

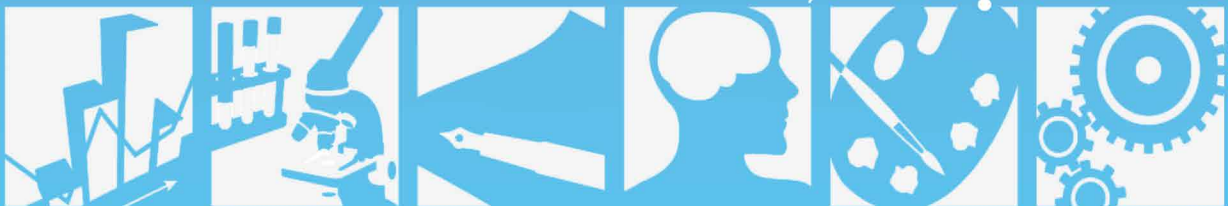
Metropolitan State University of Denver

6th Annual

# UNDERGRADUATE RESEARCH CONFERENCE

A Symposium of Scholarly Works  
& Creative Projects

**April 21, 2017**  
8:00 am - 5:00 pm  
North Classroom



METROPOLITAN STATE UNIVERSITY<sup>™</sup>  
OF DENVER

Undergraduate Research Program

Design by

studio **m**

A Service-Learning Experience Through  
Metropolitan State University of Denver



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*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 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 are developing essential skills relevant toward the pursuit of a particular profession or graduate school program; additionally, because many of our graduates remain in Colorado, you are bolstering the livelihood of our amazing state. The work showcased at this year's Metropolitan State University of Denver's Undergraduate Research Conference, A Symposium of Scholarly Works and Creative Projects, truly

highlights the diversity offered at MSU Denver and the transforming experience of undergraduate research.

My gratitude and respect goes to each of you for taking the road less traveled and for continuing to make MSU Denver an exceptional university. While my path will take me away from MSU Denver, I have enjoyed the journey that we have taken and have reveled in the tremendous advancements within undergraduate research at MSU Denver. Congratulations 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, past and present, discussions about the phenomenal work conducted at MSU Denver!

Stephen M. Jordan, Ph.D.  
President

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I am thrilled to welcome you to the 6<sup>th</sup> Annual MSU Denver Undergraduate Research Conference: A Symposium of Scholarly Works and Creative Projects! This conference showcases the incredible diversity and breadth of expertise on our campus, and highlights the initiative, perseverance, dedication, and accomplishments of our students and faculty. MSU Denver is dedicated to the pursuit of lifelong learning.

Benjamin Franklin said *"Tell me and I forget. Teach me and I remember. Involve me and I learn."* At MSU Denver, we are committed to providing education through opportunities in the classroom, laboratory setting, and in the community so that our students are inspired to contribute not only to their diverse fields of study, but also to their surrounding communities and abroad.

Today, we have the opportunity to observe the extraordinary efforts of our students and faculty, to learn, and to become inspired by their presentations. Many of us may even be motivated to explore our own paths for research possibilities.





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



### Dr. Nicole Garneau

**Dr. Nicole Garneau** is an advocate for women in science and a believer that science isn't an exclusive club. She strives every day to make it fun and personally relevant, and to encourage others to see that there is a scientist in everyone. Her formal training in genetics and microbiology led her to the Denver Museum of Nature & Science where she serves as the Curator of Human Health and the PI of the Genetics of Taste Lab ([www.dmns.org/genetics](http://www.dmns.org/genetics)). Beyond her day job, she is the founder of three companies, including the craft brewing sensory app DraughtLab, and proud mom to an energetic toddler. Dr. Garneau is also a sought-after public speaker and science communicator, and has had the honor of being an invited presenter at MileHigh TEDx, the Craft Brewer's Conference, and many scientific conferences. She has given numerous interviews for radio (e.g. Colorado Public Radio, NPR TED Radio Hour), television (e.g. CBS4), and online (e.g. PBS NewsHour). You can find follow her work at the Museum at [www.dmns.org/nicole](http://www.dmns.org/nicole) and @yoppearlscigirl. Or head over to [www.drnicolgarneau.com](http://www.drnicolgarneau.com) and @DocGarneau for her insiders look at flavor science.



## Conference-at-a-Glance

- 8:15 am-3:30 pm:** Conference Participant Sign-in  
**North Classroom Building- Atrium**  
*Light refreshments will be provided in the morning*
- 9:00-10:15 am:** **Conference Session I**  
**Oral Presentations- North Classroom**  
Room 1312: Humanities/Social Sciences  
Room 1313: Humanities/Social Sciences/Professional Studies  
Room 1314: Natural Sciences  
Room 1315: Engineering and Technology  
Room 1316: Humanities/Social Sciences  
  
**Poster Presentations Session I (9:30-10:30 am) – North Classroom Atrium**
- 10:30-11:45 am:** **Conference Session II**  
**Oral Presentations- North Classroom**  
Room 1312: Humanities/Social Sciences/Professional Studies  
Room 1313: Humanities/Social Sciences  
Room 1314: Natural Sciences/Technology/Engineering/Math  
Room 1315: Art/Humanities/Social Sciences  
Room 1316: Humanities/Social Sciences  
  
**Poster Presentations Session II (11:00-12:00pm) – North Classroom Atrium**
- 12:15 pm** Lunch  
**Turnhalle, Tivoli Student Union**
- 12:45-1:45 pm** Keynote Speaker: Dr. Nicole Garneau  
*From Failure to Setback, From Setback to Success*
- 2:15-3:15 pm:** **Conference Session III**  
**Oral Presentations- North Classroom**  
Room 1312: Humanities/Social Sciences/Professional Studies  
Room 1313: Humanities/Social Sciences/Professional Studies  
Room 1314: Technology/Engineering/Math  
Room 1315: Humanities/Social Sciences/Professional Studies  
Room 1316: Humanities/Social Sciences  
  
**Poster Presentations Session III (2:15-3:15 pm) – North Classroom Atrium**
- 3:30-4:30 pm:** **Conference Session IV**  
  
**Poster Presentations Session IV (3:30-4:30 pm) – North Classroom Atrium**



## 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 Library (especially Lorrie Evans)  
Keynote Speaker: Nicole Garneau  
Studio M Class  
Educational Technology Center (ETC)

Session Moderators  
MetroLeads Program  
All Volunteers  
Marketing and Communications  
Dr. Mark Potter

We would also like to thank Jessica Moore for enlisting her Studio M class in the development of the amazing poster designs.

---

## Undergraduate Research Grant Recipients

Nathan Aist	Edgar Flores	Thomas Rausch
Vlonjat Alija	Levi Fonseca	Ashley Raykovitz
Marissa Azua	Cesar Garcia	Danielle Russell
Caitlin Babbitt	Erick Gomez	Karolina Ryncarz
Tristen Bryce	Martin Gonzalez-Romero	Andrea Speer
Chase Buerck	Jena Jacobs	Christian Sroka
Cetan Christensen	Keegan Karbach	Steven Stier
Daniel Clark	Daniel Kovacic	Ginger Stout
William Clarke	Alexander Leith	Josh Vanlandinham
Kathryn Davis	Traci Lundstrom	Brandon Waterman
Deva DeAngelis-Lowe	Patrick Marsden	Clinton Woods
Delilah DeWilde	Todd Matuszewicz	Seth Youtsey
Lisa Fetter	Thomas McLaughlin	

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## Undergraduate Research Grant Reviewers

Dr. Maria Akrabova (Education)	Dr. Christopher Jennings (Technical Communications)
Dr. Pamela Ansborg (Psychology)	Dr. Devi Kalla (Mechanical Engineering Technology)
Dr. Rebecca Canges (Education)	Dr. Fordyce Lux III (Biology)
Dr. William Carnes (Business)	Dr. Bridget Murphy-Kelsey (Psychology)
Dr. Lorretta Chavez (Education)	Jeffrey Parker, MFA (Theatre)
Dr. Adam Graves (Philosophy)	Dr. Emily Ragan (Chemistry)
Dr. Jeffrey Helton (Healthcare Management)	Dr. Amanda Schaeffer-Fry (Mathematics)
Dr. Andrew Holt (Accounting)	Dr. Sheryl Zajdowicz (Biology)

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### Moderator Coordinator

Dr. Sheryl Zajdowicz (Biology)  
Salina Blea, M.A. (Applied Learning Center)

### Scheduling/Conference Program

Dr. Sheryl Zajdowicz (Biology)  
Salina Blea, M.A. (Applied Learning Center)



## **Presentation Abstracts**

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

### **From Shark Tank To New Venture "The Future of Connected Vehicles"**

Antonio Adams – Speech Communication

Faculty Mentor: William Huddy

From Shark Tank To New Venture is aimed at the evolutionary discovery of a long time entrepreneur in his pursuit of global impact and change. From student loan debt to the future of connected vehicles Mr. Adams has long since set his eyes on promising markets primed for disruption. After leaving shark tank without a deal new learnings were had and priceless lessons were transferred into his new venture with a new understanding in the art of communication and persuasion. Both ventures of Adams spawned from his traumatic experience as a former collegiate athlete sleeping out of his car and suffering a season-ending injury, but from the ashes sprouted new opportunities reawakening in him a new process of thinking and communicating. Inspired from the lens of an innovator majoring in communication with an emphasis in organizational studies, Adams embarks on transforming shark tank lessons into a tangibly profitable startup aimed to disrupt the trillion-dollar connected car industry.

**(Oral Presentation, Session II 10:30-10:45 AM, NC Room 1312)**

### **Sex Education Exposure and Perceptions of First and Second Generation Iranian-Americans in Southern California**

Roxanna Alizadeh – Anthropology

Faculty Mentor: Sanaa Riaz

The purpose of this research is to identify and explore attitudinal differences regarding sexual activity pre/post-marriage, sex education, contraception, and family planning of first-generation Iranian immigrant parents, and second-generations Iranian immigrant daughters following the latter's exposure to sex education in school. To analyze differences in perceptions of the two groups, second-generation Iranian-American females ages 18-35 who have graduated from American high schools, and first generation Iranian immigrant parent(s) of daughters of the same criteria were recruited online through Iranian organizations and communities in Southern California. Respondents were invited to complete online anonymous questionnaires where first-generation parents were asked about their knowledge of their daughter's education and their views about her sexual life, and second generation daughters were asked about their exposure to sex education and their views on their sexual lifestyle choices. In addition, both groups answered open-ended questions about what they felt influences their beliefs about how important, satisfying, and fulfilling sexual activity is to life. The research was approved by the Institutional Review Board at MSU Denver. The student researcher will analyze the questionnaires to highlight the degree to which Iranian-American parents' awareness of their daughter's sexual life and exposure to sex education corresponds with a lack of bias towards sexual lifestyle choices, and whether the daughter's exposure to sex education at school shows a positive correlation to their making independent decisions about their sexual lives.

**(Oral Presentation, Session II 10:30-10:45 AM, NC Room 1313)**



## **The Positive Impacts of Minorities on American Culture**

Kari Anglin – Individualized Degree Plan

Faculty Mentor: William Carnes

What is culture? Identifying culture requires a map of sorts. We can observe artifacts, rituals and behaviors, but we must dig deeper to uncover the underlying assumptions and what those mean (Schneider & Barsoux, 1997; Schein, 1999). Nevertheless, there is still some confusion as to what a culture really is. Looking at culture from an anthropologic view, one would look at all the history, language, tools and other items to define the culture of a particular land of people. What happens though, as is the case of the United States of America, when the history, languages, tools and other items are a mix from many different cultures? One could possibly use the Constitution of the United States and its amendments in defining US culture, but that has some downsides as well, such as the two-thirds rule. Americans too often allow history and its characters to be documented applying the two-thirds rule, neglecting the influence and contributions of those outside of the majority. This research will focus on and highlight those members of the United States of America that history omitted. In the US, we owe our culture to the world. We adopted things from many different countries, cultures, languages and religions to evolve into the culture we have now in the 21st century. Additionally, our culture is ever evolving because of fads, movements, entertainment, the media and the political climate, among other things. Thus, culture comes from the real-world experiences of all the individuals within the culture. In his book on corporate culture, Ed Schein credited Kurt Lewin with saying, "...that you cannot understand an organization until you try to change it" (Schein, 1999). The same goes for culture. If we could compare the culture of the US in 2017, 1917 and 1817, we would see three distinctly different cultures. However, we would also see some similarities between those cultures. While our espoused values, those values we state are important to us as a nation, may or may not be the same, our enacted values, those values we display through practices, policies and legislation may paint an entirely different picture. From the expansion moving westward across America and encampment of Native Americans, to the abolition of slavery, to voting rights, to civil rights our nation is ever-changing. Change is the only constant in American culture. Let us guide you through US history as we introduce hidden figures that have positively contributed to the daily life experiences of Americans.

**(Oral Presentation, Session II 10:45-11:00 AM, NC Room 1312)**

## **Comparative Study of the Antimicrobial Efficacy of Clove Oil, Tea Tree Oil, and Lavender Oil on Skin and Oral Microbes**

Cristina Antonovici and Erin Kazem – Biology

Faculty Mentor: Sheryl Zajdowicz

Essential oils are most known for their aromatic qualities, but they have also been used in homeopathic practices for their pain relieving, anti-inflammatory, and antiseptic benefits; however, there are few studies that investigate these properties. This study evaluates the antimicrobial efficacy of *Syzygium aromaticum* (clove oil), *Melaleuca alternifolia* (tea tree), and *Lavandula angustifolia* (lavender oil) against various Gram-positive and Gram-negative bacteria, as well as *Candida albicans*. Representative bacteria and fungi were plated onto trypticase soy agar, were exposed to the individual essential oils, and zones of inhibition were measured. The results suggest that all three oils have broad-spectrum efficacy, with clove and tea tree oil being



more effective than lavender oil, and shows the potential as treatment of skin infection as well as preventing dental caries.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #6)**

## **Engorging Behavior of the *Aedes aegypti* Mosquito (*Diptera, Culicidae*)**

Kenya Arroyo– Biology

Coauthors: Elizabeth Lynch

Faculty Mentor: Robert Hancock

The Yellow fever mosquito *Aedes aegypti* is known to be the vector of not only its namesake disease, but also Dengue and Zika. *Ae. aegypti* are native to tropical areas, which are known for their biodiverse flora and fauna. Being in such an area optimizes survival and opportunities for feeding on both blood and nectar. Blood feeding is done by female mosquitoes, who need the protein found in blood for egg production. To compare the effect of nourishment via nectar, mosquito eggs were obtained, hatched, then raised separately as adults; giving one cage sucrose and the other cage just water. Video footage of biting and engorgement from blood meal within the first 72 hours of adult life was observed and analyzed for feeding efficiency. There is a visible difference between the behaviors of the groups of mosquitoes. Mosquitoes who lacked a steady diet of sucrose were seen to have a much more erratic and unpredictable behavior. While the actual engorgement time of the mosquitoes remained about the same for both groups, it took the starved mosquitoes a much longer time to settle and begin feeding. The sucrose-fed mosquitoes spent less time and energy securing an adequate feeding place. While this is an insight into the blood feeding habits of *Ae. aegypti*, there is still more to be learned about the behaviors of these mosquitoes.

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

## **The impact of a Values Intervention on a Math Test in College Students**

Jaharri Asten– Psychology

Faculty Mentor: Maureen Flynn

Stereotype threat is a mental process in which the victim acts in accordance with a perceived stereotype. This phenomenon is linked to academic underachievement because it causes the recipient to behave in a manner that is consistent with stereotypes. (Nguyen & Ryan, 2008). Furthermore, this may be related to increased test anxiety, which is also related to poor academic achievement (Cassady & Johnson, 2002). In previous research, values interventions have been successful in minimizing the impact stereotype threat has on academic achievement. For example, one study found Latino students in the self-affirming group attained significantly higher GPAs than the control group (Brady et al., 2016). Another study found an increase in the GPA in African-American students that participated in a brief values intervention (Cohen, Garcia, Apfel, & Master, 2006). Additionally, women given a brief self-affirming values intervention improved their performance in comparison with the control group (Martens, Johns, Greenberg, & Schimel, 2006). The current study was created to measure the short-term impact of a values intervention on the math test scores of minorities, women and those with high



achievement anxiety. Each session was randomly assigned to either the values or control condition. In the values condition, participants were given twenty-five minutes to complete several questionnaires including an anxiety assessment and demographic survey. Also, they were asked to identify their most and least important value from a list. Then they were given ten minutes to write about their highest value. Finally, they were given ten additional minutes to take a math test. The control group was given the same instructions except they wrote about their least significant value. This experiment did not yield any statistically significant results at  $p=0.05$ . The average exam score for both groups was approximately forty percent indicating the intervention may not be effective as a short-term academic intervention.

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

## **Walking on Glass (Ceilings)**

Katrina Ballard– Psychology

Faculty Mentor: Anahi Russo Garrido

This paper will examine the gender pay gap that still exists in the United States. Historically women have been paid less than their male counterparts in the same positions, despite the fact that this has been illegal since 1963 when the Equal Pay Act was passed. This paper argues that even though women have yet to gain equality, one day women will gain equal opportunities in the workplace. With the passage of several laws and regulations it would be easy to assume that the gender pay gap does not exist but evidence shows that it is still very real. However, there is a projected timeline as to when women will gain equality in the workplace in the future, which can bring hope for women. Companies are realizing that there is a pay gap that still exists and are doing more to help ensure that women are paid equally. Based on textual and content analysis this paper examines the case studies of the work and strategic practices of the educational system to recruit women in the STEAM fields and ways the clothing company the GAP strives to reduce the pay gap. This analysis serves as a base for potential future recommendations.

**(Oral Presentation, Session III 2:30-2:45 PM, NC Room 1313)**

## **Unique Structures in the 3' UTR of Blackcurrant Reversion Nepovirus Genomic RNA 1 Promote Translation Initiation**

Laura Baquero-Galvis – Biology

Coauthor: Elizabeth Shields

Faculty Mentor: Megan Filbin-Wong

Canonical translation initiation is promoted and regulated by an interaction between proteins bound to a cap structure (a methylated guanosine triphosphate, m7G, as the 5' nucleotide) at the 5' end and those bound to a polyadenylate [poly(A)] tail at the 3' end of a messenger RNA (mRNA). This end-to-end interaction contributes to the recruitment, positioning, and activation of the translation machinery. Black currant reversion nepovirus (BRV) has two bipartite genomic RNAs (RNA 1 and RNA 2) that do not



contain 5' cap structures, but do have 3' poly(A) tails. Hence, the mechanism of end-to-end interaction in BRV has not been clearly defined. In other cap-less, positive-sense RNA plant viruses, structured RNA in the 5' and 3' untranslated regions (UTRs) bind via proposed RNA-RNA kissing-loop interactions between a 5' hairpin loop and a 3' cap independent translation enhancer (CITE). Likewise, the mechanism by which the 5' and 3' UTRs recruit protein synthesis machinery is directly related to their primary, secondary and higher-order structure. Considering that the end-to-end communication and recruitment of translation factors is dependent upon RNA structure, our main goal focuses on determining the secondary and possible tertiary structures of the 3' CITE structure in the genomic RNAs found in the BRV. Toward that goal, we have in vitro transcribed the minimal BRV RNA 1 CITE sequence, and probed our purified RNA with a series of covalent nucleobase, sugar and backbone modifiers. Combining our results, we have found a unique secondary structure for the BRV RNA 1 CITE that differs from a previously proposed structure based upon in silico thermodynamic folding predictions. This structure likely plays an important role regulating protein synthesis of viral proteins encoded by the RNA 1 message by either facilitating end-to-end interaction with the 5' UTR and/or directly recruiting important translation protein machinery.

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

## **Defining the YA Genre**

Hope Barajas – English

Faculty Mentors: Elizabeth Kleinfeld

This paper examines the criteria of the Young Adult (YA) genre, according to the three areas of libraries, bookstores, and publishers. My data is collected from interviews, and various articles related to the subject. Participants of this study consisted of various booksellers from across the Denver-metro area, librarians across the Denver-metro area, and publishers across all of Colorado. I analyzed this data to notice the similarities and differences between their answers, and to sort out what specific criteria exists. Figuring out this criteria is important to ensure that books under the YA heading will be targeted for the right audience. The present research shows that the most commonly agreed upon criteria for a book to be considered YA, is age of the protagonist or main character. This age is, respectively, 12-18. Despite this, more research suggests that a growing trend, is adults reading YA genre, more than the young adults themselves. This paper discusses this trend and also how it impacts the genre in the three areas. The results of my research can impact not only the companies that hold YA books, but the patrons who want to read them. Ultimately, this paper will attempt to showcase the idea that age is simply not enough to define an entire genre.

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



## **Diversity of Spore-Forming Bacteria in Soil from the Boulder Creek Critical Zone Observatory Site (CZO)**

Scott-Wesley Bean – Chemistry

Coauthor: Tess Brewer

Faculty Mentor: Noah Fierer

Soil bacteria are a necessary component of many ecosystems and play a role in generating oxygen, recycling nutrients, fixing nitrogen, and nutrient cycling. When environmental conditions are not ideal for life, some bacteria undergo sporulation, a process in which their physical form changes. This new physical form, referred to as an endospore, can resist harsh environmental conditions. Our research focused on analyzing microbial communities in soil from two collection sites: the north-facing and south-facing slopes of Gordon Gulch, CZO site, in Nederland, Colorado. We isolated the spore-formers at each site with the utilization of an ethanol treatment. Soil bacteria samples were grown on 1/100 luria broth agar plates to simulate the natural oligotrophic conditions in soil. Community compositions derived from DNA extractions of cultured bacteria communities were compared to that of extractions derived from soil treated with propidium monoazide (PMA), a DNA-binding dye, which removed DNA from dead cells. Location sites were shown to have less of an effect on community composition than the ethanol treatment, which successfully isolated known spore-formers in both samples. Culture plate samples had differences in diversity of spore-forming bacteria compared to the PMA treated soil samples, which consisted of additional and unexpected taxa. The development of conidia, lipid heavy cell membranes, and encasement within fungal spores were resistibility characteristics of bacteria that survived the ethanol treatment. Future research could involve the investigation of spore-former diversity with the addition of PMA in other conditions of soil and further inquiry of differences in diversity between location sites.

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

## **Exploring the Relationship Between Monthly Climate Variation and Extreme Heat Index Event Frequency in the Southern United States**

Charles Becker – Meteorology

Faculty Mentors: Keah Schuenemann

This study aims to explore the relationship between the frequency of extreme heat index events in the southern United States and climate variation as indicated by various climate indices. Local data used for this analysis comes from ASOS airport ground stations and climate index data is taken from the National Weather Service's Climate Prediction Center (CPC). Four indices will be used for analysis: the North Atlantic Oscillation (NAO), the Southern Oscillation Index (SOI), the Tropical Northern Atlantic Index (TNA), and the Pacific Decadal Oscillation (PDO). Analysis will cover June through September over a 68-year period from 1948-2016. A peak-over-threshold method will be used to identify heat index events, and multivariable linear regression will be used to explore the overall relationship.

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



## **Synthesis of Double Stranded GFP RNA for Use as a RNAi Negative Control in *Drosophila* S2 cells**

Beah Benzel – Biochemistry

Faculty Mentor: Emily Ragan

Iron is a vital nutrient needed by nearly all organisms. Pathways of iron uptake in mammals are more well-known than those of insects. For example, mammals use receptor-mediated endocytosis of transferrin, but insects have no known transferrin receptors. Our overall goal is to learn how iron enters insect cells. In dietary iron absorption, ferric reductases are known to reduce iron from  $\text{Fe}^{3+}$  to  $\text{Fe}^{2+}$  to allow for iron to uptake into cells by ferrous transporters. We hypothesize that ferric reductases are also involved in the uptake of iron ions in insect cells. To test this hypothesis, we will knockdown two putative ferric reductases by RNAi in *Drosophila melanogaster* S2 cells (Sg4 isolate). Double stranded GFP RNA will be used as the negative control to compare to RNAi-treated cells. We expect double stranded GFP RNA treated cells will have a consistent iron content, ferric reductase activity, and the same viability as cells not treated with double stranded RNA. This poster details our synthesis of double stranded GFP RNA and establishment of *Drosophila* S2 cell culture.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #17)**

## **Achieving Terminal Velocity**

Ian Blackmore – Aviation and Aerospace

Faculty Mentor: John Ingell

Have you ever thought about why vehicles have terminal velocity? Why airplanes can only go so high or rockets can only go so fast? Terminal velocity happens when the maximum amount of available thrust equals the amount of resistance on a vehicle. If we can bypass this limitation, we can open up the stars for exploration and commercialization. I know exactly how to achieve this.

**(Oral Presentation, Session I 9:00-9:15 AM, NC Room 1315)**

## **Rain Shadow: A Documentary Album Exploring Water, Ecology, and Time on the Front Range**

Olivia Blumenthal – Biology

Faculty Mentor: Sara Jackson

Rain Shadow: A documentary album exploring water, ecology and time on the Front Range, is a music album addressing the importance of approaching water issues from many disciplines, as well as the importance of listening to a diversity of voices to truly understand the varied perspectives of water. Through semi-structured interviews, reviews of relevant literature, field observations and song writing, 3 docu-songs exploring the past, present and future of water in the Front Range were composed, asking the question of how we understand our relationship to water while living in a rain shadow. This project approaches water as a social, political, cultural, artistic, ecological, spiritual and geographic subject. In accordance with the multidimensional nature of water, interviews were conducted with people from



diverse backgrounds, and varying involvement with issues about water. Similarly, sources of background research included an array of genres including memoirs, scientific journals, and music. Ecological field observations were made along the South Platte River above the Chatfield Dam, near the dam and below the dam. Field observations focused primarily on flora and avian species of the riparian and shortgrass prairie ecosystems of the region. Accompanying the album is a supplemental booklet expanding on lyrics with text and visual artwork.

