrees Celsius on the Divide and in the surrounding areas as initiation and development was occurring. The data collected illustrated that low level moisture does not need to be present for thunderstorm development along the divide and that the 700 millibar dewpoint and dewpoint depression are valuable forecasting parameters to diagnosing convective development on the divide.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #19)

Snowfall Event Correlations to Time of Day for Denver Winter Storms

Andrew Schwartz – Meteorology

Faculty Mentor: Scott Landolt

Snow events can have significant impacts on human activities and forecasts of event times can be, and often are, incorrect. Beginning, ending, and duration times of snowfall in storms can be attributed to parameters such as frontal passage, stratiform versus convective precipitation modes, temperature and moisture profiles, topographical lifting, and atmospheric instability. This makes accurate prediction and forecasting of snowfall events and their timing problematic. To address this issue, research was conducted to determine whether correlations exist between snowfall occurrences and the time of day in the Denver area. The goal of this research is to establish a climatology of snowfall occurrence as a function of the time of day in order to improve the forecasting of future snowfall events in Denver. To develop this climatology, METAR data containing present weather type was obtained from Denver International Airport between 2000 and 2015 and analyzed to determine the correlation between the number of snow events reported and their time of occurrence. The secondary focus of analysis was to explore which type of precipitation event, stratiform or convective, had contributed the most to diurnal snowfall patterns by analyzing the occurrence patterns of the most recent fifty cases from each type of event after radar and satellite imagery had been used to determine event type. The results from the primary and secondary focuses of analysis will be presented.

(Oral Presentation, Session II: 10:45-11:00 AM, SSB Room 205)

Creating Change on College Campuses

Kelcie Scott – English

Faculty Mentor: Eric James

The purpose of this work is to explore the change implemented by the University of Oklahoma President David Boren made after the release of the racist chanting SAE videos. This incident is compared with other University scandals and the change or lack there of. This work addresses the ways in which peer pressure is utilized on college campuses to control students. Further, the work examines how the decision made in regards to the fraternity and students was a positive change in comparison to other negative or no change situations. The central question addresses the ways in which we can learn from previous mistakes with disciplinary attitudes with students and the positive aspects of the University of Oklahoma incident. The data gathered and analyzed will have to do with previous disciplinary actions on Universities in regards to discriminatory acts by students, as well as the ways in which the University of Oklahoma incident is experiencing backlash, including a lawsuit. All college campuses can benefit from this research, which could lead to further change initiatives in discipline actions on campuses. To further this research, one could consider the ways in which colleges can create minimum backlash when implementing positive and controversial changes.

(Oral Presentation, Session IV: 3:15-3:30 PM, SSB Room 202)

Behavioral Effects of Raptor Perch Introduction in an Urban and Fragmented *Cynomys ludovicianus* Population

Thomas Seagroves – Environmental Science

Faculty Mentor: Robert Hancock

The black-tailed prairie dog (*Cynomys ludovicianus*) is a keystone species in North American prairie and steppe ecosystems. Fragmented urban populations of *C. ludovicianus* are often controlled via relocation and euthanasia when in conflict with human land-use needs. Increasing natural predation via introduction of a raptor perch in *C. ludovicianus* populations has shown to slow population increase; however, the comprehensive effectiveness as a population control measure has varied in recent research. This study measures the effect of the introduction of a raptor perch on *C. ludovicianus* foraging and alert behaviors in a before-after, treatment-control experiment. Two urban and fragmented *C. ludovicianus* populations were chosen in Denver, CO near Bluff Lake and Sand Creek with similar road and trail proximity, active burrow density, and vegetation cover. One population was subject to the introduction of a raptor perch. *C. ludovicianus* behavior was measured via intermittent scan sampling of 100m x 30m randomly selected quadrants in each population. This research will provide valuable insight into behavioral and fitness costs associated with raptor perch introduction to *C. ludovicianus* populations, which may in turn assist wildlife managers in determining raptor perch effectiveness as a population control measure.

