



University of Montana Presents

The 17th Annual



Conference on
Undergraduate Research

Program and Abstracts

April 27, 2018 ~ Missoula, Montana

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**Special thanks to all the mentors, reviewers, judges,
and volunteers who donated their time!**

UMCUR Welcome

WELCOME TO UMCUR 2018!

It is a genuine honor to welcome students, faculty, staff, alumni, and community members to the 2018 University of Montana Conference on Undergraduate Research (UMCUR). Without a doubt, UMCUR is one the major highlights of the year at UM. This year, we have over 120 students from all Schools and Colleges presenting their research and creative scholarship. Indeed, UMCUR is a powerful example of undergraduate excellence and student-faculty partnership at the University of Montana.

Research and creative scholarship experience leads to many practical benefits for our students, including stronger qualifications for graduate school and/or professional positions. Indeed, we know that college graduates will encounter many “unscripted challenges” throughout their professional careers, and that the fundamental skills they gain through participation in original research and creative endeavors will make them much more capable of addressing the complex global challenges of the 21st Century. Perhaps most importantly, undergraduate research and creative scholarship also offers our students substantial personal benefits in the form of a stronger connections with their faculty mentor(s), a tremendous sense of empowerment, more confidence, and significant intellectual growth.

I extend thanks to all of our dedicated faculty mentors, who have tirelessly guided our students through the projects they are presenting today. Thanks also go to new University of Montana President Seth Bodnar for making this conference - and undergraduate research and creative scholarship more generally – one of his highest priorities. Finally, it is important to note that many UMCUR projects are supported by private scholarships, and I would like to express gratitude to the many generous donors who continue to express their belief in our students and their potential.

Any major event requires a great deal of planning, and UMCUR is no exception. This event would not be possible without the great efforts of the UMCUR Planning Committee, the University of Montana Undergraduate Research Committee, and all the faculty members, staff, alumni, community members, graduate students, and undergraduates who have volunteered their time as facilitators and judges for the conference.

Most special thanks go to Michelle Eckert, who always goes above and beyond the call of duty in organizing this important event. The success of UMCUR 2018 stems from her unbelievably hard work.

Best wishes for a successful (and enjoyable) day,

Brock Tessman, PhD

Dean, Davidson Honors College

dhc
DAVIDSON HONORS COLLEGE



UMCUR Keynote Speaker

12:20 p.m., University Center Theater ~ April 27, 2018



Geographies of Water and Well-being

Dr. Sarah Halvorson

Professor of Geography
University of Montana

Abstract

Sarah Halvorson will address live, local and global water issues by illustrating and providing evidence of efforts to turn some intractable problems around through collaboration and cooperation. This will include some untold stories to celebrate that contribute to the well-being and happiness of individuals and communities.

About Dr. Sarah Halvorson

Dr. Halvorson's teaching and research interests span several broad and diverse areas including: gender and social aspects of water resources and environmental hazards; medical and health geography; gender geography; international development in Central and South Asia and Africa; and water and landscape transformations in the Rocky Mountain West. From 1994 to 1998 she carried out ethnographic fieldwork in mountain communities in the Karakoram of northern Pakistan. This work culminated in a doctoral dissertation entitled, "Geographies of Children's Vulnerabilities: Households and Water-Related Disease Hazard in Northern Pakistan." Since 2000, she has carried out field studies in the Bitterroot Valley of Montana, Royal Kingdom of Bhutan, Republic of Georgia, Kyrgyzstan, Turkey and Tajikistan, the Xinjiang Uyghur Autonomous Region of Western China.



UMCUR Schedule Overview

Conference on Undergraduate Research (UMCUR)

University of Montana

April 27, 2018

University Center 3rd Floor

8:00 AM	Information Desk & Poster Setup - UC 3rd Floor, Grand Foyer
9:00 - 11:00 AM	Oral Sessions - UC 326-332 <ul style="list-style-type: none">• Social, Life and Physical Sciences & Humanities
10:40 - 12:00 PM	Franke Global Leadership Initiative (GLI) Capstone - UC North Ballroom
11:00 AM - 12:00 PM	Poster Session #1 - UC South Ballroom
12:20 AM - 1:30 PM	Keynote Lecture - UC Theater
1:40 - 2:40 PM	Franke Global Leadership Initiative (GLI) Capstone - UC North Ballroom
1:40 - 3:00 PM	Oral Sessions - UC 326-330 <ul style="list-style-type: none">• Social & Life Sciences, Humanities
3:00 - 4:00 PM	Poster Session #2 - UC South Ballroom
4:00 - 5:00 PM	Oral Sessions - UC 326-333 <ul style="list-style-type: none">• Social, Life and Physical Sciences, Humanities and Visual/Performing Arts & Creative Writing

**Please check the schedules outside each room for the most up-to-date times for each presenter.*

dhc
DAVIDSON HONORS COLLEGE
UMCUR Awards Ceremony

Please join host Davidson Honors College in celebrating this year's UMCUR Awardees in the Theta Rho room, Mansfield Library (level 4) on Tuesday, May 1st, 2:00 - 3:00 pm. Cake and coffee will be provided.



2017 UMCUR Conference award recipients.



**The best preparation for
tomorrow is doing your best
today.**

H. Jackson Brown, Jr.

Franke Global Leadership Initiative (GLI) Capstone Presentation Session

These presentations feature Capstone Research from students in University of Montana's Franke Global Leadership Initiative (GLI). These Franke GLI students are in their fourth and final year of the Franke GLI fellowship. Throughout their four years they have been involved in unique and enriching academic learning that has combined practical experience with their classroom education. Franke GLI's distinctive program brings together students from different disciplines to tackle real-world problems with diverse ideas.

Franke GLI Capstone Presentation Sessions 10:40 AM - 2:40 PM UC North Ballroom

Franke GLI

10:40	What do you want to be when you grow up? - Martha Krebill; Melanie Gagen; Melisande Slater; Anna Peterson; Nikia Reynolds
11:00	Technological Approach to Recycling Incentives - Cheyenne Goetz; Megan Franz; Tiffany Folkes
11:20	Water and Us: Education as the First Line of Defense - Sarah Maxwell; Cassandra Sevigny; Izzy Diaz; Miranda Henrich; Kevin Mason; Kyra Searcy
11:40	Chasing Plenty: A Documentary on Food Security in Montana - Kurt Swimley; Colin Brust; Aspen Anderson; John Potenberg; Nathaniel Smith

12:00 - 1:30 PM Break

Franke GLI - Continued

1:40	Mental Health Services Survey - Riley Kack; Jessica Bailey; Tyler Ferguson; Victoria Gifford; Kelaiah Horat; Isaac Larowe; Madison Padilla; Rene Sanchez
2:00	Elementary Coding Education - Austin Lindsay; Emily Hake; Catherine Orfanos; Elli Sullivan; Madison Flaget; Natasha Sullivan
2:20	How Do You Love?: Conversations About Love and Lust in Morocco, Sweden, and the United States - Margaret Finlay; Audrey Brosnan; Autumn Fraser; Emily Morrison; Julia Maxon; Paris Summers

Want to participate in the 2018 UMCUR? Make sure to visit the UMCUR Website and Like us on Facebook to keep up with current happenings.
www.umt.edu/ugresearch/umcur

UMCUR Schedule Breakdown

Concurrent Oral Sessions: 9:00 AM - 11:00 AM

(Listed by room, time, and title of presentation)

Complete list of Authors, Abstracts and Mentors are located after the schedules.

Social Sciences - Room 326

9:00-9:20am	The Effect of Accountability on Dialectical and Elaborative Complexity - Gavin Ploger
9:20-9:40am	Outdoor Education's Impact on Health - Tessa Leake
9:40-10:00am	Pedagogy of Pitch in L2 Blackfoot - Naatosi Fish
10:00-10:20am	Language Use & Totalistic Social Groups - Emily Allen
10:20-10:40am	Identity Construction Among Pilgrims on el Camino de Santiago - Claire Babcock
10:40-11:00am	The Risk of Tax Avoidance through Charitable Donations in the U.S. Art Market - Laura Sikoski

Life Sciences - Room 327

9:00-9:20am	Development of a Novel Vaccine to Treat Immune-mediated Diseases - Maya Dahlgren
9:20-9:40am	Bat Hibernation in Talus Slopes - Sarah Gaulke
9:40-10:00am	Exploring the role of a novel RpoD protein in <i>Borrelia burgdorferi</i> - Bethany Crouse
10:00-10:20am	A bacteriophage integrase regulates virulence factor production in <i>Pseudomonas aeruginosa</i> - Jake Cohen
10:20-10:40am	The Effects of Floral Resource Removal on Plant-Pollinator Interactions - Rachel Dickson
10:40-11:00am	Open

Physical Sciences - Room 330

9:00-9:20am	Baseline levels of groundwater nitrate/nitrite around Hamilton, Bitterroot Valley, Montana 2015 to 2018 - Dan Jordan Jr.
9:20-9:40am	Evidence supporting stream metabolism as a driver of daily cycles of metal/metalloid concentrations - Spencer Lachman

Physical Sciences - Room 330 - Continued

9:40-10:00am	Time Comparisons of Channel Lines of the Bitterroot River - Kathleen Cox
10:00-10:20am	Mapping Mount Saint Helens: Capturing the Volcano's Geomorphologic Change over Time - Jennifer Haas
10:20-10:40am	Open
10:40-11:00am	Open