**(Oral Presentation, Session I 9:00-9:15 AM, NC Room 1314)**

## **The Legacy of Whiteness in Argentina's Genetic Projects**

Laurie Bohne – Philosophy

Faculty Mentors: Sergio Gallegos

Numerous scholars (e.g., Reid Andrews 1980, Joseph 2000, Geler 2016) have argued that, to portray itself as a white nation whose roots are solely anchored in Europe, Argentinian governments and elites have implemented a series of policies since the end of the colonial period that have been aimed at progressively erasing or making invisible Afro-argentinians and Argentine Amerindians. In particular, some scholars (Leys Stepan 1991, Rodríguez 2006, Gómez Di Vincenzo 2013) have studied carefully how science was used in Argentina in the first decades of the 20th century (particularly, in the context of eugenic and biotypological endeavors undertaken by the medical community) to support a political project aimed at 'civilizing the nation' –a project which involved identifying potentially 'dangerous elements' to the 'health of the nation' to isolate them or purge them. Though these misuses of science are nowadays acknowledged, we believe that the racialized framework that permeated the efforts of Argentinian physicians and scientists from the early 20th century to generate knowledge about their national population is still present and operating in more recent scientific projects conducted in Argentina. In particular, our goal in this paper is to show that recent projects on human genetic research undertaken in Argentina to study the ancestry of its population the trade on certain assumptions that minimize the African contribution to the genetic pool of the current population. To show this, we consider two recent studies (Toscanini et al. 2007 and Corach et al. 2010), and we show that certain assumptions made by the scientists (in particular, an assumption that ancestry proportions present in mitochondrial DNA are the outcome of a multinomial distribution with success probability of each ancestry class given the proportion estimated in autosomal DNA) may result in the underestimation of African genetic ancestry.

**(Oral Presentation, Session I 9:00-9:15 AM, NC Room 1316)**

## **Social Media Phenomenon**

Victoria Bowling – Speech Communication

Faculty Mentors: William Huddy

In the upcoming of technology and the 21st century, social media and the internet has become a big hit amongst the popular of the people. There is a new form of communication and identity happening through the internet. The form is called social media. Social media consists of phone applications such as Facebook, Instagram, Twitter, Blogs, Linked In and etc. This is a place where our moments, events and memories are shared upon the rest of the population. It has come to a time where the majority of the people "post" everything about them on their social media websites for everyone else to see. It seems as if



storage and sharing with others on social media has become more important through the years. It has become more important that we lean on it to give our human selves a sense of identity and remembrance of our past. There is a phenomenon we millennials say about social media that, “If it was not posted, it never happened.” Personally, I have experimented in this paper what it is like to “rid” oneself of social media. Results and thoughts are listed throughout the paper. Curiosity lies within with what the ties are with humans and wanting to share our everyday moments and lives with the rest of the world. A solution and research through a new perspective taken in this paper is through the holistic, spiritual, mediation and the mindfulness world. Joining this paper are interviews from people and their personal opinions. Surveys will also accompany their feedback.

**(Oral Presentation, Session III 2:45-3:00 PM, NC Room 1313)**

## **Cottonwood Stand Structure in Chatfield State Park: A Bird's-Eye View**

Kayla Bridges – Biology

Coauthors: Trevor Starr, Vinson Turco

Faculty Mentor: Erin Bissell

The Chatfield Reservoir in Littleton, CO will be modified with a reallocation plan to retain more water, when possible, in future years. This has potential to have an adverse effect on the riparian cottonwood forest. This study was designed to observe the ecological role of the broad-leaf cottonwoods, *Populus deltoides*, specifically for bird usage. *P. deltoides* in these communities occur in two distinct age categories: 1) younger stands in dense formation and 2) older Legacy trees more widely spaced. This study operates under the hypothesis that there is a difference in avian utilization between legacy and stand sites because of differences in tree density. In 2015, data on diameter at breast-height (DBH), tree height and tree density were collected; in 2016, canopy cover and elevation data were collected as well as bird counts every other week at 10 sites in each community in both years. Initial analysis suggests that there could be a difference between Legacy and Stand sites in their utilization by birds and other small animals. The 2017 data will be collected using modified BBIRD vegetation sampling methods. This includes canopy cover, diameter at breast height, nearest neighbor species type, percent ground cover, tree height, and nested quadrats with species richness and stem density in the understory. Additionally, we will use these same methods in nearby sites including the Sugar Creek site where they plan to relocate the endangered Preble's meadow jumping mouse from Chatfield, and the Platte river area below the dam where flooding will not occur.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #2)**

## **Bicycle Device Charger**

Tristen Bryce – Engineering Technology

Coauthors: Brandon Waterman, Daniel Kovacic, Josh Vanlandingham

Faculty Mentor: Devi Kalla

Smartphones and tablets have become an integral part of many Americans lives. They are used for a multitude of purposes across a broad spectrum, from simple communication in text messaging, email, or phone calls to entertainment, face-to-face meetings, or even GPS directions. While the many uses of these devices continues to grow and be enhanced, so too does the power consumption; consequently, battery



life is a plaguing issue for many users, especially those who travel by bicycle. Cycling is a significant and growing method of transportation, and so too is the demand for persons utilizing this method of transportation to charge their devices. The Bicycle Device Charger would allow cyclists to not only charge their devices while on the go, but also while they have a charge on the onboard battery which can be detached to add to the versatility of the product.

**(Oral Presentation, Session I 9:45-10:00 AM, NC Room 1315)**

## **Evans Light Rail Neighborhood and Social Impact Assessment**

Joshua Buckman – Land Use

Faculty Mentors: Sara Jackson

The growing and continued popularity of light rail transit systems in major United States metropolitan areas is leading to burgeoning research on their specific impacts and value generation. While potential impacts of light rail transit development are numerous and varied, most can be categorized into either fiscal, environmental, or social benefits. While myriad studies have been conducted on the fiscal and environmental impacts of light rail transit development in the Metropolitan Denver Area, information on social impacts is lacking. This case study of the Evans Light Rail Station characterized by the City and County of Denver as an “Urban” station type with an “Innovation” overlay seeks to address this issue by providing a better understanding of how one neighborhood has changed due to influences from the light rail. Residents within half a mile of the Evans light rail station were randomly and anonymously surveyed with a series of demographic questions and asked to provide their experiences, observations, and opinions about the neighborhood. With more than one-hundred-fifty households responding, spatial and demographics trends are examined, investigating the relationships among such factors as race, age, income, education, car ownership, and walking distance from the light rail station, with opinions around light rail development, growth, and overall neighborhood changes.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #18)**

## **Blurring the Lines of Ceramic and Metal**

Chase Buerck – Art

Faculty Mentor: Sandra Lane

Blurring the lines of ceramic and metal is focused on the interactions of metal and ceramics through oxidation and reduction kiln firings to create clay bodies comprised of powdered metals that allow for the integration of solid metal post firing. This research is expanding on my previous studies under Pushing the boundaries of ceramics where I discovered clay bodies with five to ten percent red, yellow, and black iron oxide in reduction kiln fired atmosphere created metallic clays. I am now focused on nontraditional materials added to clay bodies and how this will allow for the combination of metal and clay to create sculptures. I will mix a traditional stoneware clay body and add powdered copper, stainless steel, bronze, brass and nickel silver in increments of ten and twenty five percent to create five new metallic clay bodies, increasing percentages as needed to reach my desired results. Each metal clay body will be fired



in a reduction and oxidation atmosphere determining the best percentage of powdered metal to be used to create these metallic clay bodies. With my results I will be using the metal clays along with solid metal bars to form small sculptures testing how the clay body reacts to shrinking around the metal bars and their ability to sinter. These results will also allow me to see how the metal bars withstand both oxidation and reduction atmospheres revealing the limitations of each metal and the potential of integrating metal and ceramics in larger sculptural forms. This research expands on the traditional materials of ceramic and metal revealing new possibilities for artistic creation.

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

## **Gods and Gardens: The Mosaic of the Great Basilica in Heraclea Lynkestis**

Alicia Burton – Art

Faculty Mentor: Jessica Weiss and Summer Trenton

Even though Christianity became the official state religion of the Roman Empire in the 4th century, artists of the provincial regions continued to produce artwork related to traditional Greco-Roman beliefs well into the 5th and 6th centuries. One of these provincial cities, known as Heraclea Lynkestis in Macedonia, was conquered in the 2nd century by the Romans and not only weathered the changing political and religious atmosphere but flourished until it was abandoned in the 6th century after an earthquake. Like many other provincial regions of Rome, Heraclea Lynkestis demonstrates the presence of Christian imagery and motifs as well as the persistence of older pagan beliefs in various floor mosaics across the city. This paper will reevaluate the imagery and motifs of the floor mosaic found in the Great Basilica at Heraclea Lynkestis and provide a new interpretation that demonstrates the sharing of symbols between these two belief systems. Another point discussed in this paper will be that despite the declaration of Christianity as the sole religion of the empire, traditional pagan stories continued to be popular for centuries after, and that the well-known imagery related to these stories later became associated with Christianity rather than paganism. Much of this shared symbolism was centered on the afterlife, which took the form of a bountiful garden full of ripened fruits and exotic animals. In Christianity it was seen as heaven while in paganism the gardens imagery was closely associated with Bacchus and eternal life.

**(Oral Presentation, Session II 10:30-10:45 AM, NC Room 1315)**

## **Accelerate Climate Action**

Nicole Bush – Land Use

Faculty Mentor: Sara Jackson

Accelerate Climate Action (ACA) is a community-based project with a mission to provide individuals with knowledge and tools to live sustainably and promote change within their neighborhoods.

ACA members consist solely of volunteers and research students, who are working diligently to build community assets, including neighborhood forums, leadership development, and collaboration within the community at-large. My role is to collect data, both qualitative and quantitative, at the neighborhood level; the goal is to derive meaningful information that can be illustrated in a Fact Sheet and presented at



ACA forums to engage and educate residents. Congress Park was selected as the initial research area by familiarity, accessibility, established neighborhood-based organizations (NGOs), and demographics. My research is focused on creating a community asset inventory of current resources and programs within Congress Park; research is based on Principles of Asset Mapping (UCLA CENTER FOR HEALTH POLICY RESEARCH, n.d.). To accomplish this, various research tools will be applied, including: internet searches, satellite imagery, site visits, and informational interviews. Through targeted research, I hope to provide information about the strengths and resources of Congress Park to uncover sustainability solutions to economic, environmental, and social problems.

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

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

Katrina Carrillo – Biology

Coauthors: Kevin Dykstra

Faculty Mentor: Jennifer Gagliardi-Seeley

Previous sexual selection studies within populations of convict cichlids (*Amatitlania nigrofasciatus*) have focused predominately on female mate choice; however, since convict cichlids are serially monogamous and bi-parental, male mate choice may be as equally important. Our preliminary study showed that convict cichlid pair-bond formation occurs more often when males are given a choice of more than one female. This study will focus on male mate choice by determining which factors influence pair-bond formation. We predicted that pair-bond formation would increase when two females are present and when females interact in competitive displays. This experiment had one control (one female: one male) and 3 treatment groups (two females: one male): 1) No female interaction; 2) Female interaction without male observing; 3) Female interaction with male observing. The experimental aquarium was separated into 6 compartments. In the back of the aquarium, females were separated into their own side compartments and no female was present in the middle compartment. Males were allowed to swim freely between the three front compartments of the aquarium. An average of five direct observations of the male's location was taken every day for 21 days. The male's choice was defined as him spending at least 80% of the observations with one female. Male behavior was filmed for 15 minutes on days 1, 7, 14, and 21. Male courtship and time spent in compartment was collected utilizing EthoVision to confirm his choice. Preliminary data suggests that female interaction increases pair-bond formation.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #1)**



## **Biodiesel Research and Production on the Auraria Campus**

Edgar M. Casillas – Chemistry

Coauthors: Joe Didelot, Sean McManus, and Emily Millward

Faculty Mentor: Michael Jacobs and Shamim Ahsan

Alternative fuels are in demand to promote sustainability and alleviate our dependency for fossil based fuels. Bio-diesel production has gained considerable interest over the years as an alternative fuel to promote environmental sustainability and green energy initiatives. The process of converting waste vegetable oil into a usable bio-fuel via base catalyzed trans-esterification, has been studied extensively. Herein, we present a closed loop model developed on the Auraria campus to support sustainability by utilizing waste cooking oils produced from campus sources for the production of bio-diesel. Since its infancy the MSU Denver bio-diesel group has been conducting training and research for the production of biodiesel, for chemical, environmental, engineering processes, and the associated analyses including: trans-esterification, titration of free fatty acids in the feed stock, viscosity, soap content determination, cloud point measurements, water content testing, fuel additives, catalysts, animal fats, heats of combustion, and instrumental analysis such as IR, UV-Vis, fluorescence, and GC-MS. The program raises sustainability awareness and encompasses the three institutions on the Auraria campus and multiple disciplines such as: Chemistry, Engineering and Technology, and Environmental Science. Through hands on processing and training undergraduate students gain conceptual and applied understanding of bio-fuel standardization, analysis, applications, and usage with this model.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #19)**

## **A Brief Analysis: The Effectiveness of Domestic Violence Shelters**

DeAnna Castaneda – Women's Studies

Faculty Mentor: Anahi Russo Garrido

Across the United States, intimate partner violence has become a pandemic over the last several decades. Research shows that 1 in 3 women have been victims of some form of physical violence by an intimate partner within their lifetime. Taking into consideration the magnitude of violence against women, it is important to address the individual needs of survivors facing acute crisis. This paper examines the overall effectiveness of domestic violence shelters and the services provided to women accessing those services. I argue that domestic violence shelters, although necessary, are an ineffective solution to a much larger cultural and societal problem that continues to plague women. Further, I explore the current methods implemented using a feminist discourse to analyze the experiences of women utilizing services. A textual and content analysis compiled from studies developed within the Midwestern region of the United States provides a thorough examination of policy and procedures currently being utilized within the service provider sector. Based on these findings, it is reflected there are significant areas of improvement, which could better assist survivors towards self-efficiency, in addition the need to critique hegemonic masculinities and rigid relationship models, which perpetuate violence against women through patriarchal constructs.

**(Oral Presentation, Session II 11:15-11:30 AM, NC Room 1313)**



## **Assessing Microbial Community in Wetlands along South Platte River**

Cetan Christensen – Environmental Science

Coauthor: William Clarke

Faculty Mentor: Sarah Schliemann

Microbial communities, such as denitrifying bacteria, are critical for nutrient cycling and pollution removal within wetlands. A better understanding of the composition of microbial and archaea communities and their quantities in wetland soils would be a useful measure of biologic integrity and would enhance the understanding of wetland health conditions. Microbes and archaea may also prove useful for indicating degradation to wetland ecosystems due to their sensitivity to changes in the environment. This study aims to develop a methodology to predict microbial and archaea mass and diversity in soil environments by correlating their DNA and community structure to differing levels of urbanization along the South Platte River corridor. Soil and Microbial samples were collected from September through October 2016 from wetlands along the South Platte River, from Littleton, Colorado to Brighton, Colorado along the Denver urban corridor. Wetland assessments were performed for each of the wetlands to determine their health using the established methods and parameters. Three soil samples were collected from each of six wetland sites in the study area using the PowerSoil DNA Isolation Kit. Microbial DNA samples were sent to a lab for PCR amplification, DNA sequencing and analysis. Primers for DNA sequencing used were 21F and 008F and reverse primer 1493R --effectively targeting microbes and archaea responsible for wetland health and function. The community of microbes and archaea are shown to have a relationship with the levels of urbanization of the targeted wetland systems. The expected outcome of the project will be the ability to use microbial indicators in the multi-metric index -- the method by which wetlands are assessed --to create a more comprehensive ecological assessment for uses in wetland restoration, and management practices.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #3)**

## **Impact of Wastewater Treatment Plant Discharge on Downstream Ecosystems along the South Platte River**

Daniel Clark – Land Use

Coauthor: Ani Argiris and Matthew Clark

Faculty Mentor: Sarah Schliemann

The research area that we are interested in is located along the South Platte River in Thornton, Adams County, north of Denver and it continues south until it reaches Commerce City. The stretch of the river that we are interested in is about 2.4 miles and includes several urban riparian wetlands as well as the Robert W. Hite Treatment Facility, a secondary wastewater treatment plant, which is located at the southern end of the study area. The nature of the project is to determine whether there is a change in water quality above and below the Robert W. Hite Water Treatment Facility. The objective is to compare sites above and below the wastewater treatment facility to determine whether water and soil chloride concentration is significantly different upstream and downstream. Water and soil samples were collected at 12 sites along the South Platte River, Clear Creek, and Sand Creek. Composite soil samples were collected 18 inches from the water line. Soil water content was determined using a gravimetric approach and total organic content will be determined using a loss on ignition approach. The concentrations of chloride in the soil and water samples were determined through ionic chromatography (ICS). A chloride gradient was established with significantly increasing concentrations in soils and water downstream from



the RWHTF's effluent point. This research will help scientists to better understand wastewater effluent's impact on riparian ecosystems in an urban setting and will help inform future decisions on wastewater effluent regulations.

**(Oral Presentation, Session I 9:30-9:45 AM, NC Room 1314)**

## **DNA-modified Gold Nanoparticles to Enable Surface-Enhanced Raman Spectroscopic Biosensors**

Derek Clarke – Chemistry

Faculty Mentor: Andrew Bonham

Gold nanoparticles, typically particles with a diameter of ~100 nanometers, present unique electrical and optical properties from the bulk material. These properties have been used to enable a variety of sophisticated molecular and chemical techniques. One of the most intriguing of these is the phenomenon of surface-enhanced Raman scattering, wherein closely spaced nanoparticles dramatically increase the sensitivity of Raman, a technique that allows “fingerprinting” of molecules. In this project, we synthesized gold nanoparticles, coated them with single stranded thiolated DNA. In the near future, we will anneal two variations of functionalized gold nanoparticles together. A functionalized Gold nanoparticle scaffold will form and promote signal Raman amplification due to calculated spacing. Designated proteins will bind to specific regions of DNA in the scaffold. Binding should alter the molecular fingerprint of an organic dye, methylene blue, that is attached to the DNA. Ultimately, such assemblies should offer a stable optical platform for the creation of incredibly sensitive biosensors.

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

## **The Multiple-Urn Ehrenfest Model: A Probabilistic Tool**

Jacquelyn Combellick – Mathematics

Faculty Mentor: Diane Davis

Originally developed in order to model thermodynamics, the Ehrenfest urn model has many practical applications, including treatment allocation in clinical trials and studies of population migration patterns. While the standard 2-urn model has been thoroughly studied and is fairly well-understood, the same cannot be said for the multiple-urn model. The premise of the model is fairly simple: a variable number of balls are distributed amongst three or more containers, or “urns.” As time goes on, a ball is selected at random from its current urn and transferred to a different urn, with each remaining urn having equal probability of receiving the ball. We can use a matrix to summarize the probabilities associated with this process as time goes on; raising this matrix to a power  $n$  and taking the limit of this process allows mathematicians to study the long-term behavior of the system. However, these transition matrices can be quite large, presenting difficulties for anyone wishing to study these limits. Here, a complete solution to the multiple-urn model is presented, allowing for computation of powers of these matrices with comparative ease. This enables mathematicians to better understand the long-term behavior of the system and makes the multiple-urn Ehrenfest model a much more feasible tool for analyzing real-world situations.

**(Oral Presentation, Session II 10:30-10:45 AM, NC Room 1314)**



## **Gender, Depression, and Discourse: Contextualizing Women's Experiences of Depression and Recovery**

Jacquelyn Combellick – Mathematics

Faculty Mentor: Anahi Russo Garrido

This presentation examines the combined effects of normative expectations of women, the discourse of depression, and the experience of depression itself on depressive women seeking recovery in modern Western society. Backed by a synthesis of diverse texts from a feminist, social constructionist, and discursive perspective, I argue that this combination presents a significant challenge to achieving recovery, with the expectation of self-sacrificial care-giving at the forefront of damaging ideals of womanhood. Furthermore, effective recovery processes for depressive women involve renegotiating restrictions imposed by these ideals of womanhood and building resilience through every-day actions, thereby developing more wholesome and healing narratives of self than the ones prescribed by the dominant discourses of womanhood and depression. Ultimately, I seek to provide an understanding of women's depression as grounded in their gendered experiences, as well as to suggest a general guideline for recovery that incorporates this knowledge.

**(Oral Presentation, Session III 2:30-2:45 PM, NC Room 1312)**

## **Mystery Rock Between Kimberlite and Sherman Granite**

Travis Cooper – Applied Geology

Faculty Mentors: Uwe Kackstaetter

The contact between the Sherman Granite and the kimberlite of Northern Colorado/Wyoming is sometimes shared by an unknown rock. This rock is high in silica and aluminum depleted, which does not match rocks, which are readily identifiable. Samples were collected north of Virginia Dale from an intrusion between kimberlite and Sherman Granite in a line to observe chemical changes from one contact to the other. The chemical analysis was done off site, while the physical analysis was done by thin-sectioning to identify the individual minerals making up the unknown rock. Sherman Granite and kimberlite were included in the analysis as a control.

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

## **Music Therapy Influence on Alzheimer's and Dementia**

Mikaela Craig – Health Care Management

Faculty Mentors: Jeff Helton

An estimated amount of 5.2 million Americans has either Alzheimer's/Dementia, consequently it is one of the largest causes of deaths in America. The influence that music therapy has on people who have Alzheimer's/Dementia is extensive and life-saving. By identifying the impact that music therapy makes on those who suffer from Alzheimer's/Dementia, the reader will better understand how the moods change via music therapy; agitation management, emotional closeness, as well as the type/pace of the music and



how it may affect their emotions or activities. Due to the different stages of Alzheimer's and Dementia, the author will identify the three different stages and the impact the music therapy will make to their daily activities, sing-alongs, and exercise. In order to better educate the readers, the research will be provided through in-home care, assisted living/memory care communities, and collegiate research studies.

**(Oral Presentation, Session I 10:00-10:15 AM, NC Room 1313)**

## **Quality of Nutraceutical Grade Supplements**

Elizabeth Cuc-Capota – Integrative Health Care

Faculty Mentor: Jeff Helton

As consumers are shifting towards the use of natural products the industry is growing to appeal to the retail popularity. In 2010 the sales of natural products went up 6 percent to \$117 billion.<sup>1</sup> Due to this rise the question is how much is the government protecting the public from unsafe products and mislead claims? This research will be looking to preserve the quality of natural products so that so that the consumer's trust will be secured. Quality issues related to nutraceutical grade supplements will be investigated to reveal what methods of herbal preparations produce efficient bio-availability for medical use. Do consumers need to be skeptical about what they are buying or can they be assured that every ingredient is pure and safe? This analysis will lead to solutions on how the natural product industry should move forward in expansion of herbal medicines.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #13)**

## **Development of a Low-Cost Photogrammetry System to Assess Spearfishing Impacts on Hogfish (*Lachnolaimus maximus*: Labridae) in Florida**

Christopher D'Arcy – Biology

Faculty Mentor: Robert Hancock

Size limits for spearfishing are subject to the judgment of underwater sportsmen: unlike hook and line fishing where undersized catch are released, spearfishing is lethal and below-limit culling could negatively impact game fish populations. The protogynous harem-spawning shallow water dwelling hogfish *Lachnolaimus maximus* is an increasingly popular food fish in Florida and, as such, can be negatively impacted by removing too many reproductive females from the population. Using underwater laser-pointers, I fabricated and calibrated a 10cm parallel-beam array that could be mounted on an underwater automatic digital camera/lighting rig and, when hogfish were photographed in lateral view with 2 laser dots, I could calculate their lengths. During 20 research SCUBA dives on reefs off of Marathon, Florida in July of 2016, I used this technique to determine the fork lengths of a total of 108 fishes from 13 different dive sites. 70% of the sampled fish were below the 30cm size limit and few males/transitioning females were found thus indicating a significant human pressure against the upper half of the population size distribution there. My results are reflective of more-protective 2016 adjustments to size and bag limits for this species in US Atlantic waters.

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



## **A Blunt Analysis**

Deborah Daugherty – Psychology

Faculty Mentor: Katherine Hill

Across the U.S., there is a trend for the legalization of marijuana, with 29 States allowing medical and 8 States allowing recreational use. There has been a boom in product development (11 product categories, including edibles, drinkables, and topicals, in addition to inhalable forms of cannabis) and a trend towards increasing levels of THC in these products. In the 1980s, THC level was 3%; in 2012 the THC level was 12%. As THC levels rise, CBD levels with their protective factors have decreased (ElSohly, et al., 2016). Considering the rapid changes in legal status, availability, products, and THC levels, this study updates our knowledge by examining: abuse and addiction; motivations; sensation seeking; and “Big 5” personality traits. Colorado and Washington participants (N=186) were recruited by flyers to complete an anonymous online survey. The study is IRB approved. Note: the study is ongoing and has since gone national. The most surprising findings for the preliminary results were that 67.5% of participants have cannabis abuse issues while 16.5% have cannabis dependence issues. There is a significant positive correlation between THC level preference of 21% and up and CUDIT-R scores. Our findings on sensation seeking were mixed; we found only a positive significant correlation with boredom susceptibility, consistent with Creemers et al. (2009). Unlike past research, we found no correlation with high neuroticism and low agreeableness (Kotov, Gamez, Schmidt & Watson, 2010; Ruiz, Pincus & Schinka, 2008). We did find a significant negative correlation with conscientiousness. Our preliminary findings from this ongoing study indicate that modern marijuana products with elevated THC are associated with higher levels of abuse. Additionally, there is evidence of users with different motivations and different SSS-V and BFI scores. Further research is needed to adequately generalize our findings.

**(Oral Presentation, Session II 11:30-11:45 AM, NC Room 1313)**

## **A Feminist Approach to Sex Education**

Austin Davis – History

Faculty Mentor: Anahi Russo Garrido and Kimberly Klimek

Sex education in the United States has gone through decades of change as our society begins to evolve in its ideologies. Does our current system do enough to prepare students for the complex emotional and physical relationships that they may encounter? The question being proposed is answered simply, no. I believe a liberal feminist sex education perspective would do more to prepare students for their futures, simultaneously minimizing physical and emotional damages that can occur due to lack of information. By breaking down the positives and negatives of abstinence-only sex education and comprehensive sex education, we can identify and alter the shortcomings of the two while also improving upon their positive aspects. By developing a more feminist intersectional approach to sex education, we can ensure that all students are receiving accurate, pertinent information that will positively impact their futures.