(Oral Presentation, Session I: 9:45-10:00 AM, SSB Room 205)

Ek Em Skjaldmær: Warrior Women in the Viking Age

Tyrel Sorensen – Anthropology

Faculty Mentor: Kimberly Klimek

The purpose of this work is to determine the literal and figurative roles that women played as warriors in male-dominated Norse society. Women warriors are common in Viking mythology and recent research is suggesting they may have been more than myth. Looking at sources, like the Volsunga Saga, contemporary historical works like the Anglo-Saxon Chronicle, along with historical literature and archaeological data, the idea that the Norse Warrior Woman is more historical than mythical is contended. This research has revealed evidence suggesting women were active participants in Norse warrior culture more frequently than has been considered in the past. This possibility begs further research into the topic and a review of relevant data obtained during times when the recognition of women's roles in all societies were downplayed as a result of long-held cultural biases favoring men over women.

(Oral Presentation, Session III: 2:15-2:30 PM, SSB Room 203)

Determination of Toxic Trace Metal Compounds in Trout Species in Colorado Mountain Streams

Morgan Spedale – Chemistry

Faculty Mentor: Garry Farmer

We have developed a trace metals analysis procedure for fish tissue using inductively coupled plasma mass spectrometry. Analyses were conducted for arsenic, cadmium, chromium, copper, lead, manganese, nickel, silver, and zinc. Quantitation limits are in the low micro-gram per gram (ppb) range. Brown and Rainbow trout species were collected from Dillon Reservoir, Georgetown Lake, and Jefferson Lake, Colorado. Waters of Dillon Reservoir and Georgetown Lake receive mine drainage, thus trout tissue samples collected from these waters are expected to contain measurable concentrations of metals. Specifically, trout from Dillon Reservoir are exposed to elevated concentrations of zinc, manganese, and lesser levels of copper. Trout from Georgetown Lake are exposed to elevated levels of zinc. Tissues samples from these respective lakes contain low levels of these elements.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #17)

Attitudes About Writing at MSU Denver

Tamara Tabb – English

Faculty Mentor: Elizabeth Kleinfeld

Composition and psychology research over the past 100 years has produced numerous theories to the cause of writing anxiety and writer's block. Researchers John Daly and Michael Miller concluded that writing anxiety is a common and pervasive condition that affects a large portion of the population. Emulating the research methods of J.A. Daly and M.D. Miller, (1975) The 'Attitudes about Writing' questionnaire aims to find the cause of writing anxiety and blocks for MSU Denver's unique student population. 'Attitudes about Writing', an anonymous questionnaire, launched on the writing center's website March 2014. The questionnaire was also available to students as a hard copy in the writing center. The collection process concluded November 2014. In an eight month period, a total of 70 responses were collected. Data gathered through the 'Attitudes about Writing' questionnaire is not comprehensive enough

to draw firm conclusions about writing anxiety among the MSU Denver student population. However, the initial analysis suggests a predominance of optimistic attitudes over pessimistic ones amongst students. This research provides interesting insights with which future researchers at the university and the writing center could use to launch further investigation.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #16)

Isolation of Novel Thermophilic Strains from Axial Seamount

Francisco Tapia – Biology

Faculty Mentor: Helene Ver Eecke

Earth's subsurface biosphere is thought to contain thirty to fifty percent of our planet's biomass that is still not well understood. Deep-sea hydrothermal vents serve as an outlet for obtaining samples of the microbial life that is thriving in the subsurface biosphere. The primary goal of this study was to focus on primary enrichments of diffuse-hydrothermal fluid samples and isolate and identify the microorganisms found in the samples. By identifying and characterizing the microbial life coming from the vents, we can further understand and develop models that can predict microbial habitability, patterns in distribution, and knowledge about the subsurface biosphere. Research cruises to Axial Seamount in the northeastern Pacific Ocean in September and October of 2013 collected samples from different hydrothermal venting locations along the underwater volcano's caldera: Anemone, Boca, El Guapo, Marker 113, and Vixen. The diffuse- hydrothermal fluid temperatures ranged from 6.7°C to 29.2°C at the time of sample extraction. These samples were enriched in an anaerobic heterotrophic sulfur-reducing media at 55°C as part of a most probable number (MPN) assessment. Pure strains were isolated using three successive dilutions-to-extinction. Two novel anaerobic, thermophilic, heterotrophic, sulfur-reducing strains were isolated from samples taken from the sites named El Guapo and Anemone. Next will be identification and characterization of these novel thermophilic strains, which will allow for further understanding of the ecology of the massive biomass living in our subsurface biosphere and how these microorganisms thrive and interact with it.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #18)