Humanities - Room 331

9:00-9:20am	Angels and Demons: A Southern Crusade for Equal Rights and Justice - Joseph Starr
9:20-9:40am	"You Know Where I Stand" - The Irish Catholic Response to the Boston Busing Crisis of 1974 - Meaghan Fernandes
9:40-10:00am	Fantasy versus Reality: A Twenty-First Century Film Series to Explore How the Absurdity of Alternate Realities Affects the Individual in the Audience - Courtney Wunderwald
10:00-10:20am	Creating Shift in Power and Gender Dynamics in Professional Cultures: Combatting Sexual Harassment Through Interdisciplinary Education - Amanda Rosbarsky
10:20-10:40am	Creating the Fourth Wave: The Evolution and Impact of the Black Athlete Protest - Reagan Colyer
10:40-11:00am	Rostov Undone: Jews, Gentiles, and the State Mediation of Anti-Semitic Violence - Ethan Holmes

Humanities - Room 332

9:00-9:20am	"Run Like a Girl": The Rise of the Women's Marathon, 1960-1985 - Mary Butowicz
9:20-9:40am	"What Lies Within a Label? The Deconstruction of "Labels" in Society - Blaine Wilder
9:40-10:00am	A Space of Their Own: Missoula's Women's Place 1974-1995 - Anastasia Bakos
10:00-10:20am	WORLD WAR I, FEARS OF WHITE MEN, AND THE BLACK MILITANCY LEADERS CAPITALIZED ON - Madison Renaldo
10:20-10:40am	Deconstructing Discourse: Gaps in María de Zayas's Feminism - Jennifer Zundel
10:40-11:00am	Open

Poster Session #1: 11:00 AM -12:00 PM
UC South Ballroom
(Listed by category and last name of author)

Humanities

1	The Evolution of Microaggressions Against Native Americans in Montana History Books - Lacey DeSalles	3	Developing an Intervention: An Undergraduate's Experience - Morgan Webster
5	Building Prime Towers to Understand Factors - Alexis Feffer		

Life Sciences

9	Language and Psychosocial Outcomes for Stroke Survivors with Aphasia Following an Intensive Comprehensive Aphasia Program - Kendall Alley	15	Construction of the Soft Sound Test for Hearing Aid Prescription - Sully Magee
7	Use of Capsaicin for Desensitization of the Cough Reflex - Emma Bozarth	23	A bacteriophage integrase regulates virulence factor production in Pseudomonas aeruginosa - Autumn Robinson
19	PHYSIOLOGICAL CONTRIBUTORS AFFECTING HEAT ACCUMULATION WITH A WILDLAND FIREFIGHTER HELMET - John Center	13	Switch II Region in Gai1: Specificity for Ric-8A - Melissa Roseleip
17	Social learning of male dominance relationships in degus - Alec Dalton	11	LOAD CARRIAGE AND ENERGY EXPENDITURE DURING TREADMILL VS FIELD TRIALS - Rebecca Skoric
25	Using Chimeric Proteins to determine basis of FBF-2 localization - Benjamin Hickey	21	Quantifying false positives between two avian survey methods - Kaitlyn Strickfaden

Physical Sciences

27	Radiocarbon Dating of a Bitterroot Valley Peatland - Sandra Amsden	29	Polystyrene Surface-Absorbed Trehalose Diester as a Means for Performing Pulldown Assays - Alexander Riffey
33	Establishing groundwater nitrate/nitrite levels around Hamilton, late winter, Bitterroot Valley, Montana - Jimmy Baggett	35	Integrated Design and the Backyard Astronomer - Benjamin Seratt
31	Investigating Water Rights and Stream Flows in Over-Allocated Streams in Montana - Corey Hall		

Social Sciences

50	Face Perception and Identification - Audrey Aamot	46	Screening Tool for Behavioral Cough Suppression Therapy - Serena Haller
48	Speech Sound Testing: The Relationships Among Measures of Connected Speech Samples for Children with Speech Delays - Margot Diffendaffer	40	Extreme Smoke Events: Climate Change and Human Health in Western Montana - Sarah Luth

Social Sciences - Continued

42	A Montana Ski Town and its Persistent Housing Crisis - Donnie McBath	52	Scraping Away at the Past: Extracting Ancient DNA from Stone Tools - McKenzie Morgan
44	Caregivers of stroke survivors with language impairments: The impact of an Intensive Comprehensive Aphasia Program on caregiver psychosocial well-being - Haley McMahan	56	Assessments to Enhance the Psycholinguistic Approach for Speech Sound Problems - Jeff Wigmore
54	Preservice School Professionals' Knowledge of Speech-Language Pathologists' Literacy Practices - Sarah Moen		

Keynote Lecture 12:20 - 1:30 PM

UM Professor, Dr. Sarah Halvorson - UC Theater

“Geographies of Water and Well-being”

Pizza Provided in the UC Foyer

Oral Sessions - Continued: 1:40 PM - 3:00 PM (Listed by room, time, and title of presentation)

Social Sciences - Room 326

1:40- 2:00pm	Suprasegmental Production by American Learners of Japanese: A Phonetic Investigation - Yuna Hiranuma
2:00- 2:20pm	Climate Change Action: Chilean Response to an Altering Environment - Rebecca Levandowski
2:20- 2:40pm	The Value of Silence in Finland: A Geographic and Cultural Perspective - Meghan Kuhns
2:40- 3:00pm	A Review of the Historical Influences of the Rural Physician Shortage in the United States - Andrew Honken

Life Sciences - Room 327

1:40- 2:00pm	Use of genetic techniques to address biases in Northern goshawk turnover metrics - Carly Muench
2:00- 2:20pm	Spatial Patterns of Winter Roadside Gray Wolf (<i>Canis Lupus</i>) Sightability in Yellowstone National Park - Jeremy SunderRaj
2:20- 2:40pm	The effect of plumage coloration on interspecific competition between mountain bluebirds <i>Sialia currucoides</i> and tree swallows <i>Tachycineta bicolor</i> - Jenna Millsap
2:40- 3:00pm	Open

Oral Sessions - Continued: 1:40 PM - 3:00 PM
(Listed by room, time, and title of presentation)

Humanities - Room 330

1:40-2:00pm	Finding Hope in the Face of Climate Change: Lessons from Costa Rican Activists - Lindsay Ashton
2:00-2:20pm	It's Never Been Done Before: Margery Hunter Brown and Her Indian Law Clinic - Lauren Selleck
2:20-2:40pm	Individuality and Identity Among New England's Nineteenth Century Mill Women - Breann "Ellen" Watterson
2:40-3:00pm	Folk or Forgotten?: The Collection of Marginalized Folk Culture Under New Deal Programs - Noah Johnston

Poster Session #2: 3:00 PM - 4:00 PM
UC South Ballroom
(Listed by category and last name of author)

Humanities

2	Music Through Math: Analyzing and Composing Scores Mathematically - Katerina Hall	4	Exploring Death in the Russian Experience - Maree Herron
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Life Sciences

10	DLC-1 Over-Expression and Growth Inhibition in <i>Saccharomyces cerevisiae</i> - Ella Baumgarten	16	Is the protein-protein interaction discovered in the nematode conserved for mammalian proteins? - Emily Osterli
20	Branching Out: Generating an Evolutionary Tree of Southeast Asian Plants with Computational Tools - Conner Copeland	22	Reducing False Sequence Annotation Due to Alignment Overextension - Jack Roddy
24	Event related electrical potentials recorded from the brain prior to the initiation of speech - Ethan Germann	8	Moss Rehydration in the Genus <i>Syntrichia</i> - Maggie Ross
14	Blood Oxidative Stress Following Exercise Recovery in Normobaric and Hypobaric Hypoxic Environments - Christopher Johnson	18	Statistical Clustering of Glioblastoma and Glioblastoma Multiforme Data - Jed Syrenne
12	Life History Variation in Non-Native Brook Trout - Madeline Lewis	26	Quantifying the Presence of Alternative Reading Frames in the Human Genome - Sarah Walling

Physical Sciences

37	An Inter-Model Comparison of Gridded Temperature and Precipitation Products in Montana - Colin Brust	30	Arbuscular Mycorrhizal Fungi Ameliorate the Negative Effects of Drought on the Common Intermountain Forb: <i>Gaillardia aristata</i> - Patrick Demaree
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Physical Sciences - Continued			
34	The Combinatorics of the Clarinet - Cory Emlen	32	Studying the Effects of Atrazine-induced Estrogen on the Development of Regulatory T-cells - Dawit Mengistu
36	DOES THE METABOLIC COST OF LOAD CARRIAGE DIFFER BETWEEN MALES AND FEMALES? - Hannah Habighorst	39	Modeling Surface Mass Load Displacements Along The Cascadia Subduction Zone - Cody Norberg
28	Improving the Accuracy of Digital Seismic Traces Generated from Images of Paper Sign Bit Seismic Sections. - Shevin Halvorson		