**(Oral Presentation, Session I 9:30-9:45 AM, NC Room 1313)**



## **Aversive Childhood Experiences as a Predictor of Adult Risk Taking**

Kathryn Davis – Psychology

Faculty Mentor: Lisa Badanes

Early experiences in adverse (including abuse and neglect) and stressful environments during childhood have been shown to be associated with increased risk for psychopathology, including depression, substance use, and greater risk taking behaviors like sexual promiscuity (Allen et al., 2007; Hussey et al., 2006; Shin et al., 2013). These tendencies toward increased health and safety risk taking behaviors may be particularly problematic when individuals reach adolescence and emerging adulthood adolescence (Lewinsohn et al., 1993; Moffitt, 1993). This study sought to examine the associations between adverse childhood experiences, early life stress, and health and safety risk taking behaviors in a sample of college students. The sample consisted of 188 undergraduate students enrolled in Introduction to Psychology (age range: 18-55,  $M = 23.20$ ). 60.9% of the students were white, and 62.2% were female. Participants were asked to complete a demographic questionnaire, the Domain-Specific Risk-Taking scale (DOSPERT; Weber et al., 2002), the Life Events Checklist (LEC; Blake et al., 1995) and the Adverse Childhood Experience questionnaire (ACE's; Felitti et al., 1998). We ran a linear regression predicting health and safety risk that included ACE's, the life events checklist, and gender. Both ACE's and gender (female) were significant predictors of health and safety risk (see table 1), suggesting that both are important predictors of adult risk taking. Findings point to the importance of addressing early adverse experiences in our prevention and intervention efforts for decreasing health and safety risk later in development.

**(Oral Presentation, Session II 11:15-11:30 AM, NC Room 1315)**

## **Conscientiousness as a Predictor of Depressive Symptoms**

Kathryn Davis – Psychology

Coauthor: Dimpna Flores

Faculty Mentor: Lisa Badanes

Conscientiousness, one of the personality variables in the five-factor model of personality, remains relatively stable throughout the adult life (Costa & McCrae, 1988, 1994). High conscientiousness is characterized by reliability, organization, and purposeful action, while low conscientiousness is characterized by carelessness, disorganization, and poor personal health habits (Booth-Kewley & Vickers, 1990; Costa & McCrae, 1992). Previous research has shown low conscientiousness to be a predictor of depression, and that low conscientiousness is linked with increased experience of depressive symptoms (Huang, Peck, Mallya, Lupien, & Fiocco, 2016). The current research conducted on conscientiousness and depression coincides with the previous findings. The sample consisted of 124 undergraduate students enrolled in Introduction to Psychology (age range: 18-63,  $M = 22$ ,  $SD = 6.74$ ). 62.1% of the students were female, and 68.5% were white. Participants completed the nine Conscientiousness Items from the Big Five Inventory (John & Srivastava, 1999) as a measure of conscientiousness, and depression was measured with the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). A Pearson correlation conducted on the self-report questionnaire data showed a negative correlation between conscientiousness and depression,  $r = -0.472$ ,  $p < .001$ . Participants who scored low in conscientiousness exhibited higher levels of depressive symptoms, and participants who scored high in conscientiousness exhibited lower levels of depression. We speculate this correlation exists due to low conscientiousness promoting low instrumentality and inconsistent or inadequate performances, leading to a poor achievement (Bassoff & Glass, 1982; Pekrun, 1992; Whiteley, 1985). Poor performance may lead



to low self-esteem and increased daily stressors, thus leaving individuals vulnerable to depressive symptoms.

**(Oral Presentation, Session III 2:15-2:30 PM, NC Room 1312)**

## **Officer Fatality and Violent Crime Relationship**

Allison Dean – Criminal Justice & Criminology

Faculty Mentor: Hyon Namgung

The research will be guided to see if there is a relationship between officer fatality and violent crimes within the United States. Over the years, there seems to be more of a focus on these two factors because of the media. I was to find if there is a specific relationship if this pressing issue is just a hot topic for the media. The findings of this research could be influential for policy change and for officers to be aware of this relationship. Not only will this give the citizens an idea of what is truly going on within society, but could potentially save the lives of officers if the right policies are put in place. I will be using the Officer Down Memorial Page and the FBI: UCR United States Offense Analysis to collect the data. The hypothesis is that there will be a positive correlation between the two variables; however, it will not be a strong correlation. The reason being is that officer fatality and violent crime rate fluctuate throughout the years. There will need to be future research to see if there is a correlation with other factors regarding officer fatality.

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

## **Microbial Comparison in Wetlands of Varying Health**

Deva DeAngelis-Lowe – Environmental Science

Coauthor: Drew Strosnider and Jacqueline Russell

Faculty Mentor: Helene Ver Eecke and Sarah Schliemann

At South Platte Park two very different wetland environments were chosen, Beaver Pond and Red Tail Delta, to be assessed for a variety of ecological health factors. Vegetation was assessed for content and diversity. The soil was analyzed for texture, horizons, redox characteristics, organic matter content, moisture, cation exchange capacity, pH, dissolved oxygen (d.o.), and anion (sulfate, phosphate, and nitrogen) levels. The water has been analyzed for conductivity, pH, and anion content. The sediment under the water column was tested for anions. Redtail Delta has very little organic matter in the very sandy soil of its beaches, and the very slow-flowing water has higher d.o. levels, likely due to a large amount of photosynthetic algae related to eutrophication conditions. There is less nitrate and sulfate suspended in the water in Redtail Delta likely because of the nearly still water and microbial reduction functions made obvious by the smell of hydrogen sulfide and wetland muck all along the water's edge. Beaver Pond, while historically a healthy, beaver-formed, wetland has experienced anthropologic changes have excluded Beavers from inhabiting the area. The waterway flowing through is clear, with less obvious and abundant wetland sediment features, but still with a greater range of wetland vegetative diversity. Primary enrichment cultures are currently undergoing serial dilutions to extinction in sulfate-



reducing and denitrifying media; from each soil, sediment, and water sample DNA was extracted and is being analyzed, some for more complete genomic analysis that can be related to the environmental data that has been gathered.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #10)**

## **Remembering the Virgin Queen**

Amy DeHerrera – History

Faculty Mentor: Shelby Balik

Queen Elizabeth the first, known in history as the “Virgin Queen” was represented in portraits throughout her life and reign. This paper will first examine how Elizabeth I’s seemingly religious decision to remain a virgin throughout her reign was also motivated by her political intentions. It will also pay detailed attention to how Elizabeth was portrayed in her portraits focusing specifically on the symbolism within these portraits. Paying particular attention to symbolism within Elizabeth’s portraits can allow a deeper understanding of the virginal image Elizabeth wish to convey as a ruler. Therefore, this paper will also observe the various symbols used to represent virginity during Elizabeth’s era and how that impacts the memory of her as queen even today. This paper will also consider whether these portraits were produced as replicas of the Queen, or whether they may have been well-crafted pieces of propaganda to boost Elizabeth’s power throughout her reign. Ultimately, by examining the portraits of Elizabeth I, this paper will consider Elizabeth’s visual and cultural legacy and how that legacy has shaped her historical memory.

**(Oral Presentation, Session II 11:00-11:15 AM, NC Room 1313)**

## **Who’s Out There: Integration of Stationary Point Counts and Conservation Photography to Assess Reef Fish Biodiversity**

Caitlin Dempsey – Biology

Faculty Mentor: Robert Hancock and Jennifer Gagliardi-Seeley

In the face of declining coral reefs due to human impacts, periodic assessments of “reef health” have been implemented. Conventional scientific methods include standardized fish counts executed in defined areas on randomly selected reefs by trained SCUBA divers. These counts rely predominantly on in situ identifications of fishes by the divers with adjunct photography being performed for unknown fishes. Examined in this study was the utilization of underwater photography and fish counts with intentions to enhance representation of the biodiversity in demersal reef fishes. Stationary point count surveys in designated 10 M cylinders were coupled with free roaming photography to compare measurable indices of biodiversity between openly fished areas and ecologically similar no-take preserve areas within the Florida Keys National Marine Sanctuary. The availability of high quality digital photography and videography conjoined with high capacity memory storage enabled a visual census to be catalogued in a greater capacity than past methods allowed. Preliminary results indicate differences in biodiversity between openly fished and the preserved reefs.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #11)**



## **Kinetics of Grignard Reactions**

Chancery Denbrook – Chemistry

Faculty Mentor: Russell Barrows

In most chemical reactions the intermediates or transition states largely control the outcome of chemical reactions. The project being present was designed to develop hands-on/inquiry-based laboratory exercises that demonstrate this basic principle of chemistry that is often overlooked or ignored by students. It is critical for students to understand that intermediates and transition states control the outcome of most chemical reactions in order for them to accurately predict the outcome of chemical reactions they are and will study in their chemical studies. To investigate this important attribute of chemistry the following project is measuring initial rates of reactions of phenyl magnesium bromide, methyl benzoate, & benzophenone to quantitatively show how intermediate states control the overall outcome of the Grignard reactions. The following presentation reports on our progress to measure several different types of initial reaction rates of intermediates in the reactions of Grignard reagents and esters. The first step was to develop a reliable analytical method for the measuring of reactions products. The analytical method that showed the greatest accuracy and reliability was the Internal Standard method. Concentrations of consumed starting materials and reaction products are being determined by integrating the Total ion current (TIC) chromatogram of each analysis and verifying the identity of each peak using MS spectroscopy. Reactions are being run in thermally jacketed reaction vessels, which allow for running Grignard reaction of interest at different temperatures.

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

## **Investigating Lead Sources Near a Secondary Lead Smelting Site: Using Antimony as a Pathfinder Element**

Delilah DeWilde – Chemistry

Coauthors: Karolina Ryncarz, Nathan Aist

Faculty Mentors: Michael Ketterer

Residential and non-residential areas within ~ 10 km of a secondary lead smelting site operating since the 1930s have been investigated in order to determine the relative importance of secondary lead smelting vs. other common urban pollutant sources of Pb in local environmental soils. The central hypothesis being tested is as follows: lead originating from secondary lead smelting will also contribute Sb as a highly correlated concomitant; however, lead from other urban sources (e.g., paint, gasoline) will lack Sb. After preliminary studies revealed a strong Sb:Pb correlation with a slope of ~ 0.1 for soils from undisturbed locations very close to the smelter, we commenced a sampling effort, obtaining soil cores (5.2 cm diameter, 30 cm depth) from a range of locations with reasonable variation in distance/direction and land use. Soil cores were sectioned into 0-5, 5-10 and >10 cm intervals. Core intervals were dried, ground, and digested using an HNO<sub>3</sub>-HF-H<sub>3</sub>BO<sub>3</sub> procedure. The element Pb was determined by both flame atomic absorption spectrometry (FAAS) and inductively coupled plasma mass spectrometry (ICPMS); Sb concentrations were determined by ICPMS. The results will be presented and interpreted, both in terms of how the Pb concentrations imply any health risks associated with elevated soil Pb, and as to how the Sb:Pb relationships observed support the hypothesis about impact and contributions from secondary lead smelting.

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



## **Integrative Medicine Present Within Health Care System Today**

Natasha Dillon – Integrative Health Care

Faculty Mentor: Jeffrey Helton

In order to improve the foundation of the health care system, introducing and implementing integrative medicine, in which brings together both conventional and alternative medicine into one, has become the pioneer to developing and reshaping the functionality of the health care system. As for the general public, the public needs to become informed and educated about all the possible healing modalities that are available and accessible. In order to increase patient satisfaction and further promote holistic health and wellness for each patient to attain, integrative medicine has found a way to bring Eastern with Western medicine into one healing practice. The purpose of the study is to determine key reasons why there is growing demand for implementing more integrative medical modalities in the forms of massage therapy, chiropractors, and acupuncture into health facilities such as clinics and hospitals. In order to assess whether or not there is a significant demand for increasing resources of integrative medicine, cross sectional studies must be done in order to evaluate the patients' response through surveys. Also, by observing rising trends in populations of young adults that range from the ages of 18-30 years old, will be the target age group as well as looking at clinical trials along with recording the results of different forms of integrative medicine such as massage therapy, acupuncture, and chiropractor. The sample size will consist of the Denver Metro area due to how in Colorado integrative medicine has been more present in the health care system and therefore that will yield in more data that has been collected over a period of time and we will use a mixed research study method.

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

## **Intrasexual Competition of Female Convict Cichlids, *Amatitlania nigrofasciata*, in the Presence or Absence of a Potential Mate**

William Dokai – Biology

Faculty Mentor: Jennifer Gagliardi-Seeley

Convict cichlids, *Amatitlania nigrofasciata*, are a socially monogamous Neotropical fish species. Convict cichlids aggressively compete for access to mates, and establish dominance via intrasexual competition. Although convict cichlids exhibit mutual mate choice, most research has focused on male-male competition. Here we focus on female-female competition. We hypothesized that two female cichlids, in the presence of a male, would show increased intrasexual aggressive behaviors, compared to two females in the absence of a male. In addition, we hypothesized that larger females would exhibit more aggression than smaller females. To test these hypotheses, we placed one large female and one small female in an aquarium with or without a male present. We recorded their behavior for 15 minutes and analyzed it using EthoVision. Female aggression was not statistically different in the presence or absence of a male. Although not significant, there is a trend that shows larger females exhibit more aggressive behaviors, both in the presence and absence of a male. This could indicate that the hierarchy of intrasexual dominance in female cichlids is independent of the presence of a potential mate.

**(Poster Presentation, Session II (11 AM– 12:00 PM), Poster #23)**



## **BNP Biosensor**

Naz Dubchak – Biology

Faculty Mentor: Andrew Bonham

We developed an electrochemical DNA (E-DNA) biosensor for point-of-care quantitative determination of B-type natriuretic peptide (BNP) levels in blood. BNP is a commonly used biomarker for the onset of heart failure conditions, as its secreted levels in the blood correlate with the internal pressure of cardiac tissue, and high levels of BNP are typically found in patients with congestive heart failure. Unfortunately, current tests for BNP are largely based on phlebotomic blood draw followed by ELISA, which requires external testing and eliminates the possibility of point-of-care diagnosis. To address this unmet need, we have developed a rapid, convenient biosensor for BNP based on a known DNA aptamer specific to BNP that has been modified and incorporated into an electrochemical readout format. E-DNA biosensors have been shown to function in unprocessed whole blood and yield quantitative results in less than one drop of blood. When an E-DNA biosensor binds to its target, a conformational change results in a change in electrical current. Using varied concentrations of BNP in PBS buffer we were able to dose-response behavior from the biosensor. This data is used as a calibration standard to allow quantitative measurement of unknown concentrations of BNP, which would have useful clinical application. Although optimizations remain, ultimately, the biosensor will measure BNP levels in whole blood, offering a new bedside or point-of-care way to measure and monitor an important biomarker for diagnosis of heart failure.

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

## **Forest Successional Stage and Habitat Value for Migrating and Resident Birds on the Pacific Slope of Monteverde, Costa Rica**

Kevin Dykstra – Environmental Science

Coauthors: Stacey Fuller

Faculty Mentor: Christy Carello

Over 900 species of birds are found in Costa Rica, of which 350 are North American migrants. Forested areas are a critical resource for these birds. In the cloud forest region of Costa Rica, reforestation of agricultural land has become a priority in order to create a habitat for birds. The objective of our study was to evaluate the use of migratory and resident birds in cattle pasture and coffee plantations after 8 years of reforestation. We conducted point counts and mist-netting in these reclaimed areas as well as in a reference forest to determine abundance and species richness of birds. We found that reforested coffee plantations were not statistically different from the reference forest, but that the cattle pasture had significantly less birds and fewer species than the reference forest. In addition, we found a statistical difference between migratory and resident species in the reference forest. Our results show that cattle pasture does not recover as quickly as coffee plantations, and that in mature forests, resident species outnumber migrants. These results are important in terms of prioritizing land for reclamation.

**(Oral Presentation, Session I 9:15-9:30 AM, NC Room 1314)**



## **Synthesis of Liquid Crystals Manifesting Twist and Splay: Biphenyl-Gallate Tail Substitutions on the Bent Core**

Dania El-Batal and Valerie Toman – Chemistry

Faculty Mentor: Ethan Tsai

There are various applications that can be utilized by macromolecular motifs within thermotropic liquid-crystalline phases (LC), such as organic zeolites, molecular filtering, ion trapping, and organic semiconductors. Deformations within LC phases can be described by splay, twist and bend within the supramolecular structure. In this novel investigation, increasing the amount of uniform twist and splay deformation can potentially access optically isotropic, bi-continuous cubic phases. A previously synthesized target, W622, provided access to an optically isotropic phase. Utilizing this motif in conjunction with the splay driven biphenyl-gallate tail substitutions on the bent core, would potentially yield the rare arrangement in space seeking truly optically isotropic ordered phases.

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

## **ENOX2-Selective Aptamer Identification for an Electrochemical-Aptamer Biosensor in Cancer Diagnostics**

Lisa Fetter – Biology

Coauthor: Jena Jacobs

Faculty Mentor: Andrew Bonham

Human Ecto-Nicotinamide Dinucleotide Oxidase Disulfide Thiol Exchanger 2 (ENOX2) is a common isoform of a parent protein ubiquitously expressed in humans, ENOX1. The ENOX2 isoform is very highly expressed on the surface of tumors in at least twenty-six variants of cancer, resulting in ongoing research into ENOX2 as a potential diagnostic biomarker for cancer. Given both that ENOX2 is shed into the sera and that its presence is cancer-specific, ENOX2 is an attractive target for blood-based diagnostic screens for cancer. To enable this detection on a rapid and reagentless sensing platform, we have designed an aptamer-scaffold electrochemical biosensor directed against this cancer-related protein. This was accomplished by first using systematic evolution of ligands by exponential enrichment (SELEX) procedures and high-throughput next generation sequencing to identify an ENOX2-selective aptamer sequence. This novel aptamer may be useful in a variety of applications. In this work, the aptamer was then modified to support a conformation-changing response to target binding. The result modified oligonucleotide was incorporated into an electrode-based electrochemical biosensor platform. Electrical current changes in the presence of ENOX2 were measured, creating a dose-responsive readout. Ultimately, this biosensor against ENOX2 will maintain functionality in whole blood, yielding a novel and clinically-relevant diagnostic tool for the rapid detection of early stages of cancer.

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



## **Survivability on the Metropolitan State University Denver Green Roof**

Jenessa Fischer – Biology

Coauthors: Erik Vazquez, Caroline Hall

Faculty Mentor: Christopher Meloche

There are companies, which produce standardized, sedum-seeded green roof surfaces. The Metropolitan State University's Student Success Building incorporates a green roof that was contracted from SemperGreen® a company with physical locations in Virginia and Wisconsin. For these designs to be sustainable, green roof design has to take into consideration certain aspects that best fit into the fundamental architecture of a metropolitan structure. We believe that an important consideration for a green roof is the local climate and environment, which is considerably different in Colorado than in Virginia and Wisconsin. The ultimate goal of this project is to produce data, which can be used as both a baseline for future studies and a basis for sharing the value of our green roof with the public. The data we have collected include number and distribution of remaining species of plants on the roof, relative plant cover, and total plant cover. These observations will help us determine what is thriving, what is struggling, and what has not survived over the past seven years since the green roof was installed.

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

## **Strength, Stiffness, and Linear Roughness of As-Printed ASTM E8 Test Specimen from Three Orientations to Evaluate the Efficacy of Additive Manufacturing Techniques**

Edgar Flores – Mechanical Engineering Technology

Coauthor: Erick Gomez

Faculty Mentor: Devi Kalla

Benefits of additive manufacturing are vast and encompass nearly every aspect of life. Direct Metal Laser Melting (DMLM), as compared to traditional manufacturing, typically produces parts with inferior mechanical properties due to ferocious heating and cooling during deposition that yields martensite. Mechanical properties are directly correlated to grain structure, and therefore DMLM process factors. Research has shown that effectively controlling energy density, average energy applied per unit volume, can lead to acicular alpha's martensite in-situ decomposition into near-equilibrium lamellar (alpha & beta) grain structure, and notably produce mechanical properties superior to traditional manufacturing. It is predicted that research can enhance the service performance of additive manufactured titanium parts by carefully selecting DMLM processing factors: layer thickness, focal offset distance, laser power, laser scanning velocity, and hatch spacing. This study will initially evaluate the efficacy of process factors using stainless steel evaluated with strength, stiffness, and linear roughness. Initial phase data will be analyzed to make recommendations for the best factors. Once factors are defined, scanning electron microscopy and X-Ray diffraction analysis will investigate Ti6Al4V grain structure. The right selection of DMLM process factors can produce expected results of alpha + beta-phase between lamellar and equiaxed without undergoing losses in strength distinct in annealed titanium alloys. Results will inform



additive manufacturing about techniques to produce titanium metal parts with superior strength, yet no loss in elasticity for the production of prototype and end-use parts to meet needs cost effectively and with speed.

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

## **The Antimicrobial Efficacy of Poultices**

Michael Flores – Biology

Faculty Mentor: Sheryl Zajdowicz

The use of plants for their medicinal value has often been cited as the origins of modern day pharmaceuticals. Antimicrobial resistance to synthetic drugs has prompted studies to re-evaluate the beneficial properties of these plants. Recent studies indicate that antimicrobial phytochemicals found in traditional forms of treatment associated with less developed societies are effective against these resistant organisms. Often such properties are exploited by direct application of mashed plants (called poultices), extracts, or essential oils. Although research has explored the antimicrobial benefits of specific compounds found in various plants (such as allicin found in *Alliums*), this current study evaluated fresh poultices from the bulbs of the *Allium* and the leaves of *Apiaceae*. These plants were chosen for their often fragrant and volatile phytochemicals, which include enzymes, phytotoxins, and a host of other biochemicals that can interfere with microbial growth and reproduction. Poultices of *Allium cepa* (common onion) and *Allium sativum* (common garlic) were prepared, applied to BHI agar plates inoculated with various microbial strains, including both gram-negative bacteria (*Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Neisseria sicca*), gram-positive bacteria (*Staphylococcus epidermidis*, *Bacillus cereus*, *Staphylococcus aureus*, *Bacillus subtilis*, and *Corynebacterium xerosis*), or fungal species (*Candida albicans*). Following incubation, zones of inhibition were measured. Inhibition was observed within the *Allium* family, with garlic having significant inhibition against all organisms tested. Future analyses will be performed on poultices prepared from *Allium ampeloprasum* (common leek), *Petroselinum crispum* (common parsley), *Coriandrum sativum* (cilantro/coriander), and *Anethum graveolens* (common dill).

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

## **Eating Meat: Have we been sold our diets through marketing?**

Sage Freeman-Gonzales – Marketing

Faculty Mentor: Sarah Schliemann, Sally Baalbaki, and Megan Hughes

In a nation of meat eaters, it is nearly impossible to imagine a growing number of people to go against their taste buds. Against all odds, people are realizing that much of our culture of animal consumption is driven by corporate interests and not by our nature of supposed carnivorous instinct. We have been sold an idea of meat consumption by companies who are only interested in selling their product. Did we become omnivores because we are meat eaters by nature, or was this idea sold to us like so many of our other values that we forgot were once sales campaigns.

**(Oral Presentation, Session I 9:45-10:00 AM, NC Room 1313)**



## **Rationing Healthcare Services Research Proposal**

Audra Gaffney – Health Care Management

Faculty Mentor: Jeffrey Helton

There is no simple solution for curbing the ever-growing costs of health care services in the United States. Currently, the US is known for its abhorrently high expenditures on health care, and there is no foreseen end. Several avenues have been approached, including the Affordable Care Act, requiring Americans to saturate the health care market by mandating health insurance. Other ideas have been mentioned, such as using Accountable Care Organizations (ACOs), creating and the use of medical homes, as well as revising the way in which the Centers for Medicare and Medicaid Services reimburse providers. However, one possible solution has potential to bring power back to the buyers of insurance within the market by throwing transparency of the costs of services back into the transaction. The word “rationing” in and of itself comes with connotations that are not usually positive, ringing thoughts of communism, therefore making rationing high cost health care services a scary option; however, the current health care system already rations health care by ability to pay for services. Although the Emergency Medical Treatment And Labor Act (EMTALA) stipulates that patients who present in an emergency department cannot be turned away if they cannot pay for services, it does not apply to other areas of health care, including primary care. This study proposes to find whether rationing high cost health care services based on a person’s need, rather than their ability to pay, in public not-for-profit hospitals in the Denver Metropolitan area will facilitate lowering the cost of providing care.

**(Oral Presentation, Session III 2:30-2:45 PM, NC Room 1315)**

## **Effect of Bleach and Bleach Neutralization on the Detection of Blood in Forensic Analysis**

Cesar Garcia – Chemistry

Faculty Mentor: Megan Filbin-Wong

Blood is one of the most common types of biological evidence found at crime scenes for human identification, while bleach is the one of the most common cleaning agents used by criminals to cover up their crimes. In this study, we tested the effect of bleached bloodstains on four presumptive tests: lab-made phenolphthalein, and commercially available phenolphthalein, luminol, and leucomalachite green. We found that while bleach decreased the detection of bloodstains for the lab-made phenolphthalein, the commercially available detection methods were only slightly decreased in their ability to positively identify blood. In efforts to “recover” evidence samples treated with bleach, we also tested whether or not acid neutralization of the bleached stains would yield positive presumptive tests. We found that the samples treated with the lab-made phenolphthalein tested positive only in the presence of acid and bleach, and the commercially available phenolphthalein yielded a higher positive signal. However, the leucomalachite green tested negative when acid was added to the bleached stains, indicating acid neutralization is not a useful approach for this particular presumptive identification of bleached blood evidence. Bleach and acid neutralization of bleach had no effect on luminol identification of blood. Along with presumptive testing, we also tested the effect of bleach on confirmatory test identification of human blood. To address this idea, we utilized two commercially available immunochromatographic methods common in evidence field-testing. While both immunochromatographic strips positively identified blood in the presence of bleach, we found that only one strip was able to positively identify bleached blood after



acid neutralization. We conclude that acid neutralization can be applied to presumptive testing without obstructing subsequent confirmatory testing, however, neutralization should not be a universal method to positively identification of bleached blood evidence.

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

## **Examining the Relationship Between Mindfulness and Conscientiousness**

Annie Garofalo – Psychology

Coauthor: Renee Baker

Faculty Mentor: Lisa Badanes

Mindfulness in contemporary psychology has been described as the tendency to be highly aware of one's internal and external experiences in the context of an accepting, nonjudgmental stance towards those experiences (Cardaciotto et al., 2008). Conscientiousness is a personality construct that is a core determinant of health, positive aging, and human capital. The trait of conscientiousness has four components or facets: orderliness, industriousness, self-control, and responsibility (Roberts et al., 2014). Beneficial effects of mindfulness can be explained by mindful individuals' greater ability to self-regulate. Both mindfulness and conscientiousness are characterized by deliberateness and responding effectively rather than reacting habitually or impulsively (Kabat-Zinn, 1990). Mindfulness-based cognitive therapy (MBCT) offers a promising cost-efficient psychological approach to preventing relapse/recurrence in recovered depressed patients (Teasdale et al., 2002). A mindfulness intervention program was found to be both practical and effective in decreasing employee stress, while improving resiliency, vigor, and work engagement, thereby enhancing overall employee well-being (Aikens et al., 2014). The current research demonstrated a direct correlation between mindfulness acceptance and conscientiousness. The sample consisted of 124 undergraduates. The participants were 62.1% female, 32.3% Hispanic, and 68.5% White. Data was obtained using self-report questionnaire packets containing mindfulness and conscientiousness scales. A Pearson product-moment correlation was run to determine the relationship between mindfulness and conscientiousness. There was a moderate, positive correlation, between mindfulness acceptance and conscientiousness which was statistically significant,  $r^2 = 0.317$ ,  $p \leq 0.01$ . Mindfulness acceptance was associated with: thoroughness, liability, efficiency, carefulness, and attention. It was not associated with task perseverance. These findings may be useful in practice and clinical application, encouraging conscientious personality traits to increase mindfulness to buffer against stress and depression.