Investigating the Adaptive Significance of Intraspecific 'Instar Piggybacking' in Larval Damselflies

Samantha Taylor – Biology

Faculty Mentor: Robert Hancock

As juveniles, insects in the order *Odonata*, commonly known as dragonflies and damselflies, are obligate aquatic ambush predators that cling to submerged vegetation. Larvae undergo a series of molts, resulting in instars of increasing size. The life cycle of *Odonata* subjects may entail years in larval stages culminating with emergence as a terrestrial adult that lasts only days. Adults are known as voracious predators with impeccable aerial maneuverability that prevents them from much predation, therefore, juvenile exposure to predation and behavioral adaptations to avoid it may be essential for survival to terrestrial adulthood and sexual maturity. The behavior of larval *Odonata* has not been thoroughly described in scientific literature, though observations pertaining to movement and activity level have been attributed to possible adaptation for predator avoidance. In 2013, during *Odonata* diversity research in both the field and laboratory environments, I observed intraspecific "instar piggybacking" behavior in

damselfly (sub order *Zygoptera*) subjects, in which smaller larvae grasped onto the dorsal surfaces of larger larvae and remained in this immobile position until considerable agitation was applied. I am considering several hypotheses related to this phenomenon including: fish predation avoidance by mimicking unfavorable prey target size, substitution to satisfy perching instinct with limited substrate availability in the microhabitat, coping mechanism for spatial density dependence, and avoidance of intraspecific predation. Morphological characteristics pertaining to this behavior are also being examined. Field observations and laboratory studies are being conducted by videographic and removal techniques at Lowell Ponds in Denver and microcosm experiments at Metropolitan State University of Denver, respectively.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #21)

What Risks Climate Change and Water Usage Have on the Quality of the South Platte River Basin

Tanya Thames – Environmental Science

Faculty Mentor: Randi Brazeau

In the United States, as required by the Clean Water Act, surface water s is classified according to their "beneficial uses". Standards then are adopted as necessary to protect these uses. Beneficial uses typically include domestic water supply, agricultural water supply, recreation, and protection of aquatic life. The South Platte River basin of Colorado provides drinking water to over 75 percent of Colorado's residents; it is also an area of intense agriculture supported by surface-water diversions from the river. The purpose of this study is to examine what significant risks if any, over usage and climate variability has on the water quality of the South Platte River.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #17)

"Killing "The Angel in the House" in Elizabeth Gaskell's North and South

Pamela Gates-Trayser – English

Faculty Mentor: Gloria Eastman

The purpose of this research is to identify the various tactics that Elizabeth Gaskell uses to push against the Victorian Era gender ideals, essentially killing the notion of "The Angel in the House" that was so prevalent during the time in which she wrote the novel North and South. Coventry Patmore's poem "The Angel in the House" places middle class women into the domestic sphere (all education and behavior should revolve around activities in the home). Gaskell works against this ideal by presenting a female protagonist, Margaret Hale, who has progressive feministic behavior. Margaret represents the male figure both within the dynamic of her family, as well as in the relationship she has with John Thornton. Evidence from the text shows Margaret taking on the role of male head-of-household within her family, namely in taking on responsibilities that her father should have and the feminine aspects given to Mr. Hale. A comparison between the characterization of Margaret with the frailty of the other female characters in North and South reveals Margaret as the sole strong young adult. This research will provide valuable information on how, in a time when Victorian Era ideals were strong, one female author was working to eradicate the notion that women could not own property, be educated, or go against "The Angel in the House" norms to find success.

(Oral Presentation, Session II: 11:00-11:15 AM, SSB Room 202)

Heterospecific Eavesdropping on Black-capped Chickadee (*Poecile atricapillus*) Alarm Calls

Vinson Turco – Biology

Faculty Mentor: Christy Carello

Many animals are able to communicate the presence of a potential predator through vocal signaling. It is known that Black-capped Chickadees (*Poecile atricapilla*) are able to not only advertise the presence of a potential threat but can also indicate varying levels of risk associated with a threat through a complex alarm call. While it has been shown that some birds eavesdrop on the alarm calls of other species it would greatly benefit heterospecifics living in sympatry with Black-capped Chickadees to understand the degree of danger being communicated as well; fleeing in response to non-urgent calls wastes both energy and time. In this study we are performing playbacks of various Chickadee alarm calls and measuring the response in a number of other bird species to determine which are able to discern between the different degrees of urgency being communicated. Though we are still in a relatively early stage of data collection, the most urgent of calls have, thus far, elicited the greatest response in House Finches (*Carpodacus mexicanus*). It is hoped that as ensuing playbacks are performed, meaningful data can be collected. Although the response of animals to heterospecific alarm calls has been demonstrated, the ability of one species to interpret and respond to variations within a call has only recently begun to be explored and has potentially great implications for avian ecology.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #12)