Social Sciences			
51	Exploring Perspectives on Recreational Drone Use on Public Lands Parks, Tourism, and Recreation Management - Jennifer Allen	47	DNA Extraction and Analysis of Bone Samples from the Orton Quarry Ossuary. - Paige Plattner
57	Children's Understanding of Robots: A New Ontological Category or Just Pretend? - Rachele Barker	58	University of Montana's Anthropological Collection Facility's (UMACF) Ethnomusicology Collection - Rachel Steffen
45	The Identification of 'Mystery' Seeds from Bridge River, BC - Lauren Clark	59	Sometimes Hesitancy is Key: Effects of Moral Deliberations on Children's Interpretation of Credibility Cues - Kali Taylor
43	Are robots animate or inanimate? Children's pronoun use provides insight into categorization challenge - Stephen Cooke	41	Social learning of safety in degus - Dorothy Young
55	Of Betta splendens and Speed Dating: an Analytical View - Sarah Hecht	53	Fostering Resilience in Middle School Students - Hannah Zuraff
49	The Effectiveness of Youth Engagement Through Intervention: An Intensive Treatment - Westley Hughes		

Oral Sessions - Continued: 4:00 PM - 5:00 PM
(Listed by room, time, and title of presentation)

Social Sciences - Room 326	
4:00-4:20pm	Where there's a Will, there's a Way: Young People and Climate Change - Emma Kiefer
4:20-4:40pm	Dreaming American Dreams: The American Dream as Related to Race and Ethnicity - Nikia Reynolds
4:40-5:00pm	""White Folks Has Everything They Need"": Diversity and Inclusivity at the University of Montana - Emily Gillispie

Oral Sessions - Continued: 4:00 PM - 5:00 PM
(Listed by room, time, and title of presentation)

Humanities - Room 327

4:00-4:20pm	Waltrene Willis, a Montana Suffragist - Chloe Loeffelholz
4:20-4:40pm	The Life of Montana Suffragist Margaret Jones Souders - Anisa Ricci
4:40-5:00pm	Margaret Jane Rozsa, A Montana Suffragist - Calyn Hitchcock

Humanities - Room 330

4:00-4:20pm	Isonomia: Intersecting Philosophy, Politics, and Medicine - Jakob Wyder
4:20-4:40pm	Intersectionality of Gender and Society in Edith Wharton's The House of Mirth - Gentry Darkenwald

Life / Physical / Social Sciences - Room 331

4:00-4:20pm	The Possible Effects of Fluctuating Selection on the Gene RLG1A in Mimulus Guttatus (Yellow Monkeyflower) - Ean MacArthur-Waltz
4:20-4:40pm	Rocky Mountain High: An Investigation of Downhill Snow Sports and Marijuana Use - Silas Phillips
4:40-5:00pm	Commissioning the Scanning Photoionization Microscopy Lab at the University of Montana - Carter Webber

Visual/ Performing Arts & Creative Writing: 4:00 PM - 5:00 PM
(Listed by room, time, and title of presentation)

Room 332

4:00-4:20pm	Imperfect Pearls: Baroque Influence on Contemporary Painting - Erin Langley
4:20-4:40pm	Silver and Light: Salt Print Photography - Nicholas Gilbert
4:40-5:00pm	Thing #1 - Johathan Green

Room 333

4:00-4:20pm	2° Celsius - Katie Conrad
4:20-4:40pm	Open

ABSTRACTS

(listed by title of presentation)

The following are the complete list of abstracts including author, co-author, & mentor.

2° Celsius: The Use of Dance to Create Forums of Discussion

Author(s): Katie Conrad

Category: Visual and Performing Arts (includes Creative Writing)

Abstract / Artist Statement: I was inspired to create a dance piece addressing coral bleaching after watching the documentary Chasing Coral. My intention for this dance piece was to start a discussion about coral bleaching, why it is occurring, and its ecological effects on the world. I felt that the idea of coral bleaching was a distant topic for those in my community considering that Montana is a land-locked state. The title of my dance piece is 2° Celsius due to the fact that ocean temperatures only need to rise by two degrees Celsius for coral to become stressed, this is a result to climate temperatures rising. I worked with Makenna Barney on the lighting design and Paula Niccum was the costume designer. When performing the dancers wore white silk outfits that reflected the lights which were colorful and constantly changing until the end of the piece when they became stark white on the dancers. In order to create this piece my cast of dancers explored movement that emulated different species of fish, plants, and coral. I lead my dancers through Andrea Olsen's Single Cell Organism movement score along with Butoh dance scores, this form is known as the dance of death due to its meticulous and slow quality. In my mind I could see dancers moving to emulate the movement of coral, showing the liveliness and beauty of a coral reef. The dancers would start convulse and slowly stop moving as if they were turning into stone, leaving the audience to witness a desolate stage so they could understand the beauty that the world is losing as it loses coral reefs.

Mentor Name: Nicole Bradley Browning

A Montana Ski Town and its Persistent Housing Crisis

Author(s): Donnie McBath

Category: Social Sciences

Abstract / Artist Statement: Ski towns across the Rocky Mountain West are facing the inter-connected problems of rising housing prices and shortages of labor. These local issues have led to severe challenges associated with the lack of affordable housing. My study focuses on three key elements that contribute to the problem of affordable housing in the booming ski town of Whitefish, Montana. These elements include: (1) the geographical and historical context that makes this community similar to other ski towns in this region; (2) the economic and land use planning factors that constrain the affordable housing market; and (3) the limited sustainable solutions to this housing crisis. As part of this study, I propose a site plan to convert a city-owned parcel (known locally as “The Snow Lot”) into a multi-family use community. My site design is guided by the objectives of affordability, sustainability, practicality (e.g., meeting parking needs), and energy efficiency. I employ collaboration with the town of Whitefish and data collection through site visits and planning documents. The intention is that my site design will help the City of Whitefish expand its low-cost sustainable affordable housing solutions in the future.

Mentor Name: Dr. Sarah J. Halvorson

A Review of the Historical Influences of the Rural Physician Shortage in the United States

Author(s): Andrew Honken

Category: Social Sciences

Abstract / Artist Statement: The rural physician shortage isn't unique to the United States, but in our country, there are several institutional and social trends influencing this flaw in our medical system. Before 1910, rural America had a surplus of physicians, but many were poorly trained. At this time, the Flexner Report was released reshaping medical education into the system we know today. Medical schools concentrated into urban centers, and more specialization attracted more physicians to urban centers with their sufficient resources and dense populations. Additionally, America saw significant urbanization in the population as a whole. As cities raced ahead in the advancement of healthcare and neoliberalist views of healthcare pushed for profit over equality, the rural-urban health disparity widened. By the 1970s, Julian Tudor Hart coined the term "the inverse care law" based on his observations that "the availability of good medical care tends to vary inversely with the need for it in the population served." In the present, we see the effects of these century-long trends in healthcare delivery. The federal government has tried to alleviate the issue with federally subsidized critical access hospitals in rural areas and student loan repayment programs to attract more physicians to rural areas. Despite this, there was speculation with the passing of the ACA that the increased patient load in rural areas would overwhelm the already understaffed hospitals. Research shows recruiting rural physicians is a process that starts with the medical school admissions process. A few schools have designed programs around this idea with great success in their small pockets of the country. This review of the history of the rural physician shortage shows the medical institution as a whole needs to recognize these flaws in the system and push for reform of medical education to close the gap between rural and urban healthcare access.

Mentor Name: Gilbert Quintero

A Space of Their Own: Missoula's Women's Place 1974-1995

Author(s): Anastasia Bakos

Category: Humanities

Abstract / Artist Statement: Missoula has more non-profits per capita than any other city in the United States. While researching Missoula non-profits, I found the Women's Place, a feminist organization that is now closed. The Women's Place opened its doors in the mid-1970s to local women; it offered a variety of services including abortion referral, rape counseling, and support for battered women. Unlike many other non-profits in Missoula the Women's Place ran as a collective, meaning that everyone's voice and opinion mattered. My current understanding is that the Women's Place never had secure funding. They ran off of a mixture of grants and private donations and one time (that I am aware of, there could be more) a garage sale enabled them to stay open. I believe because the Women's Place was ran as a collective and because of the uncertainty funding, it was restructured numerous times. In 1995 they ultimately closed. Thus far, most of my research has been in Oral Histories, Archival Records, and books/pamphlets distributed by the Women's Place. I will also use books to find national information. There have been numerous books and articles written about feminist collectives across the United States, but little written about those in Missoula. I want to see how Missoula's Women's Place compared to other feminist organizations in the US at the time. Were national trends followed? One trend in feminist collectives is the "star system." The star system is where one woman dominates the conversations and decisions of an organization. However, feminist collectives generally had a hope of equality. Having a sole person lead the conversation does not coincide with the idea of a feminist collective. There has been a lot written about the "star system," but nothing written locally. I am interested in seeing if the star system model applied locally?