**(Oral Presentation, Session I 9:15-9:30 AM, NC Room 1316)**

## **MTLM (Mutli-axis Tilting and Lifting Box Machine)**

Luella Garth – Mechanical Engineering Technology

Coauthors: Brett Floistad

Faculty Mentor: Devi Kalla

Machine design is an important component when it comes to the engineering field. In some instances, various engineering products may not seem as interesting as others, but they solve some very fundamental problems. When examining various technologies that exist for lifting heavy materials, in the manufacturing process, most machines only rotate in one or two directions. These machines are also limited in how much they can lift. Research will be done, and a product will be created, that will attempt



to give manufacturing a new type of system that can lift large weights and rotate them in multiple directions. Research was found about current weight lifters such as engine hoists, or even “below-the-hook” lifters. These concepts basic concepts will be applied when determining the projects final design. The machine that is being created is used in resin pouring applications for a manufacturing company. The resin pour assist machine will be comprised of mostly metal and will be able to spin and tilt a wooden cabinet to assist in the resin pouring process. The animal cages require a waterproof seal in each corner to ensure the wood is not compromised by the moisture. The current process of tilting the cabinets on a 45-degree angle is very dangerous and time consuming. This new machine will speed up production to make it an economical choice for the company. Reducing injury will also decrease worker’s compensation claims which will allow the company to focus on productivity. Overall this complex machine will speed up production time and increase safety in the resin pouring process, which could be fully automated in the future. Future plans for automation will be included as well as future improvements.

**(Oral Presentation, Session I 10:00-10:15 AM, NC Room 1315)**

## **Enduring the Call to Serve: Effects of Post-Traumatic Stress on Prisoners of War and Their Families**

David Gonzalez – History

Faculty Mentor: Margaret Frisbee

The physical and psychological trauma endured by prisoners of war (POWs) affects not only the service-members, but also their families during and after their return from captivity. Using examples of survivors from wars in Korea and Vietnam, the effects and treatment of Post-Traumatic Stress Disorder (PTSD) will be compared to POWs of the modern wars in Iraq and Afghanistan to show the evolution of mental and physical treatments for survivors and their families. To understand the depth of trauma suffered, I will be using testimonies from the survivors, declassified government documents, and court martial transcripts, to chronicle the hardships endured by POWs during their captivity and freedom after. Sources such as psychological studies and medical reports on service-members from the Cold War and conflicts in Iraq and Afghanistan demonstrate not only the change and effectiveness in treatments, but also changes in terminology and stigma. Finally, I will discuss the separate trauma and treatment endured by the captives’ family members from each generation, and how life at home changed when their loved ones returned. POWs have suffered unimaginable hardships that have lasting effects on their bodies and minds. Also affected are their family members who lived with the fear that they would never see their loved ones again. The changes for both POWs and their families after their release from captivity presents dramatic changes from the old family dynamic. The coping mechanisms used by modern treatments and techniques along with a more sympathetic attitudes towards POWs have come a long way since the Cold War, but there is still much that can be learned and improved on.

**(Oral Presentation, Session II 11:00-11:15 AM, NC Room 1316)**



## **Toxic Trace-Metal Analysis of Aquatic Life Living Below the California Gulch Superfund Site**

Hannah Goulding – Chemistry

Faculty Mentor: Garry Farmer

Water samples were collected below and within the California Gulch Superfund Site in Leadville, CO to determine presence of toxic metals. The central question of the research concerns whether aquatic life living in streams and rivers of Leadville contain toxic metals. Native stone fly nymphs were observed living in the Arkansas River below where the water samples were collected, so it is expected that they may be obtained in a return visit. In addition, a trout species will hopefully be collected at the same site. Water samples were tested on the Inductively Coupled Plasma-Mass Spectrometry (ICP-MS): results show that the samples contained elevated levels of zinc and low levels of cadmium and copper. The purpose of our research is to determine if these metals accumulate in the tissues of stone flies and trout species that live in the streams below the Superfund Site, and if there is a correlation to metal contamination levels found in the water. Stone fly nymphs will be collected and analyzed for zinc and trace metals cadmium and copper present in the water samples. If a trout species is collected, tissue samples will be digested and analyzed using ICP-MS for these sample trace metals.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #7)**

## **Field Game Tournament Design**

Michael Granquist – Mathematics

Faculty Mentors: None

Once a year, my friends and I hold a tournament that we call “Field Fun Games.” Teams of two members compete at games like baggo, bocce ball, ladder ball, and horseshoes. Each game has its own station, and the tournament is divided into rounds of play. We schedule the tournament according to two fundamental principles: 1) Each team should play each game exactly once, and 2) No two teams should compete against each other more than once. Under these requirements, my research aims to answer the question: What is the best possible tournament design? As it turns out, the answer is largely subjective. We want to minimize the number of rounds to be played, but attention must also be given to which teams play against which and how many common opponents the various teams share. My presentation will outline a methodology for constructing tournaments. Particular attention will be given to the reasons why there is no generalizable formula for the “best tournament.” For example, a four-game/eight-team tournament must be approached differently than a four-game/ten-team tournament or a five-game/eight-team tournament. Although my research is mathematical in nature, the results obtained should be accessible to all. A summary of dozens of tournament layouts with descriptions of their strengths and weaknesses will be available to any interested parties.

**(Oral Presentation, Session III 2:30-2:45 PM, NC Room 1314)**



## **The Battle of Kursk: A Changing Narrative**

Justin Grayson – History

Faculty Mentor: Kim Klimek and Shelby Balik

My presentation will discuss the Battle of Kursk. The battle in itself is important because it was one of the turning points of the Second World War. It is also the crux of an important piece of Russian patriotic folklore. With the release of previously classified Soviet documents around 2007, a new perspective on the battle is being brought into the academic and public eye, one that challenges the classic interpretation of the battle. These new ideas about the battle bring vindication to the German narrative of events. They also bring into question the validity of the Russian narrative, which has defined the battle for so long. Examining these points are important because they challenge the dominant narrative of Russian military effectiveness, as well as a nominally accepted patriotic myth. It also offers an opportunity to examine and discuss the power of propaganda and how it affects our historic memory of certain events. As Kursk was one of the most important military engagements of the entire Second World War, and critical to the outcome of events on the Eastern Front, understanding the reality of that battle also brings greater clarity to our understanding of the Eastern Front as a whole.

**(Oral Presentation, Session I, 9:30-9:45 AM, NC Room 1316)**

## **Investigation of Iron Transport in *Drosophila melanogaster* using RNAi Positive Control Inhibition of RhoI**

Enrique Grimaldo – Chemistry

Faculty Mentor: Emily Ragan and Maureen Gorman

Iron is a vital micronutrient needed by nearly all living organisms. Iron however, is also toxic by nature due to its oxidative state ( $\text{Fe}^{+2}$ ), which causes damaging radical formations. Consequently, iron transport must therefore be highly regulated in order to limit harmful effects. A mechanism of iron transport is required in all animals, but over time, certain animal lineages have developed different transport methods that provide the needed amount of iron while limiting the harmful effects of iron radicals. In mammals, iron is transported out of cells using ferrous permease, which is oxidized, and then loaded onto transferrin. Transferrin is taken up into cells through receptor-mediated endocytosis. This is likely not the case for insects as no transferrin receptor has been found and there is currently no identified mechanisms for iron uptake from the hemolymph in insects. To attempt to identify their mechanism, we will specifically test if the reduction of ferric iron in the hemolymph leads to iron transport in the cells using a technique called RNA interference (RNAi). My focus in this research is to create a positive control in order to confirm and verify that our technique for RNAi is successful in the cells being used. The control will be using double stranded RNA that matches the sequence of RhoI. RhoI is a protein that allows cells to undergo cytokinesis and divide into new cells with appropriate cell densities and sizes. RNAi depletion of RhoI will block this process and therefore make replicating cells abnormally large in comparison. The overall goal of the project is to gain a better understanding of the physiological mechanisms of iron transport in insects, and connect these findings to also better understand the mammalian mechanism of iron transport.

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



## **Development of Short, Entertaining Videos to Promote the Inclusion of Students with Blindness or Low Vision in the Chemistry Laboratory**

Tom Grushka – Chemistry

Faculty Mentor: April Hill

The importance of hands-on experimentation to science learning at all levels cannot be overstated. Studies have shown that the majority of learning in a classroom occurs through visual means. Therefore, opportunities for experiential learning are particularly critical for science students who are blind or low vision (BLV), due to their increased need for tactile and aural input of spatial and visual information. Unfortunately, BLV chemistry students are often relegated to the sidelines during the most interesting and critical part of the learning process: the experiment itself. Often this is due to a lack of knowledge about how to work with BLV students in the chemistry lab, and adaptive tools and technologies that are available. While this topic is addressed in various research papers, the information is fractured and not readily accessible to time-pressed instructors. In this presentation, several short videos that introduce and demonstrate various tools and techniques for incorporating BLV students into engaged and safe participation in chemistry labs are featured. Topics addressed include notched syringes, talking LabQuest devices, lab bench organization strategies, and communication etiquette. The purpose of these videos is to inform instructors about what is available and how to work with BLV students in a short, entertaining format in order to make their jobs easier. The tools and techniques presented in the videos are readily adapted to many standard chemistry experiments at both the high school and college levels. The videos will be published on the MSU Denver faculty research web site for free public access.

**(Oral Presentation, Session I, 9:45 – 10:00 AM, NC Room 1314)**

## **The Benefits and Challenges of Sustainable Pervious Concrete Design**

Tom Grushka – Chemistry

Faculty Mentor: Runing Zhang

Our cities are covered by millions of acres of roads, sidewalks, and parking lots. These mostly consist of impervious concrete, which does not allow water to seep through. The ubiquity of pervious concrete results in problems with standing water, runoff and drainage, erosion, and pollution of streams, rivers, and reservoirs by litter and contaminants. New engineering technologies have enabled the development of pervious concrete as a solution to many of these problems. Pervious concrete allows water to filter through at a controlled pace, eliminating standing water, runoff, and erosion problems. The concentration of litter and debris into streams and reservoirs, a secondary effect of runoff, is also greatly reduced. Additionally, certain designs of pervious concrete can filter out pollutants, such as harmful chemicals and oils, from seeping into the ground. While pervious concrete provides many environmental benefits, its implementation also presents unique challenges. Pervious concrete cannot be used in any application. Due to its porous nature, its strength and compressibility are reduced compared to impervious concrete. In heavily contaminated environments, the serviceability of pervious concrete can be problematic due to cleaning maintenance challenges. This poster presentation focuses on a literature review of pervious concrete, its benefits, drawbacks, and comparison to impervious concrete in design, manufacture, maintenance, and applications. It is hoped that this presentation will raise awareness of the new sustainable concrete design paradigm, introduce the viewer to some of its engineering challenges and benefits, and inspire the community to support the implementation of pervious concrete where possible to improve environmental sustainability in their local communities.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #4)**



## **Undocumented Women in the U.S.**

Cesiah Guadarrama Trejo – Political Science

Faculty Mentor: Anahi Russo Garrido

While there is much written about harassment and sexual assault against women in the workplace there is not always a significant focus on undocumented immigrant workers. Immigration is a hot topic in the U.S, there are currently 11 million undocumented immigrants living in the U.S. Many who are part of the labor sector. This paper will focus on undocumented women and their experiences in the U.S and their workplace. The question I seek to explore is how their immigration status affects their experiences in the U.S. I argue that undocumented women are among the most vulnerable groups of being victims of sexual assault, and harassment in the workplace. I will focus on various work sectors including agriculture, domestic work, and factories. My focus is on sexual assault cases, harassment, and wage theft. Often these workers are afraid to report incidents not just due to fear of losing their jobs but also fear of getting reported to ICE (Immigration Customs and Enforcement) and getting deported. I will explore how the theory of intersectionality plays a significant role in the thesis. Race, class, gender, and ethnicity are significant factors when exploring this topic. Research methods will include textual analysis based on research and interviews done about experiences lived from undocumented women. The findings reflect that undocumented women often do not report incidents against them due to fear of deportation of not only them but also their families. Access to resources can be difficult to access due to language barriers or lack of awareness of such institutions. Undocumented women often also face financial barriers and fall within poverty thresholds incomes.

**(Oral Presentation, Session I 9:15-9:30 AM, NC Room 1313)**

## **An Examination of Composite Executive Function Tasks**

Austin Haider – Biology

Faculty Mentor: Lisa Badanes

Executive Function (EF) is a broad paradigm encompassing several constructs related to complex thought processes. The EF domain incorporates (but is not limited to) concepts such as planning, inhibition, organization, and working memory (WM) (Gathercole et al., 2008). EF ultimately describes various skills that are essential to one's overall problem solving capabilities and mental prowess. This article discusses the relationship between two key facets of EF: planning and WM. Planning describes the evaluation and execution of a predefined goal and is often assessed using the Tower of London (TOL) or a variant of the task (Shallice & Burgess, 1991). WM is the ability to retain and manipulate information within a short time of the initial presentation (Ragland et al., 2002); the N-Back task is commonly used to quantify WM in this context (Jaeggi et al., 2010). While the TOL is generally regarded as an indicator of planning ability and the N-back as a measure of working memory aptitude, these tasks also include a region of overlap within the EF domain. The aim of this study was to investigate the converging and diverging features of the N-back and the TOL to better understand the nature of these EF constructs. Computerized tasks were administered to 134 introduction to psychology students using Inquisit's version of the N-Back as described in Jaeggi et al. (2010) and a slightly modified form of the TOL- first described by Shallice in 1982. Participants' performance on these tasks were assessed using an array of dependent variables calculated automatically by Inquisit. We found a strong correlation between specific performance scores



on the N-Back and TOL. Although this result may seem rather intuitive, we will discuss the mechanisms by which this phenomenon arises and ultimately provide a novel examination of this association.

**(Oral Presentation, Session III 2:45-3:00 PM, NC Room 1315)**

## **Ontogenetic Variation in Crayfish Diets Revealed by Stable Isotope Analysis**

Caroline Hall – Biology

Coauthor: Mele Avery

Faculty Mentor: Jason Kolts

Crayfish are common omnivorous inhabitants of streams and ponds that eat a variety of living and dead plants and animals. Studies on crayfish diets have provided inconsistent data on whether adults or juveniles are the most carnivorous stages of crayfish. In this project, we are examining the diets of crayfish in three metro area streams that vary substantially in available prey to see whether carnivory among crayfish size classes correlates with greater prey availability. As incorporation of N15/N14 in body tissues correlates positively with trophic level, we are utilizing analysis of the stable isotopes of N in this project. In this portion of the study, we are focusing on crayfish of varying sizes/ages collected from City Ditch in Washington Park. We collected 91 *Orconectes virilis* crayfish, and various other macroinvertebrates by sweeping vegetation along the stream edge with a dip net. Crayfish were immediately frozen at -80oC and later measured (carapace length), weighed, sexed, and identified to species. Abdominal tissue from a range of crayfish sizes were processed for stable isotope analysis. We are also analyzing the other invertebrates (e.g., amphipods, odonates) as reference to compare N15/N14 of known herbivores and carnivores to crayfish size classes. We have not received stable isotope data for crayfish and prey from the laboratory at this point, but will later this spring. In future phases of this project, we will analyze N isotopes of crayfish and prey collected from urban streams where macroinvertebrate prey is much more abundant than in Washington Park.

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

## **The Impact of a Brief Mindfulness Breathing Exercise on Levels of Anxiety in College Students**

Tayler Hanson – Psychology

Coauthors: Anna Rowland, Desiree Schneider, Sean Vieau, Mitch Kusick

Faculty Mentor: Lisa Badanes

Breathing meditations, like Pranayama and Sudarshan Kriya Yoga, produce physiological and neurological changes in the body that have shown to alleviate anxiety. Of particular importance is their affect on not only the physical manifestation of anxiety, but also the emotional-mental experience by increasing mindfulness, which is the cultivation of concentration, attention, and non-judging acceptance towards whatever one is experiencing in the present moment (Bishop et al., 2004) in contrast to deep breathing alone. The purpose of this study was to investigate if a single 5-minute mindfulness breathing exercise would reduce levels of anxiety in college students and increase levels of state mindfulness. 110



students were sampled from an Introductory Psychology class as part of a larger study, in which participants completed the Spielberger State-Trait Anxiety Inventory-State Scale (STAI; Marteau & Bekker, 1992) to assess current anxiety levels, as well as the Toronto Mindfulness Scale (TMS; Lau, et al., 2006) to assess current state mindfulness levels. Participants then completed either a 5-minute mindfulness breathing exercise or listened to a 5-minute audio book recording of the Hobbit as a control. Participants then completed both measures post-intervention. A mixed ANOVA revealed that individuals in the meditation condition increased in state mindfulness from pre- to post-test ( $F(1,55) = 10.81, p = .002, n_2 = .164$ ) compared to the control ( $F(1,59) = .412, p = .524, n_2 = .007$ ) and, after calculating a change score from pre-post anxiety scores, an ANOVA confirmed that levels of state anxiety decreased more in the mindfulness condition than in the control ( $F(1,113) = 13.70, p = .001, n_2 = .111$ ). These findings reinforce recent literature that argues in favor of mindfulness meditation over pharmaceutical interventions for treating anxiety, specifically: the immediacy of its benefits, lower cost, convenience, and the lower potential for severe side-effects.

**(Oral Presentation, Session I 9:45 -10:00 AM, NC Room 1312)**

## **Early Life Stress and Substance Use in College Students: The Impact of Early Adversity on Current Substance Use and Substance Preference**

Taylor Hanson – Psychology

Faculty Mentor: Lisa Badanes

Early adversity has been shown to increase risk for substance use and dependence as a result of physiological changes in brain structures that react to stress and reward. This in turn renders the individual more susceptible to the initiation of drugs and alcohol, and also enhances their response, thereby increasing the likelihood of dependence (Andersen, S. L., & Teicher, M. H., 2009). This study sought to replicate and extend these findings in a diverse sample of highly stressed college students by examining the amount of reported substance use as well as substance preference. 46 students from an Introductory Psychology program were sampled as part of a larger ongoing study, in which they were required to complete a survey including experiences of early life stress before age 18, as well as a current substance use questionnaire to assess substance use over the past 2 weeks. The sample was 64% female, 61% white, with an average age of 26. A positive relationship was found between reported early life stress and current substance use,  $r(46) = .43, p = .003$ . Results also revealed that the most frequently used substances for those reporting early life stress were alcohol, tobacco, marijuana, and crack or cocaine. These findings support recent literature that shows increased substance use in adults as a result of early life stress. As substance use is linked to daily impairment in important life domains, including lower academic achievement, these findings help inform intervention and prevention efforts in students entering college with a history of early life stress.

**(Oral Presentation, Session II 11:15-11:30 AM, NC Room 1312)**



## **Biofilm Reduction with Airborne**

Bryan Harris – Biology

Faculty Mentor: Sheryl Zajdowicz

In recent years, the use of Airborne™ or other vitamin supplements has become a popular means to prevent sickness. While individual ingredients of these supplements have been evaluated in the context of potential benefits to the immune response, limited information is available regarding the effect that these supplements have on microbes, particularly those associated with the oral cavity. *Streptococcus mutans* is a common biofilm-forming bacterium that is known for causing tooth decay. In the current study, we evaluated the effect of Airborne™ on biofilm formation by *S. mutans*. A bioluminescing strain of *S. mutans* (*S. mutans* firefly) was grown in the CDC continuous flow biofilm reactor to allow for biofilm formation on polycarbonate discs. Following incubation to allow for biofilm formation, control discs were removed from the reactor and for the treatment group, Airborne™ was introduced into the reactor once per day over the course of two days. Biofilms were evaluated for luciferase activity and viable cell numbers associated with the biofilm. The preliminary results indicate that there is a reduction in biofilm formation following exposure to Airborne™.

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

## **Debris-Covered Rock Glaciers in the Aconcagua River Basin: Outflow of melt water from debris rock covered glaciers based on amount of snow**

Lane Hines – Environmental Science

Faculty Mentor: Jason Janke, Antonio Bellisario and SamNg

Rock glaciers, a landform that consists of a top layer of rock underlain with a mixture of debris and ice, are often not recognized as water resource or indicator or climate change in comparison to their glacier counterparts, which have ice visible at the surface and respond quickly to warming. In the semi-arid Andes of Chile, rock glaciers outnumber glaciers by a ratio of approximately 10 to 1. In 2013, two temperature data loggers were installed at 3,805 m (Site 1) and 4,047 m (Site 2) on the Tres Gemelos rock glacier complex as part of a climate monitoring project in the Chilean Andes. Each sensor was programmed to record temperature every 2 hours at the surface and a depth of about 30 cm. Over the entire period, Site 1 had a mean temperature of  $3.6 \pm 7.2^{\circ}\text{C}$  at the surface, whereas Site 2 had a mean temperature of  $2.9 \pm 5.9^{\circ}\text{C}$  at the surface. Measurements at a depth of 30 cm had cooler mean temperatures and less variability because of insulation from overlying rock. Site 2 displayed an interesting trend, which can be linked to snowfall accumulation. After accumulations reach about 25 cm, snow acts as an insulator and creates a “flat-line” temperature signal. Snow typically lasts 6-8 months at Site 2, but displays much variability when snow accumulates (April to June) and melts (November to January). At each site, the warmest temperature recorded occurred during the summer of 2017. Each site also displayed a warming trend from 2013 to 2017 of about  $1.5^{\circ}\text{C}$  on average. These rock glaciers provide a vital water supply for both agriculture and urban populations. As the climate continues to warm, less water will be stored as ice in these alpine reservoirs. This will create an additional pressure on an already limited water resource in a semi-arid climate.

**(Oral Presentation, Session I, 10:00-10:15 AM, NC Room 1314)**



## **Investigation of Self-Care Treatment Techniques Compared to Nasal Decongestant Treatment of Sinusitis**

Isaiah Jackson – Chemistry

Faculty Mentor: None

This independent study aims to determine and compare the benefits of both self-care treatment techniques such as nasal cleansing through the use of a “neti pot” or squeeze bottle and decongestant or vasoconstrictor medications such as Sudafed and Mucinex. Nasal cleansing generally consists of rinsing the inside of the nose with warm distilled salt water and function to remove excess mucus and reduce inflammation. Decongestants or vasoconstrictors generally function to relieve swelling, congestion and “runny nose”. This independent study will utilize a social survey study to determine individual’s preference in regards to treatment of sinusitis and an in-depth analysis of the biochemical and physiological effects of both forms of treatment.

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

## **Serological Diagnosis of *Mycoplasma* via Lipoprotein Specific Electrochemical Biosensor**

Jena Jacobs – Biology

Faculty Mentor: Andrew Bonham

We have developed a novel electrochemical biosensor capable of detecting pathogenic *Mycoplasma* for use in academic, research, and clinical applications. *Mycoplasma* presents key health concerns; *Mycoplasma pneumoniae* infects 2 million people every year, it is responsible for upper respiratory infections and “walking pneumonia,” while *Mycoplasma genitalium*, is responsible for a large amount of nongonococcal urethritis cases. Current methods of detecting such *Mycoplasma* strains, such as molecular-based assays, PCR and immunological serological analysis, are time consuming, expensive, and minimally accurate. Improved serological analysis would be beneficial as effective serological analysis is not readily available in the United States and current analysis internationally only measures the host immune response and not the direct presence of the microorganism, which can produce false negative results. Here, we offer one solution to this challenge through means of direct detection of the *Mycoplasma* microorganism with a diagnostic electrochemical biosensor directed against a secreted 48 kDa lipoprotein, P48, which is common across many strains. Our aptamer-based electrochemical DNA biosensor has been characterized and exhibits high specificity and sensitivity for P48 in human serum. This biosensor will allow us to potentially improve both prevention and diagnosis of *Mycoplasma* in patients who present a proposed infection.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #20)**



## **Teaching Self-Guiding Methods of NMR Analysis**

Stephanie Jensen – Chemistry

Coauthors: Jonathan Cook, Chad Magee

Faculty Mentor: Susan Schelble

Nuclear Magnetic Resonance (NMR) is a widely-used tool for chemical structural analysis. Experience in the academic setting is necessary for developing adequate interpretations of spectra. This is an area which undergraduate students commonly encounter difficulty. Learning how to independently problem solve will provide lifelong psychological, educational, and career benefits. A systematic approach is introduced to provide an architecture for analysis. A map will be made to follow. Students are to be capable of spectral analysis with minimal guidance from outside sources. Teaching these basic steps to a student in their infancy will help facilitate quicker acquisition and understanding of spectra. The steps that are utilized in Carbon 13 (C13 NMR) and Proton NMR (1H NMR), are to count Carbon and Hydrogen environments, assessing the neighbors to said environments, knowing what shielding is, understanding solvent trends, how to identify impurities and mixtures, and functional group trends. Common student misconceptions regarding NMR will be addressed. Some of those issues include trying to fit their spectra to the molecule they wish to have, regardless if they have the target molecule in the sample. In addition, it is proposed to teach a new method to drawing the molecule analyzed to avoid this confusion. Mixtures and impurities are the main problems student face next to solvents. They do not consider that their chemical reaction did not come to completion before they attempted to analyze the materials or that their materials were contaminated initially. It should be understood with this method. Students participating will demonstrate enhanced NMR reading and problem solving skills to harness throughout their chemical careers.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #5)**

## **Slut: How the Virgin-Whore Complex Contributes to Rape Culture**

Alyssa Kamin – Psychology

Faculty Mentor: Anahi Russo Garrido

This paper examines contradictions in pressures placed on girls to be virginal as well as sexual in behavior through the social construction of female sexuality, also known as the virgin/whore complex. Exploring this contradiction in social ideas of female sexuality, it questions how the conflicting messages produce not only how young women behave based on these pressures but also how it impacts the conversation surrounding sexual abuse when it occurs. I argue that the opposing societal pressures of what female sexuality is supposed to look like contribute to rape culture due to how each social message holds different myths surrounding rape. Furthermore, they add to ideas of what a good victim looks like based on her sexual history. Through the use of Loring's social constructionist theory and Foucault's social discourses theory supplemented through textual analysis, it can be argued that rape myths from both the construct of virginity as well as the pressure to be sexual work together to normalize ideas of victim responsibility that perpetuate rape culture.