Teaching Tools and Other Factors that Influence Exam Scores in Introductory Psychology

Marlene Ventura – Psychology

Coauthor: Rory Flynn

Faculty Mentor: Cynthia Erickson

The central question of this study is what factors influence test performance in introductory psychology students. This study analyzes the relationship between exam scores and variables such as study aids, day of the week, and time of day. Study aids involved crossword and word search puzzles. Since crossword puzzles require students to think about subject material, instead of simply searching for words, we theorized that exam scores would be higher for crossword puzzles than word search puzzles. The data gathered consisted of de-identified exam scores from five introductory psychology classes. A professor of introductory psychology retrieved and de-identified the exam scores from her previous classes. Data was analyzed using t-test and ANOVA. Findings suggest no difference in exam scores between crossword puzzles and word search puzzles, results may be due to students not completing the puzzles, which were optional. Neither day of the week nor time of day had a significant effect on exam scores. Professors and students of introductory psychology may benefit from this research by helping identify whether certain tools and strategies enhance academic performance. Future research could examine relationship between spring and fall semesters as well as compare exam scores between morning and afternoon classes.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #15)

Long- and Short-Term Memory for Pictures

Charles B. Walters – Psychology

Coauthors: Marlene Ventura, Rory Flynn, Lina Mikelevicius, Anastasia Zavilla, Sean Vieau, Nicholas Kraus

Faculty Mentor: Cynthia Erickson

Recent neuropsychological studies have demonstrated that the medial temporal lobe and the prefrontal cortex have complementary roles in memory for pictures. On the contrary, studies from monkeys indicate that neurons in the medial temporal lobe are involved in recognition of visual images or pictures; whereas the prefrontal cortex is involved in holding a particular image in mind for a short period of time. We aimed to further examine this relationship in humans. In this study, we defined long-term memory as memory in which a lasting and non-changing relationship exists between a stimulus and a response. Short-term memory was defined as memory in which the relationships between the stimuli and responses change on a trial-to-trial basis. We proposed that if the two types of memory are interdependent in humans (involving complimentary rolls from both of the above mentioned brain areas) then, when we test individuals on both kinds of tasks, their performance should be correlated. However, if they are independent, then there would be no correlation in performance on the tasks. Each participant was tested on three tasks. The first task is a long-term memory task, the second task is a short-term memory task, and the third task is a combination of the first two tasks. The third task required participants to use both short-term and long-term memory. Adults of all ages were tested on tablet computers. The results of this study may help us understand the neural relationship between short-term and long-term memory.

(Poster Presentation, Session IV (3:30-4:30 PM), Poster #14)

Characterization of Iron Homeostasis in Group B *Streptococcus* through Transposon Mutagenesis

Heather Ward – Biology

Faculty Mentor: Sheryl Zajdowicz

Group B *Streptococcus* (GBS), or *Streptococcus agalactiae*, is a known bacterial pathogen responsible for serious neonatal infections. Iron is essential for most pathogens; however, the amount of available iron in the host environment is limited. To overcome this challenge, many pathogenic bacteria produce extracellular siderophores to scavenge iron from the host. Despite the importance of iron, it is toxic at high concentrations; therefore, iron-dependent regulators, such as Fur, tightly regulate iron acquisition. While siderophore activity has previously been reported in *S. agalactiae* and genome analysis indicates the presence of a Fur-like regulatory protein, limited information is available regarding siderophore biosynthesis and regulation in this important pathogen. The purpose of this study is to begin to characterize the iron uptake mechanisms used by *S. agalactiae*. *S. agalactiae* strain A909 was grown in media having varying amounts of iron, supernatant was collected, and Chrome Azurol S (CAS) assays were used to quantify the amount of siderophore produced. We showed repression of siderophore activity with increasing iron concentration, suggesting iron-dependent regulation. To identify genes involved in siderophore biosynthesis in *S. agalactiae*, a transposon-insertion library was generated in *S. agalactiae*. These mutants will be evaluated for defects in iron uptake mechanisms, the location of transposon will be identified, and regulation of each iron-uptake associated gene's expression will be determined.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #14)