Mentor Name: Anya Jabour

A bacteriophage integrase regulates virulence factor production in *Pseudomonas aeruginosa*

Author(s): Autumn Robinson; Jake Cohen; Lia Michaels

Category: Life Sciences

Abstract / Artist Statement: *Pseudomonas aeruginosa* is a bacterial pathogen that causes hospital-acquired infections and is very difficult to kill with antibiotics. This is especially true when *P. aeruginosa* grows as a biofilm—a complex community of bacteria encased in a protective extracellular matrix. *P. aeruginosa* biofilms produce large amounts of filamentous Pf bacteriophage, which are viruses that infect *P. aeruginosa*. Pf bacteriophage are known to increase the virulence of *P. aeruginosa*. However, the underlying mechanisms that cause this are unknown. Our preliminary results suggest that when the Pf bacteriophage integrase gene *intP* is overexpressed, production of the virulence factor pyocyanin is enhanced. When *intP* is deleted, pyocyanin production is repressed in *P. aeruginosa*. Like other bacteriophage integrases, *intP* inserts bacteriophage DNA into the bacterial chromosome. We hypothesize that *intP* integrates bacteriophage DNA into bacterial genes that regulate pyocyanin production. To test this hypothesis, we will use genetic approaches to disable the integrase activity of *intP* followed by biochemical assays to measure pyocyanin production. Understanding how Pf bacteriophage manipulate the virulence of *P. aeruginosa* may result in new ways to treat or prevent infections caused by this ubiquitous bacterial pathogen.

Mentor Name: Patrick Secor

An Inter-Model Comparison of Gridded Temperature and Precipitation Products in Montana

Author(s): Colin Brust

Category: Physical Sciences

Abstract / Artist Statement: Gridded datasets are one of the primary ways that scientists gather temperature and precipitation data for their study areas. Gridded data can be thought of as a series of maps that overlay a study area. For every day of every year, scientists can use these gridded data to determine the temperature, precipitation, or a host of other variables at any given location within their study area. These datasets are created by using point data from the ground (e.g. weather station data) to interpolate the values of climatic variables across the dataset's area of interest. As a result, gridded datasets are powerful tools that can be used to estimate climatic variables when physical measurements are unavailable. Unfortunately, due to differences in calculation methods, interpolation methods and point data, it is unlikely that these datasets will yield the exact same result for a given point within a study area. To determine the temporal variations between datasets, I am conducting an inter-model comparison of the gridded temperature and precipitation products available in Montana. To do this, I gathered daily gridded temperature and precipitation data from the past 30 years to create monthly, seasonal, and annual climate normals. I then compared each of the normals to determine which datasets deviated the most from the average of all datasets. Although using this method will not reveal the accuracy of each dataset, it will show where datasets vary the most and yield uncertain results. This information can be used by scientists to determine which dataset best fits their study area and is most likely to produce accurate results.

Mentor Name: Nicky Phear

Angels and Demons: A Southern Crusade for Equal Rights and Justice

Author(s): Joseph Starr

Category: Humanities

Abstract / Artist Statement: In May 1954, the Supreme Court banned segregation nationwide in the landmark lawsuit, *Brown v. Board of Education*. Very few whites in Mississippi and not many more blacks took it seriously; most Southerners considered it a joke. Reverend Will Campbell, Director of Religious Life at the University of Mississippi, generated nationwide controversy in 1956 when he invited racial sympathizers to speak on campus against the legitimacy of racial segregation, from a Christian perspective. In *Angels and Demons*, I investigate the politicization of prayer, and the use of public prayer demonstrations as an effective form of protest. Additionally, I explore the life of Will Campbell; a white Southern Baptist preacher who championed racial equality at a time when white southerners avoided the issue. Rev. Campbell took a hardline against the policy of segregation, and through religious affiliations, he forced educators to publicly defend the merits of segregation, while simultaneously uncovering inconsistencies in southern Christian values and academic integrity. The project was completed as a historical essay, utilizing primary and secondary sources to support my thesis. The amalgamation of religiosity and political beliefs resulted in lengthy, often volatile arguments between influential members of society that captured the attention of the nation. For the first time, the practice of segregation was contested in a public forum, not only by southern legislators, but also religious leaders who questioned the morality of its existence. Confrontation between white southern Christians and national religious leaders revealed the strength of religious commitments to segregation and white supremacy; commitments that appear vague in mainline denominational histories. This study of prayer and civil rights reveals a complex entanglement of religious perspectives and political inclinations that heavily influenced the behavior of southern Christians during the 1950s.

Mentor Name: Tobin Miller Shearer

Arbuscular Mycorrhizal Fungi Ameliorate the Negative Effects of Drought on the Common Intermountain Forb: *Gaillardia aristata*

Author(s): Patrick Demaree

Category: Physical Sciences

Abstract / Artist Statement: Root colonizing arbuscular mycorrhizae fungi (AMF) are primarily known to help plants acquire nutrients and grow. However, recent research suggests that AMF colonization may also enhance plant drought tolerance. In a field experiment in western Montana, we tested whether AMF colonization improves growth and ameliorates the effects of drought on the native forb *Gaillardia aristata* (Blanket flower). In 2017, we transplanted greenhouse-grown AMF-colonized and non-colonized Blanket flower seedlings to a field experimentally devoid of AMF. Each colonization type was further subjected to two watering regimes: one receiving mostly ambient precipitation and one receiving supplemental water. In mid-July (when plants were still growing) and in August (when plants started to flower) I destructively sampled plants from each treatment to examine the effect of AMF colonization on growth and plant water status. Irrespective of moisture treatment, AMF-colonized plants grew more, allocated relatively less biomass to roots and produced more flowers relative to non-colonized plants. Water treatments had modest effects on soil moisture and, consequently, on growth. However, supplemental water drastically increased reproduction in AMF-colonized plants relative to non-colonized plants. AMF colonization did not affect plant growth and water status under supplemental water. However, under ambient soil moisture (drier) AMF-colonized plants had better water status than non-colonized plants. Our results show that Blanket Flower benefits from AM fungi colonization and that such benefit increases under drought. Globally, drought is intensifying in magnitude and duration with potentially severe ecological and societal repercussions. Recent advances in soil ecological research have emphasized the role of complex below-ground biotic interactions on plant community distribution

and resilience to drought. Our results add to a growing body of evidence that AMF contribute to plant drought tolerance. Further research should identify the physiological mechanisms involved and the ecological implications.

Mentor Name: Anna Sala

Are robots animate or inanimate? Children's pronoun use provides insight into categorization challenge

Author(s): Stephen Cooke

Category: Social Sciences

Abstract / Artist Statement: Children attribute an array of animate characteristics to robots (e.g., emotions, mental states, sociality, and moral standing), yet at the same time understand them as inanimates (e.g., non-biological). However, much of the existing research has relied upon explicit measures (children's self-report), rather than implicit or behavioral measures. Given that children attribute a unique constellation of animate and inanimate characteristics to robot (new ontological category hypothesis), it is critical to evaluate children's conceptions of robots using converging measures (implicit and explicit). Thus, the purpose of the current research was to assess children's categorical understanding of a robot using an implicit measure of pronoun use. We conducted this study with 90 participants equally divided into three age groups: 5 (M=5.5, SD=.28; 50% girls), 7 (M=7.4, SD=.32; 50% girls), and 9 (M=9.4, SD=.24; 50% girls) years. Each participant interacted with a robot and puppet (counterbalanced order) in three phases: Familiarization—five introductory activities with the entity (e.g., feeding with a leaf, petting, playing tug-o-war); Free Play—participant played on their own with the entity (up to 5 min.); and Attribution Interview—assessed participant's attributions to the entity (17 randomly-ordered questions). We then coded gendered (he/him, she/her) and neuter (it) pronoun use by the participant and researcher during the Familiarization phase and Attribution Interview. Based on previous research, we predicted (1) children will use more gendered pronouns (male-gendered, in particular) with the robot compared to the puppet, and (2) researcher's pronoun use will influence participant's pronoun use more for the robot than the puppet. Our next step is to analyze the results of this study. This research will provide critical insight using implicit measures into children's understanding and categorization of robots. Importantly, it will inform on long-standing theoretical issues in the development of categorical reasoning and the emergence of a new ontological category.

Mentor Name: Rachel Severson

Assessments to Enhance the Psycholinguistic Approach for Speech Sound Problems

Author(s): Jeff Wigmore; Paige Hillman

Category: Social Sciences

Abstract / Artist Statement: When clinicians can pin-point exactly where a speech issue is originating in a child's speech-language system, they can help the child learn more efficiently; this results in a quicker therapy process. Stackhouse, Pascoe, and Gardner (2006), presented an approach to speech therapy intervention which incorporated a three-way method. In their psycholinguistic approach, they gathered information about incoming speech, how the information was stored and processed, and the resulting production of speech by one child with a speech delay. This approach offered a more effective way to plan treatment. The current study's goal was to explore the relationships among measures that could support the verbal aspect of the psycholinguistic model. Elements of both static and dynamic assessment methods were studied to foster better understanding of speech skills. This method was executed by comparing data from previous testing sessions of children, ages 3-7, specifically those sessions which used a standardized (static) test: the Hodson Assessment of Phonological

Patterns (HAPP), along with a test that measured the amount of help needed to say a sound (dynamic test): Glaspey Dynamic Assessment of Phonology (GDAP). By comparing the scores of these two tests with each other along with other client variables, the data were used to inform treatment plans for future use. Having enhanced measures that address specific areas in the psycholinguistic approach (input, storing, and output) could allow clinicians to create more appropriate treatment plans. The intention of this study was to discover how much more effectively these two kinds of measures could improve understanding of the verbal component of the approach. In using the HAPP assessment and by guiding treatment with the GDAP, the enhanced results of this “hybrid” psycholinguistic approach will be seen and described in this poster presentation.