**(Oral Presentation, Session III 3:00-3:15 PM, NC Room 1312)**



## **Heavy Metal Deposition in the S. Platte River**

Jordan Kingery – Environmental Science

Coauthors: Frank Vento, Amanda Hudson

Faculty Mentor: Sarah Schliemann

Research studies have been conducted in an effort to understand the adverse effects of heavy metals contaminants on human health. Since the movement of heavy metals throughout the environment via water cannot be contained, an understanding of river water heavy metal concentrations is necessary in order to prevent adverse health effects on people and the environment. The heavy metals of concern were limited to iron, zinc, lead, copper, tin, cadmium, nickel, selenium, manganese, mercury, and molybdenum. Analyses of collected water samples taken along the South Platte River began in May 2016 and finished in February 2017. Collection of the water samples were systematically taken every 3 miles, starting upstream from Chatfield Reservoir, and finishing in Brighton. A total of 14 samples were taken per collection day, and were conducted far below confluences of streamflow so as to avoid areas of contamination and active mixing. Samples were stored in a 0.2% nitric acid solution, and kept in a refrigerator until the filtering process. Lastly, filtered samples were run on an ICP Mass Spectrometer to identify all the heavy metals in the samples. Data indicates heavy metal concentration increases as sampling proceeds downstream as a direct result of anthropogenic activities, and atmospheric deposition. These heavy metals may have negative effects on riparian systems.

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

## **Dispatch Optimizer**

David Kirch – Computer Science

Coauthors: Alan Peters, Abdalla Elmedani, Brunno Putnam, Michael Chambliss, Nick

Beier, Patrick Pearson, Quyet Nguyen

Faculty Mentor: Steven Beaty

The dispatch optimizer project is designed to produce an optimized schedule to reduce costs for a water truck dispatch system. The problem being studied is based on real world needs for waste water disposal for natural gas and oil production locations. The locations, or pads, produce a certain amount of waste water, which is then driven by water disposal trucks to either a storage facility or a recycling facility. The goal of the project is to produce a schedule that minimizes the amount of time the pads are shut down, as well as optimizes the number of trucks being used. To accomplish the project goals, our team will implement a java program with multiple aspects. First, the program will need to take in information, initially from a csv file. Then, it will take this information, and produce schedules for how best to transport the waste water to the disposal or recycling site. The schedules that are produced will be analyzed for how many barrels are recycled, how many hours the pads are shut down for, how many trucks are used, how much time until a pad is shut down, and more. The analysis of these schedules will be aimed to produce an optimal schedule that reduces cost (based on various metrics). To optimize the schedules, which will be the most complex part of the project, we will be using various algorithms. These will include algorithms such as a brute force algorithm, a genetic algorithm, a heuristic algorithm, and others.

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



## **Education as Intervention of the Elective Cesarean**

Rachael Knief – Integrative Health Care

Faculty Mentor: Jeffrey Helton

There continues to be a significant increase in women who choose to give birth via elective cesarean section. Although cesarean sections are sometimes medically necessary, women who opt for an elective cesarean for the birth of their child are doing so with no medical necessity and without physician recommendation. There are a number of reasons why women are electing cesarean delivery and studies show that many women choose this method of delivery based on misconceptions of vaginal birth. According to the American Congress of Obstetricians and Gynecologists, the maternal mortality rate is more than three-fold in women who have a cesarean vs vaginal birth. This study will analyze the extent that information and education of women regarding the increased risk of mortality associated with cesarean delivery and clarifications of vaginal birth has an influence on decision making. This study will examine women who have not had a previous cesarean section and are choosing this method of birth with no prior medical indications for a cesarean from their physician. Researchers have found that women respond well to information provided in a personal and interactive manner. Women will also be surveyed regarding their reasons for cesarean delivery to help researchers identify additional reasons as to why women are electing cesarean delivery.

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

## **Harmonization of Velocity as a Function of the Experience of Synchrony**

Mitchell Kusick – Psychology

Coauthors: Sean Vieau, Sasha Noel

Faculty Mentor: Lisa Badanes

Human beings possess an extemporaneous tendency to coordinate their individual movements, ranging from basic, controllable behaviors, such as walking, to unconscious, physiological mechanisms, including heart rate. This yearning to achieve synchrony - or a state in which things happen, move, or exist simultaneously - is a fundamental social phenomenon that may facilitate our ability to connect with one another. This study assessed the tendency for people to synchronize their movement by engaging in finger tapping. It was hypothesized that the velocity and duration of taps would correlate more as a function of the experience of synchrony during the Rhythm Tapping Task (RTT) ( $n = 110$ ; 67 female). After being randomly assigned, participants completed the RTT, in which four different rhythms were heard for one minute each, and tapped along on a laptop pad, which recorded average velocity and duration of taps. As part of a larger study that had no systematic effect on velocity or duration of taps, participants engaged in a brief intervention, followed by the RTT for a second time, modeled in an identical fashion as the initial task. Results showed that the velocity and duration of which participants in the synchronous condition tapped at correlated more in both the pre- ( $r_{pb}(110) = .195$ ,  $p = .040$ ) and marginally in the post-test ( $r_{pb}(117) = .177$ ,  $p = .056$ ). Moreover, participants in the synchrony condition tapped harder than those in the asynchrony condition during the pre-test ( $F(1,112) = 4.33$ ,  $p = .040$ ). Additionally, those in the synchronous condition experienced a significantly greater degree of harmony ( $F(1,114) = 116.90$ ,  $p =$



.001,  $\eta^2 = .506$ ). Further, it was also revealed that males tapped significantly harder than females in both the pre- ( $t(1,108) = 2.79$ ,  $p = .006$ ) and post-test ( $t(1,108) = 2.78$ ,  $p = .006$ ).

**(Oral Presentation, Session I 9:00-9:15 AM, NC Room 1312)**

## **A Preliminary Validation of the Cognitive Fusion Questionnaire among Hispanic University Students**

Mitchell Kusick – Psychology

Faculty Mentor: Maureen Flynn

Cognitive fusion refers to a tendency to be overly influenced by thoughts. Acceptance and Commitment Therapy (ACT) uses interventions that target cognitive fusion so individuals have greater choice in their behavior. Psychometrically sound measures of cognitive fusion are needed for treatment outcome studies. The Cognitive Fusion Questionnaire (CFQ) has been shown to be reliable and valid in predominately Caucasian samples from the United Kingdom. The aim of the current study was to examine the psychometric properties of the CFQ among Hispanic college students. Participants ( $n = 335$ ) completed a battery of questionnaires online. Regarding concurrent validity, results showed that cognitive fusion was associated with higher levels of psychological inflexibility, frequency and believability of negative automatic thoughts, and psychological distress. Cognitive fusion was also correlated with lower life satisfaction, acceptance, and awareness. The CFQ significantly added to the prediction of psychological distress over and above general psychological inflexibility and thought suppression. The CFQ did not add to the prediction of life satisfaction. Implications of these findings will be discussed.

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

## **A Preliminary Validation of the Cognitive Fusion Questionnaire among Hispanic University Students**

Mitchell Kusick – Psychology

Faculty Mentor: Maureen Flynn

Cognitive fusion refers to a tendency to be overly influenced by thoughts. Acceptance and Commitment Therapy (ACT) uses interventions that target cognitive fusion so individuals have greater choice in their behavior. Psychometrically sound measures of cognitive fusion are needed for treatment outcome studies. The Cognitive Fusion Questionnaire (CFQ) has been shown to be reliable and valid in predominately Caucasian samples from the United Kingdom. The aim of the current study was to examine the psychometric properties of the CFQ among Hispanic college students. Participants ( $n = 335$ ) completed a battery of questionnaires online. Regarding concurrent validity, results showed that cognitive fusion was associated with higher levels of psychological inflexibility, frequency and believability of negative automatic thoughts, and psychological distress. Cognitive fusion was also correlated with lower life satisfaction, acceptance, and awareness. The CFQ significantly added to the prediction of psychological distress over and above general psychological inflexibility and thought suppression. The CFQ did not add to the prediction of life satisfaction. Implications of these findings will be discussed.

**(Oral Presentation, Session I 10:00-10:15 AM, NC Room 1312)**



## **An Examination of the Impact of Brain Boosters Among Urban University Students**

Mitchell Kusick – Psychology

Faculty Mentor: Michael Rhoads

Studies commonly report a classroom environment where students are disengaged and bored. Additionally, teachers often complain of concentration deficits and reduced levels of attention in students. The use of physical movement in the classroom is an emerging approach to increase students' level of engagement and attention in the classroom. However, no known studies have examined brain boosters in a college classroom setting. As such, the purpose of this study was to examine the potential benefits of brain boosters, content delivered with physical movement, in the college classroom to answer the following questions: do students show enhanced learning, report higher levels of attention, and have more fun when presented classroom content using brain boosters compared to traditional instruction? Participants were taught using differing instructional methods, either with brain boosters and breaks or through traditional classroom lecture. To investigate the hypothesis, this study utilized a quasi-experimental cross-over design, in which participants documented their perceptions, both qualitatively and quantitatively, using the experience sampling method (ESM). Based on final grades in the two classes, preliminary results suggest that no significant differences existed between groups ( $p = .55$ ,  $d = 0.21$ ). The ESM revealed that there was a statistically significant difference between groups on the variables "Active," ( $p = .01$ ,  $d = 0.48$ ); "Discomfort," ( $p = .02$ ,  $d = -0.38$ ); and "Enjoyment," ( $p = 0.04$ ,  $d = 0.37$ ). Moreover, qualitative analysis resulted in a collection of emerging themes. With regards to what students were thinking about at the time during which the ESF was administered, the most common responses were related to course content, teacher behavior, physiological and/or psychological needs, the activity performed, and the environment. Additional findings may be used to improve instruction in the college classroom.

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

## **An Examination of the Impact of Brain Boosters Among Urban University Students**

Mitchell Kusick – Psychology

Faculty Mentor: Michael Rhoads

Studies commonly report a classroom environment where students are disengaged and bored. Additionally, teachers often complain of concentration deficits and reduced levels of attention in students. The use of physical movement in the classroom is an emerging approach to increase students' level of engagement and attention in the classroom. However, no known studies have examined brain boosters in a college classroom setting. As such, the purpose of this study was to examine the potential benefits of brain boosters, content delivered with physical movement, in the college classroom to answer the following questions: do students show enhanced learning, report higher levels of attention, and have more fun when presented classroom content using brain boosters compared to traditional instruction? Participants were taught using differing instructional methods, either with brain boosters and breaks or through traditional classroom lecture. To investigate the hypothesis, this study utilized a quasi-experimental cross-over design, in which participants documented their perceptions, both qualitatively and quantitatively, using the experience sampling method (ESM). Based on final grades in the two



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**(Oral Presentation, Session III 2:15-2:30 PM, NC Room 1313)**

### **Purposeful *Pichia* Pitching: Analyzing Beer Deliberately Fermented with *Pichia*, a Yeast Genus that May be Unknowingly Prevalent in Barrel-Aged Beer**

Jonathan Lambert – Brewery Operations

Coauthor: Ginger Stout

Faculty Mentor: Helene Ver Eecke

Modern craft brewing is trending towards increased barrel-aged beer. These barrels are of unknown microbial make-up, which can lead to unpredictable products. Avery Brewing Company contributed 13 samples from their barrel-aged projects. Previously, the Ver Eecke lab analyzed these samples using culture-dependent (growing on 6 different types of media) and culture-independent (next generation amplicon sequence analysis) techniques. Bioinformatic analysis of all bacterial/archaeal 16S rDNA genes and all fungal ITS regions revealed a community with low richness dominated by *Lactobacillus* and *Pichia*, each comprising ~98% of their respective domains. *Lactobacillus* is conventional in sour beer production, but *Pichia* has not been. *P. membranifaciens* is commonly used in smear-surface ripened cheese fermentation for flavor development and unwanted mold inhibition. Use of *Pichia* spp. is prevalent in the biofuel industry due to its ability to tolerate relatively high alcohol concentrations, break down plant components (xylose and cellulose), and produce lipids. This xylose/cellulose degradation may elucidate why *Pichia* may be prevalent in wooden barrels and/or fruit based sours. As a wine contaminate investigated ~50 years ago *P. membranifaciens* was found to produce alcohol, acetaldehyde, ethyl-acetate, and iso-amyl acetate as fermentation byproducts. These compounds have traditionally been thought of as off-flavors, but with the current renaissance of craft beer that promotes eclectic beer styles, these flavors may be desirable. We brewed a hop-less golden ale and compared various fermentations: *Saccharomyces cerevisiae* (WLP001) exclusively, *P. membranifaciens* (YB4326) exclusively, and a copitch of WLP001 in primary fermentation and YB4326 added during secondary. Beer samples were analyzed via sensory analysis and gas-chromatography-mass-spectroscopy. Future analyses will investigate hop-tolerance, *Brettanomyces* comparisons, and aging qualities.

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



## **Physiological Risk Factors for Suicide Among Young Men**

Jordan Leffel – Integrative Health Care

Faculty Mentor: Jeffrey Helton

Suicide is the second leading cause of death among young men across the globe, and during the last 50 years the most at-risk group has shifted from elderly men to younger men aged 25-34 among high-income countries. While many psychological and neurological risk-factors have been explored and potentially correlate with higher suicide rates, physiological risk-factors have been less explored. This study will examine whether cardiovascular fitness among middle-class males aged 25-34 in the United States correlates with suicide rates. Men are less likely to seek out mental health professionals to treat psychological disorders, however if healthcare professionals are able to identify physiological markers that link with higher suicide rates they will be afforded the opportunity to provide information and resources to those men who present with specific cardiac symptoms whereas they may have been overlooked in the past.

**(Oral Presentation, Session III 2:45-3:00 PM, NC Room 1312)**

## **Particulate Material Separation and Processing Using Cyclonic Separator**

Alexander Leith – Physics

Coauthor: Keegan Kerbach

Faculty Mentor: Randall Tagg

In particulate materials processing, the size of particle is often very important to the processing of the material. We are looking at a novel way of both separating and processing the particulate materials using a cyclonic separator and ultimately generation of an inductively coupled plasma. Research papers have indicated that particle separation down to the micron or tens of microns range is trivial, and we hope to design flow parameters that will allow us to push the lower limit of particle separation size. We will focus on using our theoretical modeling of rotational fluid dynamics as well as pressure and flow measurement and fluid visualization in order to help us to push these boundaries. We have constructed a rudimentary cyclonic separator as a proof-of-concept and have created a theoretical model from first principles, however, more rigorous numerical simulation is necessary. Using this grant, we purchased a laboratory-grade cyclonic separator using the dimensions found during modeling. This will allow us to test our concept at full-flow parameters to determine the feasibility of particle separation below the well-researched bottom limit as well as the material durability to be able to withstand the generation of an inductively coupled plasma in the future.

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



## **What I Make You Think About Me: Investigating Appearances and Stereotypes in Face-to-Face Interactions**

Tess Lindsay – Speech Communication

Faculty Mentor: William Huddy

What is it about appearance that communicates so much yet not enough for an individual. This paper explores how the individuals display of self in our daily interactions affects our communication. In an age where self expression through visual appearances is widely accepted, there is still much push back in the biases that emerge and how this affects our communication. Does your appearance really say that much about you? Are the stereotypes in place for certain representations of self accurate depictions for assumptions to be based off of? Using the work and research from Erving Goffman and “The Presentation of Self in Everyday Life” with focus on the face-to-face interactions and how an individual's choice of appearance is seeking to guide the impression of the other, with specificity to hair and appearance. Other information for this is taken from studies done on how personality is perceived based on face value. The concept of “Stigma” by Erving Goffman will be reviewed in relation to face-to-face interaction.

**(Oral Presentation, Session I 9:30-9:45 AM, NC Room 1312)**

## **Exploring Benefits of a Short-Term Yoga Intervention with Incarcerated Women**

Traci Lundstrom – Psychology

Faculty Mentor: Courtney Rocheleau

Research shows that incarcerated individuals exhibit a high instance of stress-related disorders, including addiction and PTSD, as well as the added stress of captivity. Yoga has been used to provide stress reduction in many settings. The current study aims to expand on previous research by testing the effects of a brief, intensive yoga intervention (i.e., daily yoga practice over five consecutive days) within a population of incarcerated women. This study took place in a county jail setting with the women's inmate population. Of the 21 initial participants, 11 completed the study (Age:  $M = 38.81$ ,  $SD = 13.67$ ). Participants were assigned to either the yoga group (5 daily, 75-minute yoga classes), or wait-list group (5 daily, 15-minute group meetings), using a match-paired sampling by age. Assessments were taken at 3 time intervals (baseline, week 1, and week 2 final assessments). Several self-report assessments were obtained; the current presentation will focus on a subset of these, including the Beck's Depression Inventory [BDI2] and Perceived Stress Scale [PSS]. Data was assessed both descriptively and inferentially, due to the small sample size. Across all participants, there was a significant linear decrease in depression scores on BDI2 over time,  $F(1, 8) = 22.29$ ,  $p = .001$ . There was also a significant linear decrease in perceived stress on PSS, shown over time,  $F(1, 8) = 262.60$ ,  $p = .001$ . Due to the transient nature of the jail institution, it is important to examine all possible benefits of interventions that can be provided on a short term basis. This study looks closely at several measures in response to a 5-day intervention. While there were a number of limitations of the study, these results support the conclusion that the brief yoga intervention had a positive effect on participants' stress and depression scores.

**(Oral Presentation, Session II 10:30-10:45 AM, NC Room 1316)**



## **Conductive Gel Polymers as an Extracellular Matrix Mimic and Cell Vehicle for Cardiac Tissue Engineering**

Marcos Maldonado – Biology

Faculty Mentor: Andrew Bonham

Cardiomyopathies, diseases of the heart, are one of the major causes of death in the United States, and thus research into preventing and treating these complications is imperative [1]. However, due to the nature of limited availability of donors, heart tissue transplantation, culturing human tissues/tissue-derived cells and tissue engineering, finding a suitable extracellular environment in which cardiomyocytes develop and live is difficult to attain. As such, a great deal of work has gone into efforts to produce polymer mimics of the natural cell environment, in properties such as binding sites, stiffness, reactivity, and hydration [2-4]. The purpose of this research is to contribute to the development and characterization of conductive polymer scaffolds for cardiac tissue support for academic, research, and professional settings by creating high purity gold nanorods with defined surface functionalization. This research is important as it could contribute to the ongoing studies in properly accommodating cardiac cells to build functional cardiac tissue constructs and further improve cell retention, spreading, homogenous distribution of cardiac specific markers, cell-cell coupling and synchronized beating behavior at tissue level [5]. By improving this area of research, cardiac tissue engineering can be directed closer to ultimately repairing damaged heart muscle and improve cardiac function in cardiovascular diseases whether they have been acquired or developed through hereditary traits.

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

## **The Prison Industrial Complex and Meditation as a Coping Strategy**

Tyler Maldonado – Psychology

Faculty Mentor: Anahi Russo Garrido

The Prison Industrial Complex can be described as the privatization of prisons through prison management, labor and the expansion of spaces of incarceration for profit. The Prison Industrial Complex has operated as a form of oppression (in the form of mass incarceration) particularly in regard to individuals of color, masking true systemic inequalities in society. In order to address the consequences of incarceration, several health and spiritual services are offered to inmates, among them meditation programs have proliferated in prisons. Meditation, the ancient technique of sitting in silence, is widely practiced in the East, but has gained massive popularity in the West. Based on the textual and content analysis of secondary literature, I argue that meditation programs in prisons across the country have played a role in the increased well-being of inmates, and even in the decline of recidivism. This paper examines which individuals have historically been targeted by the Prison Industrial Complex, what some of the mental and physical health consequences of incarceration are, and ultimately how meditation can be used as a tool to not only to reduce stress while in prison but also once released.

**(Oral Presentation, Session II 10:45-11:00 AM, NC Room 1316)**



## **Monitoring the Biodiesel Reaction via Fluorescence Spectroscopy and an Investigation of TATP as a Possible Biofuel Additive**

Kenneth Marincin – Chemistry

Coauthor: Seth Yannacone

Faculty Mentor: Michael Jacobs

The focus of this group's research is two-fold: 1) to monitor the progression of a biodiesel reaction via fluorescence spectroscopy and 2) to synthesize and implement triacetone triperoxide (TATP) as a possible biofuel additive. In the first aim, steady-state fluorescence spectroscopy is used to determine the evolution of the alkaline-catalyzed transesterification reaction of vegetable oils into biofuels. Previous research has shown a marked fluorescence intensity variation between the main components of the reaction: the raw vegetable oil, biofuel, and glycerol. Based on the conjugated structural properties of fatty acid chains within triglycerides and their respective methylesters, this group is investigating the viability of using fluorescence to track the conversion from reactants to products. Our preliminary data has suggested that by sampling the transesterification reaction at different time intervals, the fluorescence emission of layers within the samples may be able to give an approximation of the reaction progression. In addition, these methodologies may further be utilized in an undergraduate biodiesel synthesis training module in tracking reaction progression and purification analysis using photophysical concepts such as fluorescence. In the second aim, the synthesis of TATP has been investigated in attempts to optimize catalysis and recrystallization of the product. There is a strong theoretical basis for the possibility of TATP to increase the enthalpy of combustion of biofuels. Solubility, cloud point tests, and bomb calorimetry are being employed to investigate this compound and its integration as a biofuel enhancer. If successful, TATP may be used as a valuable fuel additive and have additional industrial applications.

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

## **Monitoring the Biodiesel Reaction via Fluorescence Spectroscopy and an Metabolic Analysis and Biochemical Pathway Modeling of the nitrification cycle of *Nitrosomonas europaea*, Using Metabolomics and Metabolic Flux Analysis**

Patrick J. Marsden – Chemistry

Faculty Mentor: Andrew Bonham

The model organism *Nitrosomonas europaea* was cultured under varying conditions of nitrogen, in order to highlight the pathways associated with the oxidation of ammonia to nitrite, and the small molecule metabolites that are involved in the intermediate steps within these processes. Conversion of  $\text{NH}_3$  to  $\text{NO}_2^-$  was measured throughout the life cycle of *N. europaea* in culture and an enhanced form of the Michaelis-Menten equation was used to pinpoint the optimal growth and metabolism. The extracellular and intracellular composition of small molecules associated with the metabolic process were analyzed using metabolomic NMR spectrometry. Quantitative PCR was used to amplify the 16s rRNA (used for identification) and the ammonia monooxygenase (AMO) mRNA, this qPCR data was used to make a comparative analysis of the transcription of gene products related to the rate limiting step of the oxidation of ammonia within the cell. This step also has major environmental importance due to its rate control on the larger multi-organismal processes of nitrification ( $\text{NH}_4^+/\text{NH}_3$  to  $\text{NO}_2^-$  to  $\text{NO}_3^-$ ). Along with basic chemical attributes (pH, OD600, electrical potential, i.e.) that were recorded during growth, this collection of data was layer together and analyzed for changing patterns in metabolite concentration and



using computational modeling of the known stoichiometric relationships as well as thermodynamic properties of individual reactions, a comprehensive diagram of the pathway was constructed. Using current models, as well as de novo development of constraint matrices based on other biochemical properties, the “fluxome” of the nitrification pathway of *N. europaea* was calculated and mapped.

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

## **Social Media's Influence on Body Image**

Olivia Martins – Psychology

Faculty Mentor: Anahi Russo Garrido

This paper aims to explore social media's influence on young women's beauty ideals. I argue that social media's influence plays a role on the production of body image, specifically with a thin body ideal. I explore these themes through a variety of journal articles, empirical studies, books, and theories such as Fredrickson and Roberts' objectification theory and Judith Butler's theory on performativity. I also analyze Instagram hashtags and the type of content Instagram famous women share on their accounts in relation to the topic. I conclude reasserting the correlation between social media and body image.

**(Oral Presentation, Session I 9:00-9:15 AM, NC Room 1316)**

## **The Methodological Development of Lipid Residue Analysis in Archaeological Pottery Samples**

Todd Matuszewicz – Chemistry

Faculty Mentor: April Hill

New techniques and advances in chemistry as they pertain to uses in archaeological investigations have advanced or altered existing hypotheses. A recent chemical analysis of pottery vessels from China pushed back the theory of barley beer making by thousands of years (Wang et al., 2016). This presentation covers the original research, documented in an accompanying paper, which establishes a methodology for extracting fatty acid residue from archaeological pottery sherds in order to verify the use of the vessels and corroborate theories of seasonal migration through dietary habits. Pottery sherds from unidentified sections of vessels were crushed and subjected to solvent extraction. Established chemical techniques were used to convert fatty acids in the extracts to fatty acid methyl esters (FAMES) for analysis by gas chromatography-mass spectrometry (GC-MS). The mass spectral data was used to identify the fatty acids present in each sample and the chromatographic data was used to determine the ratio of specific lipids in the residue. By comparing these ratios to decomposition bi-plot data from the literature, and applying archaeological data, the likely source of the fatty acids (animal, plant, etc) can be determined. More specific identification was obtained by further referencing to site gathered specimens. To more precisely identify the source substances, further investigation into techniques for isolating proteins, peptides and isotopes must be studied and developed.