Online Course Versus Interactive in Person Lecture: The Effects of Instructional Format on College Students' Awareness and Acceptance of Rape Myths

Alexis Warden – Psychology

Coauthors: Michael Van Sickle, Abby Wright, Bianca Gonzalez, Ryan Pahlavan

Faculty Mentor: Jovan Hernandez

The purpose of this research is to bring to light the alarming number of sexual assaults on college campuses across the United States and what training methods are most effective at decreasing the numbers. According to the 2014 White House Report 1 in 5 women in the United States were sexually assaulted during their time in college. One possible reason for the high number of sexual assaults could be the lack of education that students receive on the topic. Rothman and Silverman (2007) found that students who received no prevention education were 1.74 times more likely to experience a sexual assault during their first year of college than those who received the education. Similarly, Jozkowski, Peterson, Sanders, Dennis, and Reece (2014) found glaring discrepancies between gender and conceptualizations and indicators of consent. Much of the past research has focused on education done in person from peers or professionals with very little research being done with online trainings. Yet, many colleges are already using online training modules. Working closely with the Phoenix Center at Auraria, an online sexual assault training module was created along with a 30 minute in-person presentation. Participants complete either the online or in-person training, they are then asked to fill out questionnaires measuring their acceptance of rape myths. The control group completes the questionnaires without any training. The outcome of this study will show whether an online training or an in-person interactive training is more effective at decreasing students' acceptance of rape myths.

(Oral Presentation, Session IV: 3:30-3:45 PM, SSB Room 202)

Gold Nanoparticle-DNA Platform for Aptamer-Based Protein Detection

Ryan Warren – Biology

Faculty Mentor: Andrew J. Bonham

Metallic nanoparticles (NP) have been used as the basis of versatile new classes of bio-medical tools. NP-biopolymer conjugates have been used as sensitive tumor markers, MRI imaging contrast enhancement tools, novel chemotherapeutics, and as biosensors. Particularly, NP biosensors can be built that use the unique surface plasmon features of metallic NP to enhance the sensitive molecular fingerprinting technique Raman spectroscopy. Here, we aim to expand on the utility of rationally designed DNA oligonucleotide-based biosensors by expanding them from electrode-bound platforms to NP-conjugated, solution-phase systems. Gold nanoparticles (10-50 nm diameter) were synthesized via citrate reduction of gold aurate, followed by conjugation to thiol-modified DNA probes and spectroscopic characterization. The NP-DNA conjugates display unique molecular fingerprints, and we hypothesize that variations in these unique spectroscopic features can be used to track the association of small molecule and protein targets of interest with the NP-DNA assemblies. This would provide a rapid, responsive measure of target concentration using Raman spectroscopic investigation. Field portable Raman tools are already common in the manufacturing and food safety industries, and those tolls, with our NP-DNA assemblies, could be adopted rapidly into a useful new class of medical point-of-care diagnostic. This work describes our fabrication and characterization process, as well as our results using the NP-DNA platform to detect transcription factor proteins.

(Oral Presentation, Session I: 9:30-9:45 AM, SSB Room 205)

Comparison of Methods for Detection of Fecal Contamination from Outfalls on the Platte River

David Watson – Biology

Coauthors: Jon Novic, Megan Filbin-Wong

Faculty Mentor: Rebecca Ferrell

This study is using molecular quantification of human *Bacteroides* spp. with a human specific probe designed for a Taq-Man Quantitative polymerase Reaction (Q-PCR) to identify human sewage output at three outfalls on the Platte River in Denver, Colorado. We are also using culture quantification with a commercial kit (Colilert, Idexx, Inc.) that is the standard method used by the Environmental Protection Agency to identify human sewage contamination. The human *Bacteroides* Taq-Man Q-PCR method was established by a research team in cooperation with the EPA to replace culture quantification techniques for *E. coli* currently used to identify human sewage contamination. Current *E. coli* culture quantification assays have the limitation that they do not differentiate between human and non-human sources of fecal pollution. The molecular-based human *Bacteroides* assay has the advantage of only identifying the input of human fecal material. The data from the two methods will be used to identify how much human source fecal pollution is discharged from the outfalls in question and to identify what level of culturable *E. coli* is discharged from the same outfalls. The City of Denver is currently facing significant fines related to fecal pollution, and these data will be used in an appeal to the federal government for reevaluation of the component of *E. coli* pollution that is of human origin in the Platte River.