Mentor Name: Amy Glaspey

Baseline levels of groundwater nitrate/nitrite around Hamilton, Bitterroot Valley, Montana 2015 to 2018

Author(s): Don Jordan Jr.; Aldo Rodriguez; Broc Perkins; Dillon Lewis; Gavin Nuttall; Jame Kowalski; James Baggett; Kathleen Cox; Kendra Norton; Kimberly Martin; Thomas Dowdy

Category: Physical Sciences

Abstract / Artist Statement: We propose to collect emergent groundwater around Hamilton, using standardized collection methods that include quality assurance and control samples with analysis performed at a certified drinking water testing laboratory (Energy Labs). Our goal is to compare new data to previous nitrate/nitrite data collected in 2015 by the Bitterroot College Environmental Science Class. That year nitrate/nitrite levels were reported to be as high as 14.5 mg/L in a well in shallow groundwater, which exceeds the federal drinking water level of 10 mg/L of nitrate-nitrogen. We will provide a map of the locations of all the samples 2015 through 2018 and use local hydrology data to help determine the source and flow direction of the groundwater. Routine testing and reporting of groundwater quality in our community will help protect our health and the economy of our river. Groundwater in sand and gravel aquifers from shallow wells supplies all the Hamilton area drinking water. The aquifers receive recharge from streams and ditches flowing in from the sides of the valley and the shallow aquifers discharge to the Bitterroot River and to ditches that flow past the west and north edge of Hamilton. We plan to collect about a dozen samples in an arc around the down gradient edge of Hamilton from these groundwater discharges. We will then compare these samples to identical sample locations and to wells sampled in 2015. Nitrates are tasteless and odorless, and are often the first sign of deterioration of groundwater quality. Nitrates are a health threat because they can cause “blue baby syndrome” and may function as initiators of human carcinogenesis. Nitrates are also an environmental threat because they cause eutrophication damage to surface water aquatic environments in the Bitterroot River. The trout fishing industry in our valley brings in about thirty million dollars per year.

Mentor Name: George Furniss

Bat Hibernation in Talus Slopes

Author(s): Sarah Gaulke

Category: Life Sciences

Abstract / Artist Statement: Twelve species of bats are thought to overwinter in Montana, but surveys have found few individuals hibernating within caves and mines. However, bats are consistently recorded on acoustic detectors year round across the state indicating that they are hibernating in other places. There is anecdotal evidence of bats using talus slopes for roosting and foraging, and these features may serve as important hibernacula. This is a time sensitive issue as a disease called White Nose Syndrome, a pathogenic fungus, has been found nearby in Washington. White Nose Syndrome caused severe population declines on the East coast

by impacting hibernation behavior. Knowing hibernacula is essential to monitoring and assessing for White Nose Syndrome. Pilot work using mist nets, roost searches, and acoustic detectors, was conducted at 10 sites during summer 2017 to identify active summer roosts and document species within talus slopes. To continue this work and assess what species are hibernating within these features, I placed ten acoustic recorders on talus slopes to record ultrasonic calls during winter in Northwestern Montana. In warm weather during winter, bats emerge from hibernation to drink, so winter activity may indicate hibernacula in proximity to the detectors. These acoustic data will help us estimate species diversity and relative use at each site. Additionally, I assessed attributes that may influence hibernacula suitability including: aspect, talus depth, talus size, air flow from underneath the slope, and daily temperature and humidity. In February, I will retrieve the data and analyze the number and type of calls. I will determine if the average daily number of call sequences correlates with any of the talus attributes or microclimate variables. Our goal for this project is to provide baseline data to assess the impacts of White Nose Syndrome when it reaches the state and provide previously undocumented hibernation information.

Mentor Name: Erick Greene

Blood Oxidative Stress Following Exercise Recovery in Normobaric and Hypobaric Hypoxic Environments

Author(s): Christopher Johnson; Wendy Schneider; Victoria Lucier

Category: Life Sciences

Abstract / Artist Statement: Blood Oxidative Stress Following Exercise Recovery in Normobaric and Hypobaric Hypoxic Environments John Quindry¹, Tiffany Quindry¹, Katheryn Tiemessen¹, Wendy Schneider¹, Victoria Lucier¹, Christopher Johnson¹, Roksana, Zak², Robert Shute², John Cuddy¹, Walter Hailes¹, Dustin Slivka², Brent Ruby¹ ¹University of Montana, Missoula, MT, ²University of Nebraska, Omaha, NE. Purpose: Hypobaric and hypoxia exert independent effects on exercise-induced oxidative stress in blood, while the hypobaric and hypoxic influences are not well defined. The current study was undertaken to quantify exercise-induced oxidative stress recovery during lab-simulated hypoxic and hypobaric conditions following a common bout of exercise. Methods: At a base elevation of 975m, physically active participants (n=16), ages 18-40, provided informed consent prior to performing 60 minutes of cycle ergometry at 70% watts max. Using a randomized counter-balanced crossover design participants recovered for 4 hours in 3 lab-simulated conditions; 1000m normobaric normoxia (NN, 675mmHg, 18.8% FiO₂), 4400m normobaric hypoxia (NH, 675mmHg, 12% FiO₂), or 4400m hypobaric hypoxia (HH, 440mmHg, 12% FiO₂). O₂ saturation was confirmed via pulse oximetry throughout the 3 exercise-recovery trials. Blood samples were collected in heparinized vacutainer tubes at time points Pre, Post, 2 Hours Post, and 4 Hours Post exercise. Blood plasma was analyzed for the quantification of oxidative stress to proteins (protein carbonyls, PC; 3-nitrotyrosines, 3NT), lipid (lipid hydroperoxides, LOOH; 8-isoprostanes, 8-ISO), and antioxidant capacity (ferric reducing ability of plasma, FRAP; trolox equivalent antioxidant capacity, TEAC). Results: Plasma TEAC, FRAP, 3NT and PC were unaltered by exercise and recovery environments (p>0.05). Exercise-induced increases in LOOH and 8-ISO were observed, although time-by-trial differences were not present. Conclusion: These data indicate that exercise recovery in simulated conditions of NH and HH do not impact a common panel of blood oxidative stress measures. Significance: This research will help better understand recovery during post exercise in both hypobaric and hypoxic conditions.

Mentor Name: John Quindry

Branching Out: Generating an Evolutionary Tree of Southeast Asian Plants with Computational Tools

Author(s): Conner Copeland

Category: Life Sciences

Abstract / Artist Statement: Plants in Southeast Asia are historically understudied, and their evolutionary relationships are poorly understood. This lack of an evolutionary history has proven to be an obstacle to further investigation of these species, so this research seeks to create a phylogeny, or evolutionary tree, of these plants using molecular data and computational tools. To accomplish this, we downloaded amino acid and DNA sequences from respected databases. We determined which sequences are best recorded in the species of interest, and utilized a blend of pre-existing tools and scripts written in the Perl programming language to eliminate sequences that could lead to inaccurate results. We fed these “filtered” sequences into programs that create alignments of protein or DNA sequences (MAFFT and Opal). These sequence alignments are used to infer likely relationships among these sequences and, therefore, relationships among the species they were obtained from. The resulting alignments were used to compute the most probable phylogeny, using the inference tool, FastTree. The resulting evolutionary tree will assist in filling a significant gap in our knowledge of the evolutionary history of the plants of Southeast Asia. It will also be directly applicable to the research of our Biology Department’s Dr. Jedediah Brodie, who is investigating how interactions with marsupials and mammals has shaped the evolution of these plant species.

Mentor Name: Travis Wheeler

Building Prime Towers to Understand Factors

Author(s): Alexis Feffer

Category: Humanities

Abstract / Artist Statement: There has been a fair amount of research over the past several decades on teachers’ understanding of the multiplicative structure of integers. What can easily be discerned from the literature is a lack of understanding on the part of these educational professionals. It would be easy to assume that this lack of understanding is thereby held by the students in these classrooms. Yet, very little research has examined children’s understanding of this mathematical idea. In this quasi-experimental study, we focus the effects of the use of a manipulative, the prime towers, in a three-day teaching experiment carried out in a fourth grade classroom. Students “build” towers of blocks that represent each number 2-100 as a product of prime factors. Towers are studied, compared, and contrasted to build understanding of the significance of prime factorization in predicting a number’s multiplicative structure. The experiment measured students’ ability to identify use prime factorization as a tool to find all the factor pairs, multiples, prime, and composite numbers for natural numbers 1-100 (Common Core Standard 4.OA.4). The results demonstrated represent five classes of fourth grade students spanning three schools. The conclusions drawn will help to identify and refine instructional practices that promote the understanding of the Fundamental Theorem of Arithmetic at a fourth grade level. In connection, both qualitative and quantitative data are presented to insure the practices promoted are both instructional and engaging.