**(Oral Presentation, Session II 10:45-11:00 AM, NC Room 1314)**



## **Health Care Financial Fraud In United States**

Donkor Maxwell – Health Care Management

Faculty Mentors: Jeffrey Helton

Asadi et.al (2014) acknowledges that the provision of quality health care services is paramount to the life of every individual. As such, there is the need for quality health care system. It is worth noting that, the level of health care services by a health care facility largely depends on its financial matters. For instance, Liaropoulos & Goranitis (2015) argues that appropriate use of finances by the executives in a hospital, no matter its size, results in the provision of quality health care services. However, the health care system has encountered a major challenge in its Finance Department- financial fraud, hence the need to implement internally financial control measures in the United States. This paper seeks to enlighten on the importance of implementing internally financial control measures that will help in transforming the United States healthcare system. The most common form of fraud in the United States health care system is financial fraud, which is evident in instances where individuals seek to obtain illegal payment. Health care personnel's will acquire illegal payment through different ways such as inflating charges for outpatient and inpatient care. Rudman et.al (2010) provides an exemplary case where Raritan Bay Medical Centre has increased the inpatient and outpatient care charges hence obtaining huge payment from the Medicare. Besides, healthcare financial fraud takes the lane of health personnel's conducting unnecessary medical services. In Florida, a dermatologist performed approximately three thousands medical unnecessary surgeries. The surgeries target Medicare beneficiaries. What is more is that healthcare financial fraud is evident in health insurance claims. In 2011, the United States spent \$2.27 trillion specifically on the healthcare with a portion of it, that is, more than \$4 billion was spent on health insurance claims. However, Rudman et.al (2010) argues that a solid proportion of the health insurance claims were precisely frauds. Finally, another instance of health care financial fraud is corrupt overpay of health personnel. Health care personnel's will receive overpay for services they provide to individuals. For instance, health providers in 80% of the audited state would receive approximately \$ 27.3 million Medicaid overpayment for specifically services that were claimed after the death of beneficiaries. From the above findings, healthcare fraud is a major problem and intervention measures to prevent it should be focused more on the healthcare providers as they have been noted be the most involved.

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

## **Associations Between Mindfulness and Emotional Regulation**

Ian Maxwell – Psychology

Faculty Mentors: Lisa Badanes

Recent studies in Mindfulness have revealed advantageous elements for multiple populations. Mindfulness is the intentional ability to hold one's awareness in the present moment while maintaining nonjudgmental openness to the experience as it happens (Bishop et al., 2004; Kabat-Zinn, 2003). Mindfulness can be examined using the factors of Awareness and Acceptance. Mindful Awareness is the ability to monitor the present moment as it unfolds (Deikman, 1996) without distraction of past or future events (Roemer & Orsillo, 2003). Mindful Acceptance is the ability to experience the unfolding present moment with openness and without judgment (Roemer & Orsillo, 2003). Those with higher trait-levels of mindfulness have been shown to be less susceptible to mood disturbance (Brown & Ryan, 2003) and have fewer symptoms of anxiety and mood disorders (Curtiss & Klemanski 2014). Another source of resiliency against psychological distress is Emotional Regulation. Emotional Regulation is the process of how individuals experience and expresses their emotions within day-to-day scenarios (Gross, 1998). One current model of Emotional Regulation includes two key factors: Cognitive Reappraisal and Expressive



Suppression. Cognitive Reappraisal is the process of cognitive transformation that changes the emotional impact of a situation (Lazarus & Alfert, 1964). Expressive Suppression is a change in one's outward response to an emotional stimulus (Gross, 1998). Exploratory in nature, the current research shows correlations between Mindful Awareness and Cognitive Reappraisal. The research also shows correlations between Mindful acceptance and Expressive Suppression. A discussion of specific interactions will be held as well as considerations for limitations and future directions.

**(Oral Presentation, Session II 11:15-11:30 AM, NC Room 1316)**

## **Supraliminal Mindfulness Primes in the Classroom**

Ian Maxwell – Psychology

Faculty Mentors: Maureen Flynn

Academic settings are stressful for students world-wide (Misra & Castillo, 2004). As high stress levels are correlated with poor academic performance (Macan, Shahani, Dipboye, & Phillips, 1990), novel implementations of stress reduction methods could benefit students. Trends in both general culture and behavioral science have looked to mindfulness techniques to positively counteract mental distress. Mindfulness interventions have been shown to effectively buffer against academic related depression and anxiety (Deckro et al., 2010). As priming has been effectively shown to change one's state level (Roberts & Gettman, 2004), it is useful to investigate if mindfulness primes used in a scholastic setting could be an efficient tool toward better classroom performance. The current study investigates whether using mindfulness primes in lecture material can influence quiz scores. Participants were selected from undergraduate psychology courses and were randomly assigned into either a group, which viewed a lecture about Linguistics with either mindfulness primes for the experimental group or no primes for the control group. Before and after the lecture for both groups, a measure of state mindfulness was administered as a manipulation check for the effectiveness of the mindfulness intervention. Before and after the lecture for both groups, a quiz testing the Linguistic subject material was administered. Results displayed that the experimental group which received the mindfulness-primed lecture was not significantly higher in state-level mindfulness after the lecture than the control condition. Further, results of a comparison of quiz-scores between the two groups showed no significant difference. Limitations and future directions will be discussed.

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

## **The Modern Day Disney and their Characters**

Irene May – Psychology

Faculty Mentor: Anahi Russo Garrido

My paper is about the changes that have occurred in Disney films. I compare early films starting in the 1937s such as Snow White and the Seven Dwarfs, Pinocchio (1940) and with most recent films in the 2010s Frozen (2013) and Zootopia (2016). The question I ask is how have main and secondary characters evolved with our changing times. I argue that because our children grow up believing in the ideal image of the prince and princess, and yet decades of feminist and social justice activism have transformed gender and sexual dynamics, Disney has had to make a change to their main characters for parents to be able to take the children to watch the films. Through the use of my own experiences and through textual



analysis, I present information on how Disney characters used to be presented in films and how other researchers have critiqued them. I also discuss more current representations that the media has transformed to make them more relatable, diverging from the depiction of past characters.

**(Oral Presentation, Session II 11:00-11:15 AM, NC Room 1315)**

## **An Inexpensive and Effective Aptamer-Based Evanescent Wave Biosensor**

Ilia Mazin – Chemistry

Faculty Mentor: Andrew Bonham

Building off of existing electrochemical biosensors that have been developed by the Bonham lab, this research aims to adapt these sensors' responses when recognizing their target from electrochemical to be visual in nature. Namely, this biosensor consists of a 3D-printed brace, an acrylic slide on which DNA is immobilized, and readily-available electronics: an inexpensive LED light source and a cylindrical lens to direct the light in an elliptical pattern. The scaffold allows light to enter the slide at above the critical angle, for total internal reflectance, ensuring that the immobilized DNA experiences excitation by evanescent wave. If the immobilized DNA is an aptamer-based biosensor with a fluorescent reporter tag, binding of target that is washed across the slide surface will result in characteristic and measurable fluorescence changes. The utility of this inexpensive DIY setup was evaluated with image-analysis software to create dose-response curves for the response of a protein-binding aptamer for its target and demonstrates the potential utility of these evanescent wave biosensors.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #16)**

## **Prevalence of Trematode Parasite Infection in *Physa* spp. Snails of Washington Park and Walden Ponds, CO**

Kristen Michalski – Biology

Coauthor: Mele Avery

Faculty Mentor: Jason Kolts

Aquatic trematodes, also called flukes, are parasitic flatworms that infect a variety of vertebrate and invertebrate host species, including waterfowl, fish, amphibians, and molluscs. They are also responsible for causing Swimmer's Itch in humans when their larval form (cercaria) mistakenly penetrate the skin of humans rather than their intended vertebrate host. Snails serve as the intermediate host and release mobile cercaria which infect the definitive host. Cercarial release is stimulated by exposure to light. Understanding prevalence of trematodes in local areas could give rise to more focused avoidance measures to reduce human exposure. We also sought to quantify the effects of trematode infection on the C13/C12 and N15/N14 of snails. Such differences could continue to be propagated through snail predators and confound trophic studies in these areas. We quantified the trematode infection rate of approximately 350 snails collected in July and August 2016 from Walden Ponds and Washington Park, CO. Subsets from each location were processed for analysis of C13/C12 and N15/N14. *Physa* spp. were the most abundant snails at both locations and the only collected species to release trematode cercaria. The trematode infection rate was greater in the largest *Physa* spp. snails, and in snails collected from Washington Park, perhaps due to higher densities of waterfowl (specifically *Branta canadensis*) that



could serve as definitive hosts. We have not received stable isotope data at this point. To decrease human exposure, we suggest avoiding water contact in areas with high concentrations of both *Phryga spp.* and resident waterfowl.

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

## **Mosquito Meals: Does *Aedes vexans* Prefer Mammalian or Avian Hosts?**

Kristen Michalski – Biology

Faculty Mentor: Robert Hancock

Different species of mosquitoes have different feeding habits depending on host preference and host availability. Understanding the relationship between the cosmopolitan Inland Floodwater Mosquito, *Aedes vexans*, and availability of its preferred hosts can be used to develop more focused disease control and prevention. Throughout the summer of 2014, Colorado Mosquito Control used CO<sub>2</sub> light traps to collect tens of thousands of mosquitoes from all over Colorado, of which only some contained visible blood meals (the majority being *Aedes vexans*). After sorting several of the blood-fed mosquitoes by location, species, and amount of blood, we used the Qiagen DNeasy Blood and Tissue kit to extract DNA and PCR to amplify target sequences. The two different primers we chose were cytochrome b based avian specific and mammalian specific. We used gel electrophoresis to visualize host preference of *Aedes vexans* at various locations throughout Colorado. Currently, we are still conducting our research, and we therefore cannot yet form conclusions. However, according to background research findings from New Mexico, it is suspected that *Aedes vexans* should prefer mammalian hosts. Discovering the host preference will ultimately give us a better understanding of the relationship between *Aedes vexans* and available possible hosts so that we can take better precautions for disease avoidance.

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

## **Expression of Neuron-Derived Neurotrophic Factor during Early Zebrafish Development**

Isaac Milanda – Biology

Faculty Mentor: Vida Melvin

During neurulation, the ectoderm separates into the surface ectoderm, or epidermis, and the neuroectoderm, which will become the brain and spinal cord. During this separation event, a multipotent cell population called neural crest cells are specified. Neural crest cells originate dorsally along the anterior-posterior axis of the closing neural tube and migrate ventral-laterally to their final destinations where they differentiate into cartilage, neurons, and melanocytes. Previous studies have showed that chemoattractant factors, including chemokines and glial-derived neurotrophic factor (GDNF), promote the migration of neural crest cells to their target locations. A novel neurotrophic factor called neuron-derived neurotrophic factor (NDNF) was isolated from zebrafish in a reverse genetic screen to identify factors important in craniofacial development. Morpholino knockdown of NDNF in zebrafish led to malformation of the ethmoid plate, a cartilage that is structurally homologous to the maxilla/palate of mice and humans. We hypothesize that NDNF might be a secreted molecule which acts as a



chemoattractant to promote the migration of neural crest cells to the face. In order to further elucidate the function of this novel neurotrophic factor, we use in situ hybridization to investigate the expression pattern of NDNF in zebrafish embryos at time points important for craniofacial formation. These data will provide valuable insight into the potential function of NDNF in neural crest cell function.

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

## **Photophysical Properties of Cyanophenylalanine Derivatives**

Sasha Moonitz – Chemistry

Faculty Mentor: Joshua Martin

We report the photophysical properties of 2-cyanophenylalanine and 3-cyanophenylalanine following excitation to the S1 (1Lb) and S2 (1La) excited states of these biochemically relevant spectroscopic probes. Recent studies have demonstrated the utility of these nitrile-derivatized amino acids for their potential application to protein structure and dynamics studies. Absorption of an ultraviolet photon by the chromophore results in a  $\pi^* \leftarrow \pi$  transition with molar absorptivities similar to common biological probes, such as tyrosine and tryptophan. Due to intermolecular interactions between the solvent and the nitrile group of the chromophore, the local environment can be monitored through quenching of the quantum yield for S1  $\leftarrow$  S0 transition. Extensive spectroscopic investigations provide a framework to understand the nature of the fluorescence quenching mechanism that occurs between the solvent and electronic structure of the cyanophenylalanine derivatives.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #15)**

## **The Effect of Synchrony and Mindfulness on Prosocial Attitudes**

Morgan Moore – Psychology

Coauthors: Sean Vieau, Ian A. Maxwell, Drew Stem, & Kathryn Davis

Faculty Mentor: Lisa Badanes

Humans are constantly aligning with those around them in a phenomenon known as synchrony, or “temporal coordination during social interactions” (Delaherche et al., 2012, p 349). Coordinating with others is fundamental to social interaction (Marsh, Richardson, & Schmidt, 2009), and the effects of mindfulness on synchrony could deepen our understanding. Research shows that synchrony could be enhanced by mindfulness (Valdesolo, Ouyang, & DeSteno, 2010). Mindfulness is awareness through non-judgmental attention to the present moment (Kabat-Zinn, 2016). Synchrony has been found to increase entitativity (groupness), similarity, & self-other merging (Lakens, 2010; Valdesolo, et al, 2010; Lakens & Stel, 2011). The current research sought to extend these findings. We hypothesized that participants who meditated would experience stronger effects of synchrony on entitativity, similarity and self-other merging. The sample consisted of 109 undergraduates. Their ages ranged from 18 to 37 ( $M = 21.20$ ), and were 62.4% female, 33.9% Hispanic and 28.4% White. Participants performed a four rhythm pre- and post-test Rhythm Tapping task using a drum pad that lasted 5-minutes, followed by a 5-minute mindfulness meditation. Four conditions were created: Synchrony-Mindfulness, Synchrony-No Mindfulness, Asynchrony-Mindfulness, and Asynchrony-No Mindfulness. Participants were randomly placed in small groups of four or less in one of the four conditions. Participants finished by filling out a



demographic questionnaire and an array of questions measuring similarity, entitativity, and self-other merging. A 2x2 MANOVA showed that results were significant with participants in the synchrony condition reporting higher entitativity (Wilk's  $\lambda = .87$ ,  $F(4,100) = 3.71$ ,  $p = .007$ ). Participants who meditated were more distracted by other participants ( $F(1,105) = 8.27$ ,  $p = .005$ ,  $\eta^2 = .073$ ). Independent samples t-tests reveal that females felt more entitativity ( $t(105) = -1.99$ ,  $p = .050$ ). These findings supported our hypothesis of synchrony and entitativity and are useful in future studies looking at meditation on distraction.

**(Oral Presentation, Session II 11:30-11:45 AM, NC Room 1315)**

## **Water Quality of the South Platte River Through the Denver Metro Area**

Emily Mullins – Environmental Science

Faculty Mentors: Sarah Schliemann and Randi Brazeau

The Denver Metro area is fully contained within the South Platte Watershed and so, the South Platte River is highly impacted by urban runoff and stream modification. Elevated nutrient concentrations, pesticide residue, heavy metals contamination, bacterial presence, and excessive sediment loading have been observed in the river in discrete locations. Building on these point studies, this project aims to assess water quality in the South Platte River throughout the Denver Metropolitan area. This ongoing project began in June 2015. Temperature, pH, dissolved oxygen (DO), biochemical oxygen demand (a proxy for bacterial load), the concentrations of nitrate and phosphorus, and heavy metals are being measured every three miles along the river beginning at the mouth of Waterton Canyon and extending through Brighton. Nitrate and phosphate concentrations as well as temperature show an increase through the Metro area. DO and pH do not show a distinct trend along the river. Testing has not yet begun on the heavy metal samples. In addition to a general trend of decreasing water quality through the metro area, we also have noticed that certain locations consistently have especially poor water quality. Future work will target these areas to investigate the impacts of land use on water quality.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #8)**

## **Creating a Biosensor to Better Diagnosis Celiac Disease**

Anna Nguyen – Chemistry

Faculty Mentor: Andrew Bonham

Celiac disease is an autoimmune disorder where ingesting dietary gluten causes an autoimmune response that leads to villous atrophy and other complications. Symptoms can have gastrointestinal or extraintestinal manifestations. The symptoms can include: diarrhea, abdominal pain, dental enamel defects, neurological issues, Dermatitis Herpetiformis and more.

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



## **Investigating Role of Ferric Reductases in Iron Transport in *Drosophila melanogaster***

Alma Ochoa – Chemistry

Coauthor: Chanda Lowrance, Hannah Wagoner

Faculty Mentor: Emily Ragan

Despite knowing mechanisms for iron uptake in mammals, it is still unknown how insects accomplish this task. In mammals a transmembrane ferric reductase is responsible for reducing iron(III) ions (ferric ions, Fe<sup>3+</sup>) to iron(II) ions (ferrous ions, Fe<sup>2+</sup>). The iron(II) ions can enter into mammalian cells through a transmembrane iron(II) ion transporter and for the iron utilized for various functions such as energy metabolism. In the fruit fly, *Drosophila melanogaster*, there are two transmembrane proteins, CG8399 and CG1275, that are hypothesized to express ferric reductase activity. CG8399 has been shown to have ferric reductase activity when expressed in *Xenopus oocytes* (frog eggs). CG1275 has not been tested but has a similar sequence to CG8399 and we hypothesize that this transmembrane protein may have a similar function. In order to test if these transmembrane proteins are responsible for ferric reductase activity, RNA interference (RNAi), technique will be utilized in *Drosophila* S2 cells (Sg4 isolate). RNAi is a biological process that reduces the expression of genes. In this case, sequence specific double stranded RNA (dsRNA) will cause degradation of CG8399 or CG1275 mRNA in cells, which will disrupt protein synthesis. Knocking down these proteins will allow us to see if the expression of ferric reductase activity is altered. Our poster details how we obtained dsRNA specific for CG8399 and CG1275 sequences and our plan for future experiments to test if CG8399, CG1275, or the combination of the two transmembrane proteins are responsible for the ferric reductase activity in S2 cells.

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

## **From the Rainforests of Central America to the Desert Sands of the Middle East: The Excellent Adventures of a Metropolitan State University of Denver Undergraduate Research Project**

Faye Olsgard – Anthropology

Coauthor: Chelsie Worth

Faculty Mentor: Sarah Harman

Motivated by curiosity, scholars, artists, and scientists drive exploration. Inquisitive minds pack their luggage full of questions and travel into the realms of research, the lands of discovery. First-time ventures into research are daunting for the undergraduate student. This presentation is the review of a travel journal highlighting the challenges, pitfalls, relationships, and rewards of the real-life adventures of MSU student researchers. Successful research safaris require carefully planning your itinerary and mapping a course before wandering into uncharted territories. Missteps are inevitable, and getting lost is an important part of the learning process, however, the good news is that you never have to travel alone, there are mentors all along the route to guide your scholarly tour. Academic nomads need funding and finding the dollars, colones, and shekels you will need is an adventure in itself. We will share tips and advice on excavating available grant and scholarship treasure chests. Embarking on an undergraduate research project packing a substantial abstract as your passport can take you on the journey of a lifetime, leading to a rewarding career. Beginning our expedition at the door of the MSU Advanced Learning Center, our research work carried us all around the world, to the final destination, the presentation of the project at the international



art and archaeology conference. This talk encourages students that are interested in getting onboard a research project that undergraduate scholarly works and creative projects can be an excellent trip!

This project is dedicated to Chelsie Marie Worth. Worth began her studies at MSU Denver in the music department in 2005, completed her studies with a focus on earth sciences and GIS, and was committed to science and to information visualization. She loved working with Faye Olsgard on the Regla skulls research. Through this new scholarship in Chelsie's name, other women will be empowered to discover their own academic and professional paths through earth sciences: <https://advance.msudenver.edu/giving/chelsie-worth>.

**(Oral Presentation, Session II 11:30-11:45 AM, NC Room 1316)**

## **Irreducible Characters and their Restrictions to Subgroups**

Aaron Parker – Mathematics

Coauthor: J. Micheal Barnes

Faculty Mentors: Mandi Schaeffer Fry

Representations are functions that give us a nice way to look at group elements as matrices by marrying the two studies of group theory and linear algebra. We can then simplify this information by taking the trace of each matrix, known as a character, to identify each group element as a single complex number. Once we have our characters for a specific group, we can restrict them to its subgroups, by simply shrinking the domain of the character function from the entire group down to a subgroup. Now, irreducible characters play an important role in the study of characters. We will be looking at the behavior of these irreducible characters when restricted to various subgroups of certain groups. Do they remain irreducible? Or do they somehow become reducible? This presentation will focus on the basics of group theory, linear algebra, representation theory, and the questions asked here.

**(Oral Presentation, Session II 11:15-11:30 AM, NC Room 1314)**

## **Growing Garden: Foundations for Young Children and the Art Museum Experience**

Mireille Pasquer – Sociology

Faculty Mentors: Linda Marangia

The Growing Garden research project is a foundation and developmental project which focuses on preschool children and the art museum experience. The study examines gaps and offerings in museums programming destined for young children. Six museums in the Denver, Boulder and Fort Collins, Colorado area participated in the study, through interviews with educational programmers. One museum in Fort Collins served as a case study and service based outreach development springboard. Findings include a number of important gaps, such as lack of aggregate data about the young population, administrative climates within public schools which influence the approach to art education and networking between schools and cultural institutions, practical concerns such as funding, staffing and transportation, lack of knowledge about young children's acquisition of social and cultural capital and educators limited training in art education. Because Growing Gardens is an exploratory study, it highlights some of the aspects of the young population and the art museum experience as an important educational and cultural endeavor and seeks to define the steps which can be taken within museums and preschools to enhance availability and recognition. In designing the blueprint for feasibility and potentiality, this article takes care to articulate the steps the study needs to take in order to keep growing;



having established the gaps in offerings, it now moves on to the need of implementing outreach programs which rely on proximity. Picking the low lying fruit is akin to neighborhood outreach, where preschools and art museums within an accessible geographical zone are solicited to work together and promote the cultural and social experience of the art museum.

**(Oral Presentation, Session II 10:45-11:00 AM, NC Room 1315)**

## **Zeromile Issue 10- Exploring Tension in Society, Culture, Gender and Art through Publication Design**

Jacki Peketz – Communication Design

Coauthor: Angela Lombard

Faculty Mentor: Peter Bergman and Jessica Weiss

Zeromile Issue 10 is an art and culture publication produced and marketed by students of two courses, CDES 3225 Zeromile and Zines and ARTH 2600 Reading and Writing Visual Culture, during the fall 2016 semester. Every article of issue 10 focuses on a different social tension—and the design of this issue supports that theme. Authors, many of which were from the ARTH 2600 course, spent six weeks researching and writing their article on a topic of their choosing. In turn, their articles were designed by a student in the Zeromile and Zines course. Research occurred off campus, in or around Denver, and was inspired by current events or historical art movements. For example, “When and Where Do Black Lives Matter?” by Angela Lombard uses local publications to support her criticism of media intention in proliferating a viral social media campaign. Other articles such as “Mestizo: Cultural Tension in a Social Revolution” by Jade Gallegos, “Tension and Gender in Horror” by Ben Larned, and “Keep Calm: Breaking Tension Through Technology and Design” by Andrew French are examples of the scope of research required to create a cohesive visual language and collection of readings. The distribution and funding for the project required marketing and community outreach director, Jacki Peketz, to examine the media kit and distribution structures of major publications in Denver (5280, Out Front, Rooster). Through this research, Peketz developed a strategy to reach consumer and investor demographics for maximum funding and distribution of the magazine. This issue was also partially funded by a College of Letters Arts and Sciences mini-grant for Undergraduate research.

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

## **Avian Species Richness and Abundance in Burned and Unburned Grassland and Shrubland on South Table Mountain in Golden, Colorado**

Heather Pernel – Biology

Coauthor: Kayla Joseph

Faculty Mentor: Christy Carello

Fire can dramatically transform a landscape. These changes can have both negative and positive effects on local avian communities. On August 2nd, 2016 a lightning strike ignited a wildfire on South Table Mountain in Golden, Colorado, burning approximately 12 hectares of shrub and grassland. We took



advantage of this opportunity, using South Table Mountain as an experimental site to observe and document differences in avian species composition, abundance, and behavior found in burned and unburned shrub and grassland areas. We hypothesize that a burn in a grassland area will have more of an impact on avian habitat utilization than a burn occurring in shrubland. Observations were conducted biweekly over the period of three months taking place in August-November 2016 in four plots on the mountain using twenty-minute point counts at each observation site. The results of this study validated our hypothesis that a fire occurring in grassland has a more profound effect on avian communities than a fire occurring in shrubland. This discovery could provide valuable insight as to whether prescribed burns could be useful in order to promote species diversity in Jefferson County as well as offer suggestions of where these burns should be applied.

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

## **Communication Across Generations: The Younger Adult Perspective**

Andrew Plevak – Speech, Language, and Hearing Science

Coauthor: Blair Hunter

Faculty Mentor: David Kottenstette and Jessica Rossi-Katz

Communication across generations is especially pertinent today because populations are living longer. Therefore, the age gap between generations is growing. Our research investigates communication between younger and older adults in semi-structured interviews. In this poster, we present our findings to date from these interviews with younger adults. Participants were MSU Denver students who, at the time of data collection, were enrolled in a Communication Arts and Sciences class. Participants were asked a series of eight questions that included the age at which someone is considered old, how they modify their conversational style when communicating with older adults, and whether they believe older adults also modify their speech in the intergenerational communication process. Results to date show significant variance in the ages that participants consider someone to be an older adult. Our participants also report changing their speech, usually speaking slower or in a more formal manner. Some participants believe that older adults talk down to younger adults, or they try to fit in by using the younger generations' vernacular. Participants also express that there are barriers to communicating with older generations. These include advancement of technology, insufficient exposure to the older generations, and use of informal speech (slang). Students have difficulty finding solutions to overcome these barriers; answers range from practical solutions (Furthering the advancement of hearing technology) to philosophical solutions (Younger adults should not assume that older adults are so much different from them). Currently, we are using these findings to facilitate a narrative theater group involving 3 younger adults from the CAS department.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #22)**



## **Massacres and Mining Disasters: A Study of Death in the American West**

Jasmine Pumphrey-Robertson – History

Faculty Mentor: Margaret Frisbee

This paper explores how mass casualties in the American West during the mid to late nineteenth century played a role in the development of communities. The treatment and disposal of remains from mining disasters and massacres in particular, bound Anglo American communities. In massacres, American Indian remains were used to legitimate Anglo communities frequently at the expense of the American Indian communities. In mining disasters, proper burial of the victims' remains brought Anglo communities together. I will examine letters and accounts of those present at the Sand Creek (1864), Camp Grant (1871), and Wounded Knee (1890) massacres. Newspaper accounts of the Sleepy Hollow/Americus disaster (1894), White Ash disaster (1889), and the Homestake Mine Avalanche (1885) will inform the study. I will also look at the graves of those killed and the sites of the deaths to see the value attributed to the remains. Other historians who have focused on the remains of American Indians killed in massacres tend to emphasize the modern-day issue of repatriation. Mining disasters have been studied as they pertain to the communities, but not how the remains bound communities. By comparing and contrasting the remains of massacre victims and mining disaster victims, we can see how human remains themselves were used as tools to build communities in the mid to late nineteenth century American West.