(Poster Presentation, Session III (2:00-3:00 PM), Poster #5)

Sandstone Accumulation Near Muddy Gap Wyoming

Cailleach Way – Applied Geology

Faculty Mentor: Barbara EchoHawk

The purpose of this research is to investigate the thickness of Paleozoic sandstone in the Muddy Gap area of Wyoming. The initial question to be answered by this research is whether or not there is thicker sandstone at Muddy Gap compared with the surrounding area, as suggested by anecdotal evidence. Thicker sandstone at Muddy Gap would suggest the possibility of structural control such as faulting and basin subsidence during the time of deposition. This, in turn, could significantly influence models for exploration of oil and gas in the region. The methods used to conduct this research are analysis of well logs for sandstone formation thicknesses from oil and gas fields surrounding the Lost Soldier Oil Field at Muddy Gap, paired with published references on Wyoming oil and gas fields. Isopach maps of sandstone thickness and subsurface structural maps will be constructed from the field data in order to compare the thickness of the Paleozoic sandstone in oil fields at Muddy Gap and surrounding areas.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #9)

The Settlement between Slave Masters, Magistrates, and Ministers to Convert Slaves in British North America

Trent Whalin – History

Faculty Mentor: Shelby Balik

Though one normally associates slave masters, magistrates, and ministers in British North America with supporting each other's efforts to keep authority, a different picture emerges when it came to the Christianization of slaves. A power play unfolded between these three groups where they took opposite sides regarding the conversion of slaves and each had differing goals. The slave masters wielded economic power and sought to keep that power which largely resulted in either neglecting the conversion of their slaves or willfully keeping them from Christianity. The magistrates had the goals of serving the church and to bring order to an emerging society while acting as intermediaries. The ministers had the goals of converting and ministering to all including the slaves who they perceived as neglected spiritually in the New World colonies. They each sought to make the institution of slavery in the image they wanted it. These three groups, each with differing goals and interests, defined a new balance of power in the colonies as they shaped the institution of slavery and its relationship to Christianity. Through sermons, tracts, and laws, these three groups arrived at a public 'settlement' that fit all of their goals.

(Oral Presentation, Session II: 10:45-11:00 AM, SSB Room 202)

Artificial Bicep

Stephen Whatley – Mechanical Engineering Technology

Faculty Mentor: Devi Kalla

The goal for this project is to develop a mechanical system capable of simulating the function of the muscle bicep. When analyzing today's most advanced prosthetics it can be seen that they are a mechanical solution to an organic problem. In terms of how they move a prosthetic arm functions nothing like the real thing and this might limit their functionality in the years to come. It is speculated that in the coming years this problem might be cover come by building prosthetics to look and function like the real muscles that they replace. Sadly today's technology is not quite close enough to make the synthetic muscle fiber needed to build a true artificial arm, but it is possible to build a system that can mimic the mechanics of the human arm. By building a system that can mimic the functionality of the human bicep this can be used as a means by which to compare the viability of using such a system over a more mechanical solution.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #8)

Insight's Impact on Increasing Interest in STEM

Salina Whitaker – Psychology

Faculty Mentor: Pamela Ansburg

Aha! or sudden insight moments can be both emotionally and physiologically rewarding and enhance confidence in the liking of the insightful answer. However, research has not tied these findings specifically to generating interest in STEM subjects. This current research studies whether science-based insight can increase learning and stimulate interest in science. Using visual puzzles, the research will first pilot the insight generating materials. Starting with a highly zoomed-in photo, a progressive series of photos will zoom out slowly requiring the participant to identify groups of either science-based (giraffe,

cactus) or everyday (toothbrush, Lego) objects. Participants will then rate their level of insight in solving the puzzle. They also read and rate interestingness of science facts related only to the science photos. Using the most insight generating puzzles from the pilot, experimental groups solve either the science-based or everyday-based puzzles, read the science facts, and answer quiz questions. The control groups will read the facts without prior insight, view only fully zoomed out photos, and also read the facts and take a quiz. Correlations with personality and demographics factors will assess possible individual differences. A test of willingness to delve deeper into any of the science subjects will provide further information on levels of interest. Those who had insight should demonstrate higher quiz performance and interest towards science than those who solved everyday object puzzles or had no insight. This research hopes to model Aha! moments and associated emotional and physiological rewards in generating increased interest and learning in STEM participants.