Mentor Name: Dr. Matt Roscoe

Caregivers of stroke survivors with language impairments: The impact of an Intensive Comprehensive Aphasia Program on caregiver psychosocial well-being

Author(s): Haley McMahon; Bridget Brannan, Al Yonovitz

Category: Social Sciences

Abstract / Artist Statement: Caregivers of stroke survivors who have language impairments (i.e., aphasia) are known to have decreased psychosocial well-being, including increased depression and anxiety. Communication impairments from aphasia increase caregiver burden (i.e., third-party disability) and place strain on the relationship between stroke survivors and their caregiver(s). Intensive Comprehensive Aphasia Programs (ICAPs) are an emerging health care model providing holistic, intensive treatment to improve the stroke survivor's communication skills and the psychosocial well-being of both the stroke survivor and their caregiver(s). This cohort-based model targets the impairment, activity, and participation domains of the WHO-IFC model. This study will examine psychosocial outcomes of caregivers who participated in an ICAP at the University of Montana during the summer of 2017. **Methods:** Eight non-paid, family caregivers of stroke survivors with aphasia participated in an ICAP lasting four weeks. Caregiver intervention included: (1) twice weekly (1.5 hours/session) group counseling provided by a licensed family counselor, and (2) weekly (1.5 hours/session) caregiver education group provided by graduate student clinicians in speech-language pathology and their licensed supervisors. Prior to and immediately following the ICAP, caregivers were administered the following self-report measures: (1) Beck Depression Inventory-II, (2) Beck Hopelessness Scale, (3) Multidimensional Scale of Perceived Social Support, (4) Perceived Stress Scale, (5) General Self-Efficacy Scale, (6) Caregiver Reaction Scale, (7) Bakas Caregiving Outcomes Scale, and (8) Family Crisis Oriented Personal Evaluation Scales. Data from these outcome measures is currently being organized for analysis. Preliminary analyses will be presented. **Significance:** ICAP interventions offer unique opportunities for caregivers to participate in education, training, and social support with other caregivers. ICAP's have potential to increase communication, improve psychosocial well-being, and overall quality of life for both the stroke survivors and their caregivers.

Mentor Name: Catherine Off

Chasing Plenty: A Documentary on Food Security in Montana

Author(s): Kurt Swimley; Colin Brust; Aspen Anderson; John Potenberg; Nathaniel Smith

Category: Global Leadership Initiative (GLI)

Abstract / Artist Statement: Chasing Plenty: A Documentary on Food Security in Montana Our GLI group aims to examine the following question: how will climate change impact food security? To address this question we are conducting interviews in Montana. Despite being an agricultural state, many Montanans struggle with food insecurity, and are left without plentiful or healthy options for food. We aim to research this issue by interviewing local community members involved in food distribution. The interview data will be compiled in a short documentary discussing current issues in food security, how these problems are likely to evolve in the future, and propose solutions to the issues facing Montanans and the global community. We will examine issues such as poverty, stigma, distribution, and climate change as problems impacting food security. Data on the state of food security in Montana is sparse. To supplement existing data we use geographic information systems to provide more detailed information on the status of food security in Montana. We aggregate our data and research into an additional, more academic report detailing the specifics of our work. However, we chose film as our primary medium in order to reach a broader audience of people. Our ultimate goal is to ignite interest in this topic and get more individuals involved. We aim to bring together a community of people dedicated to addressing food security, and create meaningful change.

Mentor Name: Sara Rinfret

Children's Understanding of Robots: A New Ontological Category or Just Pretend?

Author(s): Rachele Barker; Bethany Lindner

Category: Social Sciences

Abstract / Artist Statement: Children attribute a unique constellation of animate and inanimate characteristics to personified robots, e.g., judging them to have emotions, thoughts, and capable of being a friend, while also being a piece of technology. Do children truly believe robots have animate characteristics or are they just engaging in pretend play? The latter is certainly plausible as children readily endow objects with personas. The present study sought to address this question by investigating children's judgments and behavioral interactions with a robot compared to a stuffed animal (a classic object of pretense). Ninety participants (5, 7, and 9 years) engaged with each entity (counterbalanced order) during a familiarization period, free play, and an interview probing their attributions to each entity. We coded children's judgments during the interview and their behavioral interactions with the entity (e.g., endowing animation, attempts at reciprocity). We predicted that if children are engaging in pretense, their judgments should align with pretend behaviors (e.g., saying the robot can move on its own, and then endowing it with animation). Whereas, if children's attributions reflect their veridical beliefs, their judgments should align with reciprocal interactions (e.g., saying the robot can move on its own, and beckoning the robot to come). By using convergent measures (judgments and behaviors), we gain confidence in how children understand each entity. Our next step is to analyze the results of this study. The results will help determine whether children's attributions to robots are a product of pretense or reflect their actual beliefs. In turn, these results will (1) have bearing on the hypothesis that robots may represent a new ontological category (i.e., straddling the boundary between animates and inanimates), and (2) inform on the potential implications of increasingly pervasive personified technologies on children's pretense and their developing conceptions of the world.

Mentor Name: Rachel Severson

Climate Change Action: Chilean Response to an Altering Environment

Author(s): Rebecca Levandowski

Category: Social Sciences

Abstract / Artist Statement: Chile is one of the most biologically diverse areas in the world and recently published a "Plan de Accion Nacional de Cambio Climatico 2017-2022" (PANCC-II). This plan, further referred to as the National Action Plan on Climate Change, outlines their commitment to reducing greenhouse gas emissions and mitigating climate change impacts on their country. The ambitious goals put them on the forefront of climate change action in South America. The National Forest Corporation of Chile manages the country's natural resources. Due to lack of funding, it is difficult to implement climate action plans including restoration and reforestation of degraded areas because there is little to no data on how to achieve these goals. This study analyzes the National Action Plan and cross references it to other climate action goals to determine the success of Chile's climate change mitigation. This project uses information from various scientists working on related tasks in this field. Research for this project was in part inspired by a donation of ten million acres by the Tompkins Foundation to create a new national park in the country.

Mentor Name: Cara Nelson

Commissioning the Scanning Photoionization Microscopy Lab at the University of Montana

Author(s): Carter Webber

Category: Physical Sciences

Abstract / Artist Statement: Microscopy is the imaging and study of objects smaller than the human eye can detect. This can range from micrometer-size down to sub-nanometer-scale objects. Different microscopy techniques include optical microscopy, electron microscopy, and scanning probe microscopy. Optical microscopy makes use of light, electron microscopy makes use of electron beams, and scanning probe microscopy makes use of a physical probe. A type of optical microscopy, scanning photoionization microscopy (SPIM) is a great way to study the electronic structure of nanoparticles. The physics behind SPIM will be discussed. The commissioning of the Scanning Photoionization Lab at the University of Montana is an ongoing process which needs to be completed before any nanoparticle samples can be analyzed. The lab is operated around a strong infrared laser to probe samples and a vacuum chamber to hold experimental samples and conduct research. The optical path involved in the lab involves several complex elements that are described in more detail. Several key tasks need to be completed to finish commissioning of this lab, including programming to operate lab equipment, building electrical components of the lab, and wiring lab elements to power, other lab elements, and a computer for data collection. This lab plans to study properties of gold nanoparticles and the effect of geometry on their structure with applications in cancer treatment.

Mentor Name: David Macaluso

Construction of the Soft Sound Test for Hearing Aid Prescription

Author(s): Sully Magee

Category: Life Sciences

Abstract / Artist Statement: The purpose of this study was to design a test of soft sounds that would be beneficial to patients with decreased hearing. Hearing aid fitting strategies concentrate more on hearing conversational speech levels rather than soft sounds. These soft sounds often allow a full auditory experience for the patient. Soundscape stimuli are sound exemplars that are constructed with high quality sound recordings in a specific fashion to create a real-life sounding experience. Soundscapes are a relatively new technology that are used in the field of acoustics. Little use of these stimuli have been utilized in audiology. For this study we made a series of ten one minute long soundscapes to present to participants. They were made with very strict criteria. We established ten themes to construct them and chose a background sound that may be present in the environment we were simulating. For example, one of our topics was camping, and the background sound was a fire crackling. We then proceeded to choose six micro-sounds per theme to present intermittently throughout the background clips. These were sounds that would play within the background for approximately one to five seconds at fifteen second intervals. Each background (ten themes, were repeated twice for a total of twenty), had three of the six designated sounds embedded in them while the other corresponding background sound had the remaining three. The micro-sounds were embedded at specific intensity levels that would be audible only near the sound awareness level for the micro-sound (20 dB). The test procedure should allow those with hearing loss to hear soft sounds with a hearing aid.

Mentor Name: Al Yanovitz

Creating Shift in Power and Gender Dynamics in Professional Cultures: Combatting Sexual Harassment Through Interdisciplinary Education

Author(s): Amanda Rosbarsky

Category: Humanities

Abstract / Artist Statement: The #metoo movement has taken our world by storm, and made the pervasiveness of sexual harassment and gender based violence in our workplaces both watercooler and dinner table conversation. As society reels from the daily accusations of assaults, attacks, and aggressions, we acknowledge that this is not a newly discovered problem in our country's various industries, but an impromptu collective unveiling of a common cultural phenomena. Sexual harassment in the workplace was labeled as a form of discrimination decades ago, but here we are confronted with the reality that sexual harassment is still incredibly commonplace. Discriminations which have the potential to have a direct, negative effect on one half of our workforce must certainly have a dampening effect on vast swaths of our population. Drawing on scholarly articles from various business journals this paper will explore the history and current state of laws, policies and trainings designed to combat sexual harassment in our nation's businesses. I will focus on an approach which aims to decrease gender based discriminations through leadership driven cultural change within our institutions. Because business leaders are being shaped through their college education, I will expand on the important role collegiate level education can play in proactively changing the cultural tides in power and gender dynamics in our institutions; particularly if we provide an interdisciplinary education to those who are seeking to become tomorrow's leaders of industry. This paper encourages the development of an interdisciplinary course of study at the university level which weaves together Women's, Gender, and Sexuality Studies and Business programs for the purpose of arming our leaders with the skills with which to cultivate diverse, productive, professional environments where every person can fully and safely contribute.