**(Oral Presentation, Session III 3:00-3:15 PM, NC Room 1316)**

## **Is There an Ideal Foot-strike for Runners?: A Systematic Review of the Biomechanical Differences of Foot-Strike Patterns While Running**

Molly Quaranto – Biology

Coauthor: Carolyn Watts

Faculty Mentor: Jeff Simpson

There has been a lot of news and controversy about barefoot and minimalist running within the running community in the recent years, especially after the publishing of the bestselling book "Born to Run" by Christopher McDougall. After much research, we have come to the conclusion that the biomechanics behind foot contact with the ground while running may be the most important factor for injury risk. In this review we compared the results from 15 primary research articles that looked at foot strike patterns during long distance running and the associated injuries related to each strike type. We have only included data pertaining to forefoot and rearfoot strikers because midfoot strike patterns fall in between the two and have highly varied results. The common theme we found is that rearfoot strikers have about a twofold increase in stress related injuries than forefoot runners. The type of injuries that rearfoot strikes sustain are also much more debilitating and effect larger parts of the body than the injuries related to forefoot striking.

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



## **What Are Old People For? A Reader's Theater Approach to Intergenerational Dialogue.**

Jennifer Raquipiso – Speech, Language, and Hearing Science

Coauthors: Jerrett Rivera and Jennifer Rich

Faculty Mentor: David Kottenstette and Jessica Rossi-Katz

A number of medical professionals have been considered detached and uncaring toward clients, especially in regard to older generations. The purpose of this research project is to bring attention to intergenerational stereotypes about communication and to draw light to our own biases as future medical professionals. As students in the field of speech and hearing sciences, opportunities with elderly patients are limited but absolutely necessary in understanding the needs of this patient population. The following two questions will be answered. First, can medical professionals connect to their clients' experiences when there is a significant generational gap? Second, how can communication between these groups be facilitated? Utilizing theater as a gateway to open dialogue in order to bridge the gap between generations will be especially beneficial to new medical professionals working with elderly patients. The theatrical process will create connections where bias has created barriers. Actors, whose ages span decades apart, will portray a variety of characters by producing a Reader's Theater piece highlighting this dynamic. The rehearsal process will include ensemble work to cultivate intergenerational relationships and will also challenge our behaviors when confronted with potential conflict culminating in a public performance followed by a roundtable discussion. The audience will have an opportunity to clue into our process and hopefully leave inspired to join this important conversation. We will answer these two questions, and will likely raise many more, as we embark on this journey of discovering new ways to make intergenerational communication more efficient and effective.

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

## **Quantitating the Expression of Transcription Factor AP-2 $\alpha$ Splice Variants During Zebrafish Development**

Ashley Raykovitz – Biology

Faculty Mentor: Vida Melvin and Trevor Williams

Tfap2a (AP-2 $\alpha$ ) is a transcription factor that is an important regulator of development in many species from fruit flies to humans. Previous knock-out analysis of tfap2a demonstrates a role for this gene in the development of the head and face, heart, limb and body wall. Additionally, tfap2a has been identified as a specifier gene for neural crest cells -precursors of the craniofacial skeleton, neurons, glia and melanocytes. The tfap2a gene encodes at least 6 different splice variants, which are variably expressed during development and in cancer. Three of the splice variants, called variants 1a, 1b, and 1c, use alternate 5' exons (exon 1) and are highly conserved across numerous species, including humans, mice and zebrafish. Preliminary data using in situ hybridization suggests that mouse embryos express all three isoforms during development, but only variant 1b was detected during zebrafish development. Here, we examine the expression of variants 1a, 1b, and 1c using reverse transcription PCR (RT-PCR) to determine whether they are present at various developmental timepoints. Our preliminary analysis shows that during gastrulation (50% epiboly), only variant 1b is detectable, but further analysis will expand on these data to other relevant timepoints. After determining whether all three isoforms are expressed during development, we will use real-time quantitative PCR (qPCR) to quantitate the relative expression of the



three splice variants. These data will provide valuable insight towards future experiments examining the function of individual splice variants in vivo.

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

## **Perception and Dissonance: Exploring Combinations of Common Musical Instruments**

Brendan Richards – Physics

Faculty Mentor: Grant Denn and Randall Tagg

When two pure tones are played simultaneously, the human ear perceives the resulting sound very differently depending upon the frequency difference between the two tones. If the frequency difference is within a certain critical bandwidth, the beat phenomenon will occur, and the physiological result is the perception of roughness or musical dissonance. A mathematical way to describe the dissonance of two pure tones was developed by Sethares in 1993. In his research, he proposed a function that could be used to calculate the amount of dissonance that will be perceived when two tones with differing frequencies are played together. This function can be used to calculate the dissonance between complex sound sources that contain multiple tones (a.k.a. harmonics). All harmonic instruments produce sound that is comprised of many different frequencies which are often integer multiples of the fundamental. The relative amplitudes of these partial frequencies are what characterize the unique timbre of each instrument. When two different notes are played on the same instrument the partials will interfere with each other and create some amount of dissonance. The amount of dissonance generated in this way can then be calculated across a range of frequency differences to produce a dissonance curve for each instrument. The local minima on these curves represent frequency ratios which will result in the least dissonance, or greatest consonance. The purpose of my research is to examine the dissonance curves of many different dual combinations of harmonic instruments. We construct a parameter that describes the dissonance of these combinations.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #9)**

## **Women in Poverty Living HIV Positive in Sub-Saharan Africa with Lack of Access to Maternal Healthcare**

Rondora Rose – Speech Communication

Faculty Mentors: Anahi Russo Garrido

This paper examines the access to maternal health care that HIV positive women have in Sub-Saharan Africa. It explores the current access they have within several different countries, as well as what is being done and needs improvement within these facilities. It also questions whether or not there can be improvement to create a constant support for these women and their newborns. The paper highlights how there is a serious shortage of services in regards to keeping these infected women healthy and their babies from contracting the disease. Through the use of content and textual analysis, I reiterate that this a huge epidemic in Sub-Saharan Africa needs to be urgently addressed. I finally discuss how maternal health care



access for HIV positive women can become more accessible. By creating a relationship with the government and health care facilities, more babies can be born free of HIV and remain negative while growing up.

**(Oral Presentation, Session II 10:45-11:00 AM, NC Room 1313)**

## **CubeSat Axes Rotation Simulator**

Danielle Russell – Mechanical Engineering Technology

Coauthors: Patricia Ramirez

Faculty Mentor: Devi Kalla

The use of satellites for exploration has increased over the years and provided valuable information. Due to the cost and proximity of the space environment, simulators are a great learning tool to decrease the risk of such projects. The company EyasSat provides an essential learning tool to provide an environment that mitigates the risk involved in numerous categories in the aerospace business. They have created a prototype with the three unit system, or 3U system, which simulates a three axis rotation in a frictionless environment. However, this model lacks a dependable and efficient user friendly experience. We have approached EyasSat with a possible solution to their design problem. The project will be creating a bracket system that holds the 3U cube satellite housed in a clear sphere that sits on an air bearing. The bracket will be manufactured with a lightweight material that encloses the three cubes without damaging the system or interfering with any of the equipment. Since the 3U system has interchangeable parts and attached accessories, the center of mass has to be accounted for and allow for adjustments to be made. The bracket design will incorporate an adjustable system of weights to center out the mass. The sphere will be strong enough to house all the components and be transparent to allow sensors to receive and transmit signals. This project will further provide an essential tool that allows users to learn in a cost-effective environment to help lower any risks involved in similar aerospace projects.

**(Oral Presentation, Session III 2:15-2:30 PM, NC Room 1314)**

## **Analysis of NMR Spectroscopy of Thiophosphoamidates Derived from Amino Acids**

Mary Saidov – Biology

Faculty Mentor: Susan Schelble and Russell Barrows

The purpose of this experiment is to analyze the impact of having a remote chiral center on the HNMR spectra. A 300 MHz NMR was used in the process, and proton, carbon, and phosphorus NMR were obtained for each purified compound. This experiment also observed the effect of having a Phosphorus atom in a compound and how that would split the signals in the HNMR. Thiophosphoamidates derived from Valine, Leucine, Phenylalanine, and Glycine were analyzed via NMR spectroscopy. Glycine was used as a control. For example, it was found that, with Valine, the two methyls on the R group exhibit separate splitting patterns when it is typically thought that the methyl groups are in the same environment, and would thus illustrate only one split. The thiophosphoamidate was synthesized by adding dimethyl chlorothiophosphate (DMCTP) dropwise to a mixture of triethylamine (TEA) and the amino acid. After the reaction was over, the thiophosphoamidate was filtered with a separatory funnel and washed out with



hydrochloric acid (HCl), sodium bicarbonate (NaHCO<sub>3</sub>), and distilled water. Infrared spectra (IR) spectra was used to analyze the purity of the compound. Looking forward to the future, this synthesis is one of the first steps in synthesizing an antiviral agent against Human Immunodeficiency Virus (HIV). The goal is to synthesize a compound that has a receptor very similar to what HIV binds to in a human body. Once the virus binds, the anti-viral agent can deactivate the virus, thus making the virus non-functional, so it can no longer exhibit its effects.

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

## **Varicella Zoster Virus Effects on the Expression of E-Cadherin and N-Cadherin in Human Corneal Epithelial Cells**

Lauren Sanford – Biology

Faculty Mentor: Ann Wyborny

Varicella zoster virus (VZV) infection of the cornea is one of the leading causes of infectious blindness, and poorly adherent epithelial cells are frequently observed. A potential mechanism by which VZV causes this phenotypic change is by decreasing expression of E-cadherin leading to destabilization of tight junctions, as well as increasing expression of N-cadherin leading to disruption of cell organization. We hypothesize that VZV infection of primary human corneal epithelial cells (HCECs) decreases E-cadherin and increases N-cadherin expression, contributing to the altered corneal epithelial cell phenotype. To test this hypothesis, HCECs were mock- or VZV-infected. At 6 days post infection (DPI), cells were harvested and RNA extracted or fixed on coverslips. Human fetal lung cells (HFLs) were grown in parallel and used as an infection control. Messenger RNA expression was determined by RT-PCR. Immunocytochemistry with laser confocal microscopy was utilized to determine the presence of E- and N-cadherin proteins. Compared to mock-infected cells, VZV-infected HCECs had 1.35(+/- 0.17) fold increases in E-cadherin transcripts and 0.47(+/- 0.03) fold decreases in N-cadherin transcripts. Immunocytochemical analyses did not show a difference in E- or N-cadherin protein expression between mock- and VZV-infected HCECs. In conclusion, at 6 DPI, VZV increases N-cadherin transcripts and decreases E-cadherin transcripts; however, no corresponding protein changes are seen by immunocytochemistry. Overall, at 6 DPI, we did not see the expected alterations in the cadherins hypothesized. Further studies are needed to determine if these proposed VZV-induced phenotypic changes occur at later time points similar to other virus-induced changes in corneal epithelial cells.

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

## **Habitual Effects of Childhood Obesity**

Said Sharif – Health Care Management

Faculty Mentors: Jeffrey Helton

Obesity has been one of the major healthcare subjects in recent years and it still is on the rise especially in children. In my review of article on nutritional journal.com the causes of childhood obesity are many factors and those factors are not exclusive to dietary. According to the article on Nutritional journal 25% of young children in the U.S are overweight and 11% are in the obesity range. Diet is one of the biggest driving force of obesity but there is a routine to the way obese individuals operate from day to day, whether it is going to the fast food restaurants for all meals or not, the underlining reasons are habitual in



nature (nutritional J). Obesity in general is well studied subject and well researched subject yet there is no one definite answer to its issues. This study will primarily focus on childhood obesity in Denver Colorado, The mechanics of the study will attempt to highlight the claim that habits of young children are as much of a causation of childhood obesity as of high caloric nutrition. Previous researches will be used to further study the issue and provide further knowledge on the subject.

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

## **The Pressures On**

Westley Siler– Mechanical Engineering Technology

Coauthors: Dakotah Mann, Greg Power, Kanin Prasertsin

Faculty Mentor: Devi Kalla

The manufacturing of high performance carbon fiber-reinforced plastic (CFRP) parts in the aeronautics industry often relies on preimpregnated fibers (prepregs) which are cured in an autoclave. An autoclave project that can be used in a school application would be beneficial to a school for its teaching applications. The autoclave will be used for making advanced composites for educational practices. Advanced composites are composites that are applied typically used in aerospace applications and cured in an autoclave. This knowledge and use of an autoclave is widely used in various industries for aerospace, automotive, industrial and many other applications. Composite materials are used to maintain high specific tensile strength comparable to metal materials, as well as making the product lighter. These types of components are important to the industries and thus important to education. Having an autoclave will allow the schools engineering department to better match the lab data to the data from the manufacturers. To have a true composites class and have real world knowledge this project application will be researched to give education or real world applications, or same tools, used in the industry. This machine can use for training and educating the students as a part from their study of fabrication of long fiber composite materials.

**(Oral Presentation, Session I 9:15-9:30 AM, NC Room 1315)**

## **Student Exposed to Gay Teachers Experience Less Homonegativity**

Lindsey Sitz – Psychology

Faculty Mentors: Jovan Hernandez

This study sought to understand if a perceived non-heterosexual, male, professor is viewed as less competent than his perceived heterosexual counterpart. This multifactorial study also investigated if there is a difference in perceived competence between a heterosexual/non-heterosexual professor and whether he is teaching Science, Technology, Engineering, and Math (STEM) fields of education or humanities. This study consisted of 69 (N=69) participants recruited from the Introduction to Psychology classes; 56.5% of the participants were female and 42% of the participants were male. The ages of participants ranged from 18 years old to 53 years old. 58.5% of participants were White/ Caucasian, followed by 20% Hispanic and 10.8% of participants reported multiply ethnicities. Participants were provided one of four syllabi for this study; differing in the course being taught (Math or English) and in the perceived sexual orientation (heterosexual or gay). The gender of the professor was male which was kept the same in all



the syllabi. Then the participants completed a series of questionnaires; demographic information, the Teacher Evaluation scale (Anderson & Kanner, 2011), the Homonegativity Scale (Morrison & Morrison, 2002), Marlowe and Crowne's (1961) Social Desirability Scale, and the Domain Identification Measure (Smith & White, 2001). Data was analyzed using a two-way ANOVA. A significant difference showed participants who received a syllabus with a gay professor had the lowest rates of homonegativity. The differences found varied across different types of homonegativity (overall, modern, and old fashioned) and depending on the different syllabi that the subject received. This study did not find what it was expecting to find, differences in the perceptions of the teachers, however it did find something interesting and unexpected. Students who were exposed to the perceived gay syllabus experienced lower homonegativity than those who were not.

**(Oral Presentation, Session II 11:30-11:45 AM, NC Room 1312)**

## **Sciuto Energy - Human Resource Plan for the Future**

Lindsey Sitz – Psychology

Faculty Mentors: David Lynn Hoffman

The consulting seeks to help Sciuto Energy create a more cohesive work environment by providing suggestions to the client based on research and observations of the company. Sciuto Energy was founded by Ms. Abby Sciuto 1992; they are manufacturer's representative and distributor for the oil and gas industry (measurement, control, damage prevention), and have recently expanded to manufacturing. Sciuto Energy also had a department that repair and maintain metering equipment sold by the company. Sciuto Energy has 20 employees and has many independent contractors. This human resource project examines seven sections of human resources; policies and procedures, interviewing and selection, training and development, performance appraisal, compensation and incentive pay, benefits and health care, and strategy. The consultants have divided these sections into a timeline of when each should be addressed. The first aspect that needs to be addressed is in the policies and procedures sections and that is making sure that Sciuto Energy is following all current state and federal laws. The next aspect that needs to be addressed is the strategy of the company. The consultants suggest that job descriptions and organization charts are needed in all levels of the company. Following the development of a strategy would be the development of a formal training and development program for the different jobs. In the next one to five years interview and selection, performance appraisal, compensation and incentive pay, and benefits and healthcare will need to be addressed. This human resource plan will outline how to address each of these challenges.

**(Oral Presentation, Session III 2:15-2:30 PM, NC Room 1315)**

## **Fighting Resistance with Silver Nanoparticles**

Andrea Speer – Biology

Coauthor: Marissa Azua

Faculty Mentor: Sheryl Zajdowicz

Antibiotic resistance and its acquisition in microbes are of utmost importance to public health. Because many Gram-negative bacteria have become resistant to even "last resort antibiotics," alternative antimicrobial therapeutics are essential and identifying a means for reducing the acquisition of antibiotic resistance is imperative. While various studies evaluated the antimicrobial properties of silver



nanoparticles (Ag-NPs) and the rising resistance to Ag-NPs, limited information is available with respect to Ag-NPs' ability to inhibit genetic transfer. The objective of this study is to assess the efficacy of Ag-NPs in the inhibition of genetic transfer in *Escherichia coli*. Specifically, we will evaluate the effect of a sub-lethal concentration of Ag-NP on transformation, transduction, and conjugation. To determine the sub-lethal concentration for 10nm and 20nm Ag-Nps, we exposed *E. coli* to various concentrations of Ag-NPs, including a no Ag-NPs control. Following exposure, the number of viable cells was determined for the Ag-NPs treatment and control groups, and the results indicated that 2.5mL concentration of Ag-NPs was sub-lethal. To evaluate the effect of Ag-NPs on transformation, competent *E. coli* was transformed with pGLO™ with or without the addition of Ag-NPs and the number of resulting transformants was determined. Preliminary results indicate a reduction in the number of transformants following exposure to Ag-NPs. Further analysis of the ability of Ag-NPs to inhibit genetic transfer through transduction will be performed by introducing T2 or T4 bacteriophage to *E. coli* in a solution with and without Ag-NPs. Similarly, we will determine the effect of Ag-NPs on conjugation in *E. coli*.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #12)**

## **Breeze Battery**

Christian Sroka – Mechanical Engineering Technology

Coauthors: Levi Fonseca, Martin Gonzalez-Romero, Thomas Rausch

Faculty Mentor: Devi Kalla

The Breeze Battery is the senior project for the listed students. The proposed idea for the project is to build a portable wind powered generator that will charge an internal battery. The generator will be portable so that it can be used for mountaineering, camping, and general backpacking applications, as well as any application where the user has access to stable wind, such as the beach. The generator will be capable of charging USB style devices using its internal battery, which will be charged by wind power. This product is being developed to provide an alternative portable charging method to solar powered solutions that are available to consumers today. In certain environments, wind is more reliable than solar power, and this product will take advantage of that fact. During the project development process, several prototypes may be build, and testing components will be very important, helping determine optimal designs for the vertical turbine, a Continuously Variable Transmission (CVT), and the electronics found within the unit. Advanced additive manufacturing techniques (3D printing) will be used to build major portions of the unit, while certain electronic components will be purchased. The final prototype, the one used for presentations, will be able to produce a charge to the unit, and display its power generation. It will also have fully functioning portability. A working product is the goal, but the intention here is to learn the engineering processes and the steps within the development cycle of a new product, as well as build team skills which will be crucial to student success after graduation.

**(Oral Presentation, Session III 2:45-3:00 PM, NC Room 1314)**



## **Exploring the Relationship Between Executive Function and Sleep in a College Population**

Drew Stem – Psychology

Coauthor: Austin Riker

Faculty Mentor: Lisa Badanes

Previous literature details sleep loss as a prominent problem in the modern world (Curcio, Ferrara & De Gennaro, 2006), with many individuals experiencing both sleep impairment (everyday problems associated with sleep loss) and sleep problems (issues in the night that make sleep less likely) (Ban & Lee, 2001; Tsai & Li, 2004). Furthermore, research shows that sleep disturbances can have significant repercussions on cognitive ability (Ban & Lee, 2001). One important component of cognitive ability is executive function. Executive function is a set of cognitive skills that requires self-control and allows for the achievement of life tasks. One subcomponent of executive function is cognitive inhibition, and this subcomponent is withstanding or subduing a thought that occurs (Diamond 2013; Garcia et al., 2012; Garcia et al., 2016; Miyake et al., 2000; Ramirez et al., 2012). Cognitive inhibition is therefore an important aspect of executive function, and one that may be impacted by loss of sleep. The aim of this study was to investigate the relationship between sleep and performance on a test of cognitive inhibition. The sample consisted of 124 undergraduate students. The participants were 61% female, 68.5% White, and 32.3% Hispanic. The age range varied between 18-62 with an average of age of 22. Sleep impairment and sleep problems were assessed via a self-report questionnaire. Cognitive inhibition was tested using the Stroop test. Results indicate that individuals who reported more sleep problems made more mistakes on the Stroop task ( $r=.22$ ,  $p=.01$ ), however, self-reported sleep impairment was not significantly associated with Stroop performance ( $r=.09$ ,  $p=.27$ ). Discussion will focus on this differentiation between sleep problems and sleep impairments as they relate to executive function in this sample.

**(Oral Presentation, Session II 11:00-11:15 AM, NC Room 1312)**

## **Economics of NAFTA**

Brittany Stewart – Finance

Faculty Mentor: Nicolas Cachanosky

Trade between country's can make or break an economy by using sanctions or trade deals. Nations make deals with their neighbors or allies to advocate for trade between countries. This is the case for the United States, Mexico, and Canada under the North American free trade agreement (NAFTA). The United States and Mexico have the strongest trade ties and they were never questioned until the election of President Donald J. Trump. Many people began to wonder how the agreement between Mexico, the smaller economy, and the U.S., the largest economy, could be beneficial to both countries. My research explores how many consumer products Mexico sells in the U.S under NAFTA and how this effects both economies. By analyzing the trade of consumer goods between the two countries I am able to create a basic foundation to analyze who is benefiting more from the deal. To do this I researched the profits and deficits from years past in addition to goods being sold and purchased by each country. The trade between the U.S. and Mexico under NAFTA is not sustainable because it allows Mexico to make a profit from sales and create jobs for its citizens while the U.S. is left at a deficit. NAFTA is not an attractive deal for the United States and because this is only one of the trade deals the U.S. is in it could increase the national debt.

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



## **Spatial/Temporal Analysis of Bear Creek**

Steven Stier – Mathematics

Coauthor: Clinton Woods

Faculty Mentor: Elizabeth Ribble

We have worked with Groundwork Denver and the MSU Biology department to analyze ecological data in Bear Creek, a small river that leads into the Platte River in Denver. The Biology department and Groundwork Denver have collected several hundred samples of water along Bear Creek over several years and many of them show high concentrations of *E. coli* bacteria. We used a statistical method called kriging as well linear regression models to show various predictors of *E. coli*.

**(Oral Presentation, Session II 11:00-11:15 AM, NC Room 1314)**

## **An Examination of Chronotypes, Lifestyles, and Academic Performance**

Haley Stinson – Biology

Faculty Mentor: Katherine Hill

Chronotype, referring to a person's internal clock, describes if someone is a "morning person" or an "evening person". Research on chronotypes reveals that, compared to morning types, evening type people tend to reach their cognitive peaks later in the day; they also tend to have more substance abuse issues and psychological disorders. Evening types are more likely to experience "social jetlag" in which they feel tired and may not be as productive, given that they often sleep-deprived when daily schedules require that they get up earlier than they would prefer. Evening types also tend to have lower levels of academic performance. The current study seeks to replicate these findings by investigating the relationships between chronotypes, lifestyles, and academic performance among MSU Denver students. Chronotype is assessed using the Morningness-Eveningness Questionnaire. Lifestyle variables include work schedules, child-care duties, and course schedules. Information about substance use, physical health, and psychological health, along with students' self-reported academic performance, will also be collected. Correlational and regression analyses will be conducted to look for relationships between these variables.

**(Oral Presentation, Session I 9:15-9:30 AM, NC Room 1312)**

## **The Versatile O.J.**

Joseph Story – Speech Communication

Coauthors: Zach Martelson

Faculty Mentor: Samuel Jay

This paper examines the versatile functionality of the OJ Simpson saga, a series of events that includes 1994 media coverage before, during, and after Simpson's murder trial, the FX series "The People vs. OJ Simpson," and ESPN's 30 for 30 "O.J.: Made in America." Using Kenneth Burke's theories of tragedy and melodrama and readings of these theories by rhetorical scholars (ex. Schwarze, 2006), I will highlight how Simpson's story has and continues to function in various manifestations as a melodrama chockful of tragedy. In other words, the



external struggles (ex. class, race, etc.) the various melodramatic retellings highlight also function as means for working through internal tragedies such as bigotry, idolatry, and sexism. The paper will point out the larger issues at work, including the larger discussions foreclosed upon by the continual rehashing of the OJ saga in the public discourse. In particular, leaning on tragedy and melodrama creates a clear process of purification that easily allows the public purge guilt and blame without examining their role not only in the OJ spectacle, but in injustices throughout our society.

**(Oral Presentation, Session III 2:15-2:30 PM, NC Room 1316)**

## **Protocol Optimization of Recovering and Culturing Yeast from Bottled Beer**

Ginger Stout – Biology

Coauthor: Alec Rippe

Faculty Mentor: Helene Ver Eecke

On occasion, preciously rare bottles of beer come into the hands of brewing microbiologists and chemists. Our research goal was to determine an optimal protocol of recovering and culturing yeast from a single bottle of beer. This protocol can be applied to various beer samples to confidently assess if the sample contains any viable cells and to successfully get those cells into pure culture. Various permutations of cell concentration methods (filtration/centrifugation), handling methods (anaerobic/aerobic/microaerophilic), and media types (general/selective and solid/liquid) were tested to determine the optimal protocol that yields the highest rate of cells in culture. These experimental protocol screenings were performed on spiked controls (a mixture of a known viable cell concentration and cell-free beer) and then unfiltered beer samples from various commercial bottles with unknown cell concentrations. Centrifugation and filtration testing showed minimal difference in these methods. Oxygen handling of samples showed significant variation in colony number and size. Anaerobic conditions yielded more colonies of smaller size; aerobic conditions yielded far fewer colonies of larger size. We concluded that the optimal conditions were anaerobic bottle opening combined with microaerophilic incubation to provide plentiful colonies of adequate size. This protocol was applied to a precious, multi-decade-old, sample of beer provided by the historical Tivoli Brewery. Yeast was not successfully recovered from this bottle, which was likely due to a combination of factors such as; non-ideal storage conditions, pasteurization, and filtration of the bottled beer.