(Oral Presentation, Session II: 11:30-11:45 AM, SSB Room 203)

Wrecking Work with Rudeness: Behavioral Outcomes of Experienced Incivility in the Workplace

Aryanna Wiggins – Psychology

Faculty Mentor: Courtney Rocheleau

Research on incivility within the workplace has grown substantially in the last 15 years revealing the veracity of the topic, and the areas that are still unexplored. The magnitude of the research associated with incivility covers a wide range of information. This work has a smaller scope than previous literature reviews completed by Hershcovis (2011) which focused on different forms of unethical behavior and the outcomes of the target, including bullying (higher form of mistreatment than incivility), social undermining (in which intent to harm is non-ambiguous) and finally perceived incivility. This literature review is more focused at delving into a specific facet of incivility making it distinct from the work done by Schipzand, De Pater, and Erez (2014) as their literature review is a comprehensive review of the extent of incivility work done in the last 15 years. This literature review being focused on the behavioral outcomes of experienced incivility will add to the knowledge that is needed to better understand and progress the topic of incivility in the workplace for future research.

(Oral Presentation, Session III: 2:00-2:15 PM, SSB Room 202)

The Relationship Between Personality, Mindfulness, and Task Performance

Aryanna Wiggins – Psychology

Faculty Mentor: Jovan Hernandez

Personality has been a common psychological variable of investigation for an extended period of time. An area that has utilized personality research has been occupational work placement. In addition, mindfulness is becoming an increasingly large area of research in the last decade. The research in mindfulness is lacking in regards to the work environment. This study aims to expand the research and investigate relationships between personality, mindfulness and task performance, specifically measured through anagrams (word puzzles). Data is currently being collected. Research investigating the relationship between mindfulness and task performance is sparse, and even more so in regards to the use of anagrams as a measure. The use of an anagram task is useful for the representation of inductive reasoning that is representative of cognitive abilities within a person. Tasks that represent cognitive abilities are often used

in the workplace or in measuring for research rooted in organizational content (Psychometric Tests, 2015).

(Poster Presentation, Session I (9:30-10:30 AM), Poster #5)

Honey, I Can't Blend In: A Discourse Analysis

Sam Williams – Anthropology

Faculty Mentor: Andrew Pantos

This presentation is based on a qualitative study looking for clues of the larger social discourse embedded within naturally occurring conversation. My research question was whether or not the present discourse would be indicative of larger social discourse within the LGBTQ community. My hypothesis was the naturally occurring conversation would have many instances reflecting the social discourse of the LGBTQ community. The conversation was analyzed with James Gee's Seven Language Building Tasks (Significance, Practices, Identities, Relationships, Politics, Connections & Sign Systems and Knowledge) with many connections found between the two discourses. After applying all Seven Language Building Tasks, I found the conversation evidenced three major themes within the larger LGBTQ discourse: encouragement of the gender binary system, divisions within the LGBTQ community and the complete exclusion of bisexuals.

(Oral Presentation, Session I: 9:00-9:15 AM, SSB Room 203)

Decreasing Writing Apprehension and Anxiety via Increasing Self-Confidence and Self-Efficacy

Abby Wright – English

Faculty Mentor: Elizabeth Kleinfeld

Many people are not self-assured about their writing abilities and thus avoid writing, perpetuating a cycle of insufficient practice resulting in poor performance, in turn decreasing gratification and confidence, while increasing apprehension and anxiety. Studies have found that high writing apprehension is related to low writing comprehension, avoidance of writing-related opportunities, and lower overall self-esteem. What a person believes he or she can do is not necessarily fact but has a great impact on performance. The purpose of this research is to explain how self-confidence (one's concept of competence in a skill) and self-efficacy (confidence in one's ability to learn a new skill) relate to the writing process and product and to suggest how educators can help foster self-confidence and self-efficacy in writers. Based on various studies, techniques include providing writers specific, descriptive feedback; helping them organize and set feasible but moderately difficult goals; helping them make discoveries about their own work; helping them achieve tangible success when mastering new skills; encouraging them to view their successes as results of their efforts/abilities; letting them know that even experts experience writing anxiety; and being genuinely interested and friendly. Based on those techniques for boosting self-confidence and self-efficacy in writers, the researcher recommends certain class exercises and engaging questions for student-student and student-educator discourse, as well as potential future research to help writers and educators.