Mentor Name: David Firth

Creating the Fourth Wave: The Right Arena: The Evolution and Impact of the Black Athlete Protest

Author(s): Reagan Colyer, Tobin Shearer

Category: Humanities

Abstract / Artist Statement: In 1968 in Mexico City, John Carlos and Tommie Smith became the subjects of a photograph that would become synonymous with Black Power the world over. Both athletes would be suspended from the US track and field team, and both would be ordered to leave the Olympic stadium—all for removing their shoes, unzipping their jackets, and raising a fist. Before and since the 1968 Olympics, athletes of color have chosen to utilize the venue of major sporting events to voice their feelings on race relations, institutional racism, and systemic violence. But why do protests in athletic contexts garner the reaction they do? What goes into the orchestration of an athletic protest? And most importantly, have the choices made by John Carlos, Tommie Smith, Colin Kaepernick, and their ilk brought about any change in society's conversations about race? My research has centered on these telling questions. With assistance from Harry Edwards, who was a key orchestrator of both the 1968 Olympic protest and Colin Kaepernick's choice to kneel during the national anthem at NFL games beginning in 2016, I explore the impact athletes have had on sports and society at large, the repercussions they face and risks they run in speaking as they do, and the cultural and social legacy of the black athlete's decision to protest. I conducted the majority of my research through academic and journalistic means, exploring the nuances in putting together a protest, variations in public sentiment and reaction, and personal experience of the public and private actors involved. Hopefully this project can contextualize and quantify the changes that athletes like these have wrought, and give the basis for a prediction of what's to come.

Mentor Name: Tobin Miller Shearer

Deconstructing Discourse: Gaps in María de Zayas's Feminism

Author(s): Jennifer Zundel

Category: Humanities

Abstract / Artist Statement: María de Zayas y Sotomayor (1591 – 1661) was the best-selling woman author of two extant collections of novellas, translated as Exemplary Tales of Love (1637) and The Disenchantments of Love (1647), that consist of stories of love, marriage, and gendered violence between aristocratic men and women. These 17th-century Spanish books, as popular as Cervantes', were explicitly and unapologetically pro-woman. Indeed, Zayas has retroactively been placed as an early modern feminist for her condemnation of systematic misogyny and her call for gender equality. Despite her depictions of violence against women and her denunciation of patriarchal institutions that neither include nor protect women, Zayas does not advocate for a radical restructuring of society. In fact, many of Zayas's novellas perpetuate racism, classism, and sexism. Without condemning hierarchical race, class, and gender structures, Zayas's feminism can only go so far. Zayas, writing in the baroque style and notably drawing from works such as Boccaccio's Decameron, sets up her collections in the tradition of the frame narrative, which complicates any analysis of Zayas's feminism. Not only do we have Zayas and a narrator, but we have characters, both women and men, narrating tales within. These female and male narrators provide insight into different perceptions of gender and gendered violence. It is not, however, only male-narrated tales that are guilty of misogyny. In both male- and female-narrated stories, hegemonic racism, classism, and sexism bleed through. Though many have noted Zayas's classism, few have deeply analyzed it—or her racism and sexism. By deconstructing Zayas's discourse, we can see the gaps in and limitations of Zayas's feminism.

Mentor Name: Jannine Montauban

Developing an Intervention: An Undergraduate's Experience

Author(s): Morgan Webster

Category: Humanities

Abstract / Artist Statement: This presentation outlines my experience working as an intern, and subsequently a paid Research Assistant for Psychology Research Professor, Dr. Rosemary Hughes, on her collaborative research project, ZEST. The project, "Promoting the Psychological Health of Women with SCI: A Virtual World Intervention," will be, is the first randomized controlled trial of a psychological health promotion intervention for women with spinal cord injury. This project is vital because while those with SCI represent a minority population, women only make up about 20% of that minority, and therefore are particularly underrepresented in research capacities. Secondly, ZEST addresses the psychological health of women as opposed to much of the literature currently focused on physical health. The interactive virtual world of Second Life will allow women to connect, and share ideas and experiences with other women with SCI while learning what psychological health is, and ways they can improve their own. As a senior in the psychology department, I began my work under Dr. Rosemary Hughes in August 2017. In Second Life each peer facilitated group of 8-10 participants will meet weekly for 10 weeks to do 2-hour sessions that include discussion, relaxation training, action planning, etc. as outlined in the examples provided. As an intern I was able to join board meetings about ZEST, and even meet some of the women with SCI who acted as advisors for Rosemary and her colleagues on some of the content in the intervention. As a taylor my primary job was assisting in the development and organization of PowerPoints and drafting facilitators manuals for each of the sessions. Working on the preliminary stages of ZEST under Dr. Hughes's supervision. Rosemary allowed me to see what a grant proposal looks like, and the time and effort that goes into writing and organizing the literature and supplemental material for

Mentor Name: Rosemary Hughes

Development of a Novel Vaccine to Treat Immune-mediated Diseases

Author(s): Maya Dahlgren, Fanny Astruc-Diaz, Celine Beamer, Shelby Cole, Joanna Kreitinger, and David Shepherd

Category: Life Sciences

Abstract / Artist Statement: Over the last few decades, there has been a significant increase in the incidence of people suffering from immune-mediated diseases such as autoimmune disease, chronic inflammatory disease, severe allergic disease and tissue/organ rejection. These life-threatening diseases involve dysregulation of the immune system, manifested by inappropriate attack on self-tissues and organs. Clinical treatments for these disorders are currently inadequate and often cause many adverse effects including systemic immune suppression, creating an urgent need for better therapies that specifically target and regulate deleterious immune responses. Research studies from our laboratory and others have implicated the Aryl hydrocarbon Receptor (AhR), a cellular signaling pathway that responds to environmental pollutants, dietary components and endogenous ligands, as a critical regulator of the immune system. Dendritic cells (DCs) are an important population of immune cells that regulate immune responses, express the AhR and are highly responsive to AhR activating chemicals. From this information, we hypothesized that the specific delivery of AhR activating chemicals to DCs will generate regulatory immune cells that suppress unwanted immune responses. To test this hypothesis, we generated a drug delivery system using liposomal nanoparticles containing AhR-activating compounds, autoimmune disease-specific peptides, fluorescent diagnostic markers, and targeting antibodies for mouse DCs. Our in vitro results demonstrate the utility and selectivity of this system in mouse DCs. Preliminary experiments in vivo have also indicated desirable biodistribution of the drug-containing nanoparticles to DCs in secondary immune organs (spleen and lymph nodes) when administered to mice via systemic administration. Future experiments will further evaluate the efficacy of this novel immunotherapeutic approach to suppress unwanted immune and inflammatory responses. Ultimately our goal is to develop highly targeted therapeutics that can effectively treat immune-mediated diseases without generating systemic immune suppression.

Mentor Name: David Shepherd

DLC-1 Over-Expression and Growth Inhibition in *Saccharomyces cerevisiae*

Author(s): Ella Baumgarten

Category: Life Sciences

Abstract / Artist Statement: The activity and regulation of RNA-binding proteins (RBP) is an important topic in studies of gene expression. The regulation of RBPs includes interactions with cofactors. One cofactor that our lab has identified is DLC-1, a small protein that prompts the association of a RBP with subcellular RNA granules. Previous research on a protein, Pbp1, with similar effects in *Saccharomyces cerevisiae* (yeast) shows that Pbp-1 over-expression leads to growth inhibition in yeast cells due to the promotion of excessive RNA granule formation (Swisher and Parker, 2010). Due to similar effects between Pbp-1 and DLC-1, we hypothesize that DLC-1, when over-expressed, will cause growth inhibition in yeast cells. *Saccharomyces cerevisiae* is the model organism that we will use to investigate this question because it is cost efficient, allows for fast results, and is relevant for humans because many of the proteins present in yeast have mammalian orthologs. This hypothesis will be tested on multiple strains of yeast. Using these different strains, we will express DLC-1, two positive controls (Pab1 and Dhh1), and a negative control under the control of a galactose-inducible promotor. We will then grow the yeast on agarose plates that contain different concentrations of sugars (galactose and sucrose). We vary the concentrations of sugars in order to control the activity of the promotor, resulting in protein over-expression in higher concentrations of galactose. The yeast will then be incubated on the plates for five days. At the end of the incubation period, potential lack of cell growth on the

high-galactose plate will suggest if DLC-1 over-expression does lead to inhibition of cell growth. Understanding how expression of DLC-1 is related to cell growth and RNA granule formation is important because abnormal RNA granule formation is linked to neurodegenerative diseases.

Mentor Name: Ekaterina Voronina

DNA Extraction and Analysis of Bone Samples from the Orton Quarry Ossuary

Author(s): Paige Plattner

Category: Social Sciences

Abstract / Artist Statement: The Orton Quarry site (36ER243) is a Late Prehistoric ossuary along the coast of Lake Erie in northwestern Pennsylvania. In March 1991, heavy-equipment operators accidentally exposed and destroyed approximately two-thirds of the original ossuary, leaving only the eastern third intact. Due to a personal interest in ossuaries an extensive literature search and personal communication with a one of the lead archeologists from the site was conducted. It was discovered that very little had been published on the site's importance or its original inhabitants. One of the primary objectives of this project is to change that. By extracting and analyzing the mtDNA using the Dabney et al. (2013) protocol and the aDNA contamination avoidance protocols standard in the Snow lab we will obtain valuable data on the site's genetic ancestry. Thus far the DNA from the first five samples have been isolated, and are being amplified for the first hypervariable region of the mtDNA mitogenome. The resulting sequences will be reviewed in Sequencher software. Any single nucleotide polymorphisms that are identified in comparison with the revised Cambridge Reference Sequence will then be compared with the Haplogrep software in order to confirm haplogroup assignment. The aspiration of this project is to analyse the data and compare the results to other ancient and modern DNA data from the Great Lakes region, using haplogroup and haplotype comparisons, as seen in Pfeiffer et al. (2014). Ultimately all of these results will then be written and presented on, adding to both the knowledge of the Orton Quarry Ossuary as well as the genetic data for the Great Lakes region.

Mentor Name: Meradeth Snow

Does the Metabolic Cost of Load Carriage Differ Between Males and Females?

Author(s): Hannah Habighorst; Pia Vang

Category: Physical Sciences

Abstract / Artist Statement: The scientific understanding of energy use during load carriage suggests that the additional metabolic increment necessary to support an external load is determined by the load's percentage of the subject's body weight. Accordingly, for comparison purposes experimental undertakings often adjust the mass of an external load to represent a constant fraction of each subject's mass. However, in occupational and applied settings, individuals are frequently asked to support similar absolute loads irrespective of their body weight. Here, we evaluated whether the energy requirements in male and female subjects differed during treadmill walking across a range of speeds, while supporting a common 20.5kg external load. **METHODS:** We measured VO₂ during three, 5min trials, administered with a 20.5kg pack, on a level treadmill at 1.7, 1.8, 1.9 ms⁻¹, from 20 subjects (age = 22.1±2.4yrs), who had been assigned as sex-matched pairs on the basis of mass (10 males, Mb = 72.6±6.3kg; 10 females, Mb = 72.8±6.2kg; difference between pairs = 0.6±0.5kg, max 1.4kg). **RESULTS:** Measured values of VO₂ in females were 24.7±4.2, 28.9±3.7, and 30.8±3.3ml kg⁻¹ min⁻¹ at 1.7, 1.8, and 1.9 m s⁻¹, respectively, these values in males, although lower, were indistinguishable (min p-value=0.08) and were 23.1±3.3, 25.8±3.7, and 30.1±4.6 ml kg⁻¹ min⁻¹ at the same speeds. Nonetheless, our data provide 27 points of comparison, with identical loads, at similar speeds (3 of 10 female subjects were unable to complete the 1.9 ms⁻¹ trial); in 8 of these 27 points of comparison females were more economical

than their matched pair. **CONCLUSION:** Our data lend support to the presence of a sex based difference in load carriage economy, warranting further study. We note also that the similar rates of energy expenditure between the sexes observed here, translate to higher relative intensities for females due to their likely lower mass-specific aerobic capacities (i.e. VO₂max).

Mentor Name: Matthew Bundle

Dreaming American Dreams: The American Dream as Related to Race and Ethnicity

Author(s): Nikia Reynolds

Category: Social Sciences

Abstract / Artist Statement: This study examines the current meaning of the American Dream and how one's racial identity is related to perceptions and definitions of this ideal. I argue that members of different racial and ethnic groups understand and define the American Dream in a different ways depending on society's impression of their race or ethnicity. Data was collected from the beginning of April 2017, through May 2017. Two focus groups, one made up of minority members, heavily Native American, and one of white members, were formed and asked questions related to the American Dream such as how they personally define the concept, how they believe it applies to them and to other members of their racial/ethnic group, and whether they believe this beloved philosophy, in both the traditional and their personal definitions, is attainable. I analyzed the discussion then cited quotes and themes when evaluating each focus group to draw conclusions about the American Dream as defined by minority and white Americans. Race was found to have a profound impact on participants' beliefs about the American Dream, especially in how they defined this idea and whether they believe that it is accessible to themselves and their racial group. I expected that members of the minority group would be less likely to believe in the American Dream while white participants would be more likely to trust in this American ideology, but my focus groups yielded different results. In fact, through research it became clear that while both groups believed the American Dream to be tangible the main difference between minority and white Americans was how they chose to define this ideal. While white Americans prescribed to a more traditional definition, I found that minority Americans had formed definitions based less on monetary value and more on personal achievements.

Mentor Name: Kuipers, Kathy

Elementary Coding Education

Author(s): Austin Lindsay; Emily Hake; Catherine Orfanos; Elli Sullivan; Madison Flaget; Natasha Sullivan

Category: Global Leadership Initiative (GLI)

Abstract / Artist Statement: Children are growing up in a globalizing world and must be prepared to compete in a global job market. Modern technology and software are linking the world together and providing career opportunities for people in developing countries that were once only available in developed nations. At this point, software is used to aid professionals in every career. Students who wish to be successful in the globalizing world will need to utilize and manipulate software more effectively than their global competitors. The goal of our Franke Global Leadership Initiative team is to address the importance of computing skills by providing coding fundamentals to elementary students. We achieved this goal by visiting elementary schools and providing coding games to students from the ages of 7 to 10. The students gained an understanding by building code structures through various game scenarios. We hope to help inspire a generation of young coders.

Mentor Name: Dr. Johan Eriksson

Establishing groundwater nitrate/nitrite levels around Hamilton, late winter, Bitterroot Valley, Montana

Author(s): Kathleen Cox; Don Jordan Jr.; Jimmy Baggett; Aldo Rodriguez; Broc Perkins; Gavin Nuttall; Dillon Lewis; Jame Kowalski; Kendra Norton; Kimberly Martin; Thomas Dowdy

Category: Physical Sciences

Abstract / Artist Statement: We propose to collect emergent groundwater around Hamilton, using standardized collection methods that include quality assurance and control samples with analysis performed at a certified drinking water testing laboratory (Energy Labs). Nitrate background in natural groundwater systems should contain less than 1 mg/L nitrates (U.S. Geologic Survey) but in our aquifer, nitrates/nitrites should be less than 0.25 mg/L based on previous sampling. We will map the locations of the samples and use local hydrology data to help determine the source and flow direction of the groundwater. Routine testing and reporting of groundwater quality in our community will help protect our health and the economy of our river. Groundwater in sand and gravel aquifers from shallow wells supplies all the Hamilton area drinking water. The aquifers receive recharge from streams and ditches flowing in from the sides of the valley and the shallow aquifers discharge to the Bitterroot River and to ditches that flow past the west and north edge of Hamilton. We plan to collect about a dozen samples in an arc around the down gradient edge of Hamilton from these groundwater discharges. Nitrates are tasteless and odorless, and are often the first sign of deterioration of groundwater quality. Nitrates are a health threat because they can cause “blue baby syndrome” and may function as initiators of human carcinogenesis. Nitrates are also an environmental threat because they cause eutrophication damage to surface water aquatic environments in the Bitterroot River. High densities of private septic systems, and large acreages that receive fertilizer or that support farm animals are located up gradient to the south and east of Hamilton. These are probable sources of pollution to shallow groundwater.

Mentor Name: George Furniss

Event related electrical potentials recorded from the brain prior to the initiation of speech

Author(s): Ethan Germann; Hannah Hansen; Samantha McNeely

Category: Life Sciences

Abstract / Artist Statement: The readiness potential is an event-related potential which refers to the electrical stimulus in the brain that occurs before voluntary muscle movement (Hallett & Shibasaki, 2008). Brain electrical potentials were obtained in subjects prior to the initiation of speech. These event related potentials were recorded at a sufficient sample rate that both slow negative waves and faster neurogenic signals. The results indicated repeatable patterns within and between subjects. Although not yet fully identified, it is hypothesized that the readiness potential preceding speech can be measured using proper methodology. Typically, the marking point for determining the “pre” event time epoch has been an EMG source, with the data acquired off-line and later averaged. This research uses a vocal signal as the marking point. Subjects were University of Montana students with no known speech or neural pathologies. Electrical potentials were recorded with a gold-plated active electrode positioned at the vertex (Cz) using the 10-20 system. Mastoid electrodes were used as the reference and ground electrode. A biological preamplifier was used to amplify the weak bioelectric signals 40,000 times. Each time epoch was sampled at 32,000 samples/sec on a continuous basis. The frequency response of these amplifiers had a high-pass of .1 Hz and a low-pass of 3kHz. Three seconds of these signals were averaged for 100 trials just prior to subject’s initiation of a sound, using either vowels or consonant-vowel productions. A digital band-pass filters provided a low-pass filter of 6 Hz for the slow potentials. This waveform was used to observe both the readiness potential and the microstructure within the waveform. There are a number of clinical outcomes that can be beneficial from finding a repeatable signal, including diagnosis and treatment of apraxia, stuttering, and speech disorders resulting from TBIs.

Mentor Name: Dr. Al Yonovitz

Evidence supporting stream metabolism as a driver of daily cycles of metal/metalloid concentrations

Author(s): Spencer Lachman

Category: Physical Sciences

Abstract / Artist Statement: Decades of research in stream ecology have shown that daily cycles of dissolved oxygen (DO) and pH are driven by algal productivity and ecosystem