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



## **Investigating the Nutrient Cycling Capacity of Microbial Populations With Wetlands of Varying Health**

Andrew Strosnider – Biology

Coauthors: Deva DeAngelis-Lowe and Jacqueline Russell

Faculty Mentor: Helene VerEecke

Wetlands provide many benefits to the environment, principally water purification, flood control, carbon sink, and shoreline stability. Two Colorado field sites have been surveyed and sampled: Beaver Pond has been established since 1937 but has declined across various parameters during the last 20 years while Red Tail Delta is a newly constructed area that has rapidly gained wetland qualities. Soil, water, and sediment samples were collected from each site and assessed for both chemical and microbiological composition. Environmental assessment of samples, which included chemical analyses, botany surveys, and deposition pattern analyses, are presented elsewhere. The aim of this study was to assess the microbiology of each of these wetland study sites to gain insight into the active microbial ecology involved in wetland health. Culture-dependent assessments of samples included the inoculation of media (desulfovibro & Brunner's mineral with phenol or taurine) to enrich for microbes with key metabolisms of wetland ecology; there are currently several growing enrichments of sulfate reducers and denitrifiers, which are undergoing serial dilution to extinction to isolate pure cultures that can be identified and preliminarily characterized. Whole genomic DNA of field samples were extracted for both next generation amplicon sequencing and quantitative PCR. This methodology will be used to analyze both identifier genes (16SrDNA) and functional genes (denitrification *dsr*) of the entirety of the population, thereby eliminating any culture biases. By identifying which microbes are present and what functional potential they possess, benchmarks for key microbial metabolic activity can be developed to demarcate established and declining constructed wetlands.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #14)**

## **Rare Plants of Colorado: Correlations with Roads and Habitat**

Alison Szygielski – Environmental Science

Faculty Mentor: Sarah Schliemann

This project reviews rare plants of Colorado and why they are rated rare on the global scale. The plants being reviewed are rated on the global scale of G1 and G2. G1 is critically imperiled because of extreme rarity and G2 is imperiled because of rarity or factors that make it vulnerable to extinction. In this study, I am determining if roads and habitat may be contributing to the plants rare rating. I reviewed GSI data of quadrangles of where G1 and G2 rare plants are located in Colorado and ran analyses on the data to find the percentage of the quadrangle affected by roads. I then determined if rare plants' habitat correlated to the rare rating. There appears to be a correlation with roads and the rating of rare plants rated G2. The roads correlating with the rating of rarity, means that human action of building roads may have affected the environment and caused many plants to become rare. The plants need to be protected and we need to look further into our actions and what they are doing to the environments.

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



## **Isolation and characterization of two *Thermococcales* nov. sp. from hydrothermal vents on Axial Seamount**

Francisco Tapia – Biology

Coauthors: Melissa Oviatt, James Holden,

Faculty Mentor: Helene VerEecke

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 novel samples of the microbial life that is thriving within 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 samples were enriched in anaerobic heterotrophic sulfur-reducing media. Enrichments from sample sites Anemone and El Guapo were previously isolated, in this lab, via serial dilution-to-extinction and were identified as novel via 16S rDNA sequence analysis. The primary goal of this study was to focus on characterization of these two pure novel isolates of *Thermococcales* through various growth kinetics and substrate testing experiments. Experiments included determination of growth temperature optima, pH optima, sulfur requirement, antibiotic production and susceptibility and substrate utilization. By characterizing the microbial life coming from the vents, we can further understand and develop models that can predict microbial habitability, patterns in distribution, metabolic processes in the subsurface, and gain knowledge about the subsurface biosphere itself.

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

## **Perspectives of the Detective Novel**

Tisha Townsend – Modern Languages

Coauthors: Ann Cruz Bautista, Micaela Boh, Maria Herrera Guerrero

Faculty Mentor: Maria Rey-Lopez

Since the beginning of the detective novel, and subsequently thrillers, there came forth a clearly masculine style not only for the protagonists, but also by a clearly masculine authorship. Nonetheless, we actually encounter a flood of thriller novels leading with female protagonists. The Spanish thriller novel is not connected to these new tendencies. For this showing, we center principally on the Spanish writer, Rosa Ribas, and her most successful novel, *La detective Miope* (2014) to investigate how females interpret and rewrite this literary genre which was originally masculine.

For this conference, *Detective miope* will be examined from a variety of perspectives. Firstly, as a social critique, analyzing the subtle manner with which Rosa Ribas introduces social issues through the different cases of the novel and how these themes, at first glance seemingly insignificant, in reality hide an effective narrative strategy that seeks to provoke a reaction from the reader. Secondly, the thriller is a subgenre started in North America in the beginning of the 20th century, in which writers tried to address from a conscious critique the social conflicts that reflect the problems of the individual in contemporary society. This analysis examines up to what point *La detective miope* by Rosa Ribas follows the paradigm of the thriller genre while at the same time exploring the separation related to the fact that the author is



female. Thirdly, the appearance of female protagonists in this literary genre coincides with the addition of writers like Rosa Ribas and Alicia G. Bartlett, which from their female perspective, present an independent woman who seeks her place in a clearly male police world. And finally, an analysis of the protagonists from the novels *Detective Miope* and *Full Dark, No Stars* by Stephen King. By examining both characters, one can see the important differences in the chosen strategies each character uses to confront their pain, and how these character differences are noted as one book is written by a woman, and the other by a man.

**(Oral Presentation, Session III 2:30-2:45 PM, NC Room 1316)**

## **Locational Importance within the Urban Setting for Agriculture: Impacts of Soil Health and Rainwater Composition on Urban Agriculture**

Justin Trammell – Civil Engineering

Faculty Mentor: Sarah Schliemann

With the growth of human population in urban settings, a greater need for the import of food products is required. To reduce strain on large-scale agriculture practices and the energy costs from the movement of these products over great distances, suggestions of urban agriculture have been examined. With little regulatory oversight for urban agriculture, the aim of this research is to examine the soil quality and rainwater quality of different locations within the Denver metro area to determine if contaminants are a concern for the consumption of urban grown food goods. Water and soil samples be collected within the urban Denver area and examined using inductively coupled plasma mass spectrometry (ICP-MS) to identify nitrogen and phosphorus based compounds as well as heavy metals including lead, cadmium, mercury, and zinc. The aim is to collect samples from different areas of Denver to represent a spread of different types of soil and ambient rainwater. Rainwater will be captured both without contact to any built structure and after contact with built structure (gutter/drainage systems). This will help identify ambient rainwater quality as well as the effects of building materials on water. Soil will be collected from different residential areas within the Denver metro area. Soil will be collected from where edible plants may be grown (garden bed, raised bed, near drainage spouts of built structures). A better analysis of rainwater and soil quality within the urban environment will help food producers understand and mitigate potential contamination issues with their production.

**(Poster Presentation, Session III (2:15 – 3:15 PM), Poster #21)**

## **A King with Two Minds: A Research of Chronic Traumatic Encephalopathy, Traumatic Brain Injury, and King Henry VIII**

Holly Tuchinski – History

Faculty Mentor: Brian Weiser

As a new king was crowned in 16th century England, the future looked very promising. King Henry VIII was crowned King of England after the passing of his brother. By his fortieth year of life, Henry began to change from a sports loving young athletic King, into a paranoid tyrant. Throughout the past century, historians have been researching the possible reason for such a change in demeanor. With many theories, one that seems very plausible, is that of the King suffering from Traumatic Brain Injury (TBI) or Chronic



Traumatic Encephalopathy (CTE). Henry participated in a jousting match which ended with the King pinned under his horse, and Henry unconscious for 2 hours. CTE is only diagnosed through an autopsy of the brain, even modern medical science can't diagnose the disease except after death. The symptoms that align with CTE have been confirmed through many studies. With TBI, numerous symptoms seem to align with those of CTE as well. Knowing the symptoms of both CTE and TBI, I have conducted research on the possibility of Henry the Eighth suffering from CTE and/ or TBI. While meticulously analyzing past medical records of the King and Primary sources, I have come to the conclusion Henry suffered a brain injury which changed the Kings demeanor and personality. As symptoms begin to line up with those that effected the King, there is evidence to support many physical ailments that coexist to explain what happened to the notorious Henry VIII of England. In this research, I focus on the mental health of King Henry VIII pertaining to his change in emotion and even his physical appearance to explain why the King transitioned from athlete to paranoid and tyrannical man who changed England forever.

**(Oral Presentation, Session III 2:45-3:00 PM, NC Room 1316)**

## **Impact Of Free Internet Access On The Trucking Industry In India**

Sai Samyukth Vemuri – Computer Information Systems

Faculty Mentor: Edgar Maldonado

Reliance Jio Infocomm Limited, doing business as Jio, is a LTE mobile network operator in India. It is a wholly owned subsidiary of Reliance Industries headquartered in Mumbai, that provides wireless 4G LTE service network and is the only Voice over LTE operator in India. In 2016, Jio surprised everyone worldwide by announcing free 4G internet services throughout India. 100 million people signed up in the first six months and that number continues to rise steadily. Overnight 100 million people who previously did not have internet, suddenly had high speed and reliable internet access. This has had a huge impact on the Indian economy, transportation being one of the many major industries that saw key enhancements. Internet access made

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

## **Design and Manufacturing of a Small-Scale Filament Winding Machine to Produce Composite Parts**

Andreas Vigil – Mechanical Engineering Technology

Coauthors: Demetrius Bernal-Valdez, Nathan Graves, Antonio Montez

Faculty Mentors: Devi Kalla

A filament winding machine is a manufacturing device that is used to create hollow parts out of resin-impregnated fibers that are spun onto a mandrel. The applications of the manufacturing process span in industries that vary from sporting goods equipment to aerospace structures that require a part with high strength to weight ratio. In this paper, a small-scale automated filament winding machine was designed and fabricated. In a filament winding process, the fiber is impregnated with resin and wrapped on a cylindrical shape mandrel. The design created is a two-axis filament winding machine with one axis consisting of rotational motion and the second axis being translational motion. Each axis is driven by a stepper motor controlled by a CNC program which will regulate angular speed and translational speed.



The carriage will translate parallel to the rotating mandrel it will carry the tensioning rods, resin bath, wiper blades and payoff. The fiber creel will be in a stationary location next to the translating carriage. The design will be able to create a part with a 12 [in] diameter and 24 [in] length with minimum diameter of 0.5 [in] and 1 [in] length. The adjustable winding angles are from 10 to 90 in increments of 5. Mandrel speed can be varied, or kept constant these settings will also be applied to the carriage. The design is built for experimental analysis of the mandrel speed, carriage speed and winding angles. Testing of different variations of the 3 factors will be compared to the part quality and the strength that it exhibits. This machine can be used for training and educating the students as a part of their study of fabrication of long fiber composite materials.

**(Oral Presentation, Session I 9:30-9:45 AM, NC Room 1315)**

## **Evaluation of Cranberry Extract in the Inhibition of Microbial Growth and Biofilm Formation**

RoseAnn Vik – Biology

Coauthor: Corinne Ricci

Faculty Mentor: Sheryl Zajdowicz

Biofilms are a lifestyle adapted by many different species of bacteria as a means of survival and can confer tolerance/resistance to antibiotics, thereby mediating infection. In light of this, alternative methods for biofilm prevention and subsequent treatment must be sought. Previous research indicates cranberry extract to be an effective antimicrobial agent against a variety of microbial species; however, research into prevention of biofilm formation is lacking. In this study, we aim to investigate the effect of cranberry on biofilm formation. Ten representative species comprised of Gram-negative and Gram-positive bacteria, as well as a fungal species were tested. The organisms were grown on Mueller-Hinton agar plates, were exposed to alcohol-free cranberry extract (n=3), and observed for zones of inhibition. The cranberry extract was shown to inhibit growth in 7 of the 10 organisms tested and inhibited both Gram-positive and Gram-negative bacteria, with no growth inhibition observed in the fungal species. Following determination of susceptible organisms, a minimum inhibitory concentration was obtained for each. Further research into the inhibition of biofilm formation is underway.

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

## **Specific Autoimmune Diseases Caused by Environmental Toxins Through Rocky Flats**

Dornel Walters – Biology

Faculty Mentor: Carol Jenson

I am currently researching the incidences of specific diseases identified through Rocky Flats Health Survey. Facts such as incidence rates, health surveys, and rigorous research will be provided. Summaries from those facts that will be provided will give me a better understanding of these diseases being caused by environmental factors specifically being plutonium.

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



## **Correlation of Radiation and Diseases Found at Rocky Flats Area**

Dornel Walters – Biology

Faculty Mentor: Carol Jenson

This study is focused on researching incidences of specific diseases identified through the Rocky Flats health survey and write summaries showing incidence rates. A survey was given to the residents of Rocky Flats to find out any diseases those themselves or family members who have accumulated any rare diseases in the past. My main focus is researching the different types of rare birth defects identified from the survey at Rock Flats. The results I found show the effect of radiation on newborn or unborn babies. Another goal of mine is to analyze and summarize diseases caused by environmental toxins per collaborative on chemicals documents. The type of environmental toxin I am focusing on is plutonium 239. Plutonium-239 is an isotope of plutonium. It is the primary fissile isotope used for the production of nuclear weapons that were produced in a former U.S nuclear weapon facility in Rocky Flats. The Rocky Flats nuclear bomb facility have had multiple fires which radiation leaked into the atmosphere and the also stored barrels of radioactive chemical outside in extreme weather while it leaks through ground water and the dust. The ultimate goal of this project is to find a correlation with the birth defect diseases and plutonium 239. After finding the correlation, the plan is to get the government to acknowledge the fact that this is a real situation and provide help for all the people who suffered and/or have family members who have to suffer from environment toxins. It is important to find help for these people that have suffered and are currently suffering from radiation poisoning because people should not be living in an area where radiation is high and that can lead to increases of cancer and death rate of a population.

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

## **Patient-Physician Consultation Time**

Prisca Wambuyi – Health Care Management

Faculty Mentor: Jeffrey Helton

With socioeconomic status and education being great determinants of health, it is important to examine whether racial and ethnic disparities play a role in the minority populations' perceptions of physician's style and trust which may result in dissatisfaction in patient-physician consultation time. pervasive racial and ethnic inequalities in health care and health status have been widely documented, the causes are not sufficiently understood and less is known about the influence of individual factors, such as patient perceptions and preferences on the delivery of healthcare. Do members of racial or ethnic minority groups feel that physicians listen to them? Do they feel physicians provide adequate explanations? Do they trust their physicians? Little empiric work assessing race or ethnicity and satisfaction with physician style currently exists. In one study, African American patients rated their visits with physicians as less participatory than whites. In 2 studies of health maintenance organization (HMO) enrollees, African Americans reported relatively high levels of satisfaction compared with whites. However, other studies have found African Americans to be less satisfied than whites with various aspects of care. Latinos have been observed to have levels of satisfaction similar to whites, although, in a recent study at northern California's Kaiser-Permanente, Latinos rated physicians' accessibility less favorably than did whites. Recent data suggest that Asian Americans have the lowest satisfaction of any ethnic or racial group. With the known study results, determining whether racial and ethnic disparities play a role in perceptions of physician style and trust among the minority population helps narrow down the patient's preferences.



Data from the research will be obtained from already existing research findings on similar topics, journals, and examining survey outcomes. The results from this research will confirm the hypothesis, at the same time, the findings might help in policy adjustments in physician offices, or maybe implementations of other technique to be used in efforts to improve the patient-physician relationship and trust.

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

## **Interglacial shifts of the Intertropical Convergence Zone and effects on the Asian Monsoon**

Ryan Weber – Meteorology

Faculty Mentor: Keah Schuenemann

Speleothem samples from Bittoo Cave northern India, Dongge Cave southern China and Hulu Cave eastern China, provide a high resolution paleoclimate record of the Asian monsoon from 150 ka B.P., to 110 ka B.P. Variations in the oxygen 18 isotope record, contained in the speleothems, are primarily interpreted as displacements in the Intertropical Convergence Zone (ITCZ), resulting from the transition of glacial to interglacial conditions. Though no previous research has tracked the Indian Ocean ITCZ during a Termination event, researcher show a southern shift during the Heinrich Stadial 11 in both the equatorial Pacific Ocean and the western extent of the Atlantic Ocean (Jacobel et al. 2016; Yarincik and Murray, 2000). The Asian monsoon, driven by the ITCZ, is the major contributor to seasonal precipitation across Asia, affecting billions of inhabitants.

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

## **Financial Stress Related Anxiety and Cognitive Inhibition**

Salina Whitaker – Psychology

Faculty Mentor: Lisa Badanes

Financial stress is highly prevalent in the United States with 85 percent of those surveyed admitting to having some level of financial stress (Robertson, et al., 2015). In 73% of community-based studies, positive associations have been found between a variety of financial measures (e.g., food insecurity, housing, financial stress, etc.) and emotional disorders (Lund et al., 2009). State anxiety is determined in part by individual traits and situational stress (Eysenck & Calvo, 1992) and can either inhibit the ability to ignore irrelevant information or the ability to seek out task specific relevant information (e.g., Derakshan & Eysenck, 2009). The goal of this research was to: 1. Test the impact of a financially related acute stress paradigm on state anxiety, and 2. Understand how state anxiety impacts cognitive inhibition. Participants (n = 142, 72% female, 54% white) were first primed to think about their own current financial stressors, surveyed about their economic hardship (e.g., evictions, problems with paying bills), resource insecurity (e.g., enough money for food, clothes, housing, and medical care), and confidence in dealing with college related economic hardships, such as paying for financial aid. Participants were then asked to prepare, but ultimately did not give, a five minute public speech discussing a period where they may have struggled financially. Participants then completed the 6-item State-Trait Anxiety Inventory (Marteau & Bekker,



1992) and completed the computerized version of the n-back test (Inquisit 5). We found that state anxiety was significantly predicted by our stress paradigm, and that level of anxiety predicted performance on the n-back test ( $r = .19$ ,  $p < .05$ ). Specifically, those who were higher in state anxiety demonstrated a higher response bias (lowered cognitive inhibition) on the n-back task.

**(Oral Presentation, Session III 3:00-3:15 PM, NC Room 1315)**

## **Microclimate Induced Heterogeneity in Spatial Distribution of Arthropods on an Urban Green Roof**

Hillary Whitcomb – Biology

Coauthors: Shawn Ward, Travis Batt, and Brandon Shea

Faculty Mentor: Robert Hancock

In 2011 an extensive Green Roof was installed at the Student Success Building located at Metropolitan State University of Denver, Colorado. The site is surrounded by a largely urban landscape and the Green Roof provides a corridor for primarily Arthropod populations in an otherwise sterile environment. Benefits of these microecosystems include: refuge for transient and resident populations and food sources for a variety of organisms including vertebrates. However, the exact benefits these green roofs provide in terms of ecosystem services are largely unknown. Further research on these communities must be completed to more effectively describe the benefits in regards to Invertebrate populations over a geographic and temporal scale. During the summer and fall months of 2016 biotic and abiotic data was collected. This was accomplished using various trapping methods for Arthropod species and temperature and relative humidity data loggers. On a consistent basis traps were collected and preserved for sorting, identification and storage. These data demonstrate spatial distribution patterns in Arthropod communities that are largely influenced by abiotic factors in microclimates surrounding trapping sites. We expect to see higher counts of Isopod populations in quadrats with higher humidity levels since terrestrial Arthropods have to combat surface area to volume ratio issues in regards to water loss. In this study we look to further illustrate the value these roofs have by observing the spatial distribution of Arthropod species among the various microclimates that have developed over time. This studies long-term objective aims to be a component of a larger, more complex analysis of Green Roofs and their urban environmental influences.

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

## **Femininities and Masculinities in Greek Mythology**

Leora Whiteaker – Women's Studies

Faculty Mentor: Katherine Martinez and Anahi Russo Garrido

Greek mythologies highlight key pieces of masculine and feminine characteristic tropes that transmit throughout classical Greece to modernity, specifically American, Western culture. The aim of this paper is to identify and evaluate the notions of femininity and masculinity in Greek mythology using a textual analysis. I have compiled existing data and analyses that identify themes of femininities and masculinities in both male and female Greek characters. I then use these themes to identify character gender tropes revolving within femininities and masculinities in three Greek mythologies Hercules, the Rape of Medusa and Perseus. The masculine tropes the paper identifies are: fear of being feminine, hegemonic



heterosexuality/heteronormativity, active/penetrating roles, and autonomy. The feminine tropes are: monstrous/evil, mothers/mothers in training, virginity, passive/penetrated role, and nurturing. I conclude that these tropes translate through time to notions of contemporary, Western culture and attribute to the social construction of gender, masculinity and femininity.

**(Oral Presentation, Session I 9:00-9:15 AM, NC Room 1313)**

## **Trait Mindfulness and Music Preferences**

Anastasia Wills – Psychology

Coauthor: Jacqueline Snyders

Faculty Mentor: Lisa Badanes

Mindfulness is an awareness of experiences in the moment and a non-judgmental acceptance of those experiences (Klein et al., 2015). Higher mindfulness has been linked to lower rates of depression and anxiety (Paul, Stanton, Greeson, Smoski, & Wang, 2013). Because of this, it is important for psychologists to understand ways in which mindfulness tendencies can be increased, especially for individuals experiencing stress. One novel inquiry would be to examine musical preference. A person's musical preference can reveal a lot about their personality (Rentfrow & Gosling, 2003). As the link between mindfulness and music preference has not been truly investigated, this was an exploratory study to see if such a link could be found. The sample consisted of 124 undergraduate psychology students. The participants were 62.1% female and 68.5% white. Data was obtained using self-report questionnaires containing trait mindfulness and music preference scales. A positive correlation was discovered between the awareness aspect of trait mindfulness and a preference for reflective and complex music,  $r=.241$ ,  $p=.007$ . None of the other music genres “intense and rebellious, upbeat and conventional, and energetic and rhythmic” had similar correlations. Reflective and complex music is associated with musical preferences such as classical, jazz and folk. It is likely that different personalities are drawn to different music genres. The people who are drawn to intense and rebellious music, for example, tend to have very different mindsets than those who are drawn to reflective and complex music. While the relationship between trait mindfulness and reflective and complex music needs more investigation, it is possible that listening to reflective and complex music could raise a person's level of trait mindfulness, which would add another potential avenue to help individuals under stress lower their levels of anxiety and depression.

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

## **Spatial/Temporal Analysis of Bear Creek**

Clinton Woods – Mathematics

Coauthor: Steven Stier

Faculty Mentor: Elizabeth Ribble

We have worked with Groundwork Denver and the MSU Biology department to analyze ecological data in Bear Creek, a small river that leads into the Platte River in Denver. The Biology department and Groundwork Denver have collected several hundred samples of water along Bear Creek over several years and many of them show high concentrations of *E. coli* bacteria. We used a statistical method called kriging as well linear regression models to show various predictors of *E. coli*.

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



## **Expression of Metastasis-Associated in Colon Cancer (MACC1) during Zebrafish Craniofacial Development**

Alexandra Wright – Biology

Faculty Mentor: Vida Melvin

Metastasis-Associated in Colon Cancer (MACC1) was first characterized as a marker for metastasis formation in colon cancer. MACC1 is also up-regulated in a number of other cancers, including breast, gastric, and ovarian cancer and is considered an oncogene. MACC1 is transcription factor that activates c-MET proto-oncogene expression, inducing pathways responsible for cellular proliferation, motility, migration, and invasion; however, there is little data on its normal function in the colon or other tissues. Our lab identified MACC1 in a reverse genetic screen in zebrafish as a gene involved in craniofacial development. A dose-dependent Morpholino knock-down resulted in absent viscerocranial and ethmoid plate cartilages in severe cases. To begin to understand MACC1 involvement in craniofacial development, we are investigating the spatiotemporal expression pattern of this gene in zebrafish using in situ hybridization. Preliminary data suggests that MACC1 is expressed in the developing mouth at 48 hours post-fertilization, but more developmental time points are to be analyzed. These data will identify other potentially important regions of MACC1 expression and will provide insight to the roles MACC1 plays in development.

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



## **Addendum**

### **Sustainable Neighborhoods**

Karmen Burchett – Geography

Faculty Mentor: Sara Jackson

This research project will focus on the Congress Park neighborhood, and sustainability development efforts by local citizens. Congress Park is one of fifteen neighborhoods which will be researched within a larger group of neighborhoods in the downtown Denver area who have experienced lots of changes as the city has grown. Congress Park will be the first of fifteen neighborhoods used in the ongoing research model to be observed to help outline and extract sustainability data in other neighborhoods. Individual, group, and business interviews will highlight common concerns, previous and prior impacts, and modern policy throughout the neighborhood. All of these activities influence decisions, planning, and future progress that affects neighborhood wellbeing, and identify the ability of that locale to make changes in their policy. Historical knowledge of the neighborhood will lead to a greater comprehension of how citizens can use prior information to build their neighborhood. This small scale research will map-out and establish initiatives that will help us understand how and why the neighborhood is moving in a sustainable direction through a formal collection of sustainable inventory.

**(Oral Presentation, Session II 11:30-11:45 AM, NC Room 1314)**

### **The Shape of Light - Holography in Art**

Thomas McLaughlin – Art

Faculty Mentor: Sandra Lane

I intend to build a small holography lab to experiment with creating laser reflection holograms and exploring holography as an artistic medium. My research into drawing techniques has given me an advanced understanding of visual perspective systems in art, with which I have created my own complex visual grammar. An exploration of holography is the next logical progression of this research, because of the unique properties that the medium possesses as a result of its ability to record the 3-dimensional shape of a light wave on a 2-dimensional substrate. A hologram can show multiple perspectives of an object in a single flat image. This and other properties of holograms are intriguing to me because of their potential to be integrated into my artistic visual language. I would build the lab according to readily available plans. The lab would consist of a vibration-dampening box made of lumber and filled with sand, a holography laser and related optics; and supporting material. I anticipate that I will gain a solid foundation of practical knowledge in holography that I can then apply to my art. A background in using holography for art may also give me a strategic advantage in applying to one of my top-choice graduate schools, Ohio State University, which has a holography lab shared by the Art and Physics departments, as well as an MFA printmaking program. The purpose of this project is to learn the fundamentals of holography so that I may integrate holograms into my fine art and learn how to incorporate holography into my studio practice. I currently have a well-rounded 2D art studio practice that integrates traditional printmaking and painting mediums with alternative photographic processes such as cyanotype. Through my studio practice, I have developed a body of artwork which explores different concepts of space (physical, mental, liminal, etc), using a visual grammar heavily based in perspective drawing systems. My research into perspective systems has naturally overlapped with the science of holography, because of the unique perspective effects that holograms are able to produce. Successfully creating holograms and integrating them into my art prints and paintings will allow me to create a new kind of virtual space within the picture plane, expanding and enhancing my visual language to connect with my viewers in a new way. I believe this will lead to major breakthroughs in my artistic practice.

**(Oral Presentation, Session III 3:00-3:15 PM, NC Room 1313)**



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