(Oral Presentation, Session I: 9:15-9:30 AM, SSB Room 203)

Development of the Confusion of Transgender Issues Scale

Andrea Wucherpfennig – Psychology

Faculty Mentor: Jovan Hernandez

With an increase of acceptance of LGBT communities, research is starting to explore potential differences in attitudes towards lesbian and gay people compared to transgender people. Previous research examining these differences have found a strong, positive correlation between homophobia and transphobia (Costa & Davies, 2012; Hill & Willoughby, 2005; Webber & Fell, 2012; Walch et al., 2012; Warriner, Nagoshi, Nagoshi, 2013; Winter et al., 2008). Although a positive correlation is to be expected, the strength of these correlations are so great that it calls into question whether or not participants are aware of the distinction between lesbian or gay and transgender people. There has not been any previous research examining whether or not participants are truly aware of the differences between gay and transgender people, creating a need for the present study. The aim of the present pilot study is to begin development of a new measure related to transphobia and homophobia. This new measure, titled the Confusion of Transgender Issues (CTI) scale, examines participants' feelings of uncertainty about what it means to be transgender and the belief that transgender people are the same as lesbian, gay, or bisexual people. It will be compared to existing measures of homophobia and transphobia, the Homophobia Scale (Wright, Adams & Bernat, 1999) and the Attitudes Toward Transgendered Individuals (ATTI; Walch, et al., 2012) respectively. Data collection is in progress, but preliminary analyses show strong positive correlations between the Homophobia Scale and ATTI with the CTI scale. Implications will be discussed.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #3)

Processing Biodiesel From Waste Vegetable Oil

James Zimmerman – Chemistry

Coauthor: Sean McManus

Faculty Mentor: Michael Jacobs

Biodiesel production has become increasingly important over the years as an alternative for petroleum fuels. Biodiesel is used as a renewable fuel source and can be produced from several different sources, including seed oil's, waste cooking oil and animal fats. It is often mixed with petroleum based diesel to reduce emissions without the need of modifications to an engine. Waste vegetable oil, from the MSU Denver HLC, is collected, filtered, and titrated for free fatty acid content to make biodiesel. By using potassium hydroxide and methanol we form a strong nucleophile in methoxide which allows us to do a transesterification on the triglycerides of the waste vegetable oil. This takes place in three sequential reactions to form three methyl esters, which is biodiesel. Unfortunately there are several byproducts including soap, glycerol, and water. By changing the reaction conditions including molar ratios, alternative catalysts, temperature and duration we are attempting to get a higher yield of biodiesel while reducing these byproducts. The biodiesel is tested using a few ASTM standard methods and analyzed for quality. These tests include a 27/3 test which shows the percent conversion from waste vegetable oil to biodiesel and a sop test allows us to detect soap in ppm. Currently, this is a collaborative project between MSU Denver Chemistry, Earth and Atmospheric Sciences, Engineering Technology, and CCD. With each department working on a different part of the project we are attempting to make a closed loop system in which waste oil from MSU is converted to biodiesel and then used on campus.

(Poster Presentation, Session II (11:00-12:00 PM), Poster #2)

Processing Biodiesel From Animal Fat

James Zimmerman – Chemistry

Coauthor: Ben Whipple

Faculty Mentor: Shamim Ahsan

Biodiesel is made from renewable resources, such as vegetable oils and animals fats is an alternative to conventional diesel fuel. Our research focuses on processing biodiesel from animal fats. Animal fats differ from vegetable oils in their structure and properties, specifically, the free fatty acid content, viscosity, compressibility, freezing point, and soap content. The major issue with animal fats is sulfur contamination. Part of our research pertains to the removal of sulfur content from animal fats to produce a better quality biodiesel. Here at MSU Denver we present an Auraria Campus collaboration involving biodiesel research to promote campus sustainability.

(Poster Presentation, Session I (9:30-10:30 AM), Poster #4)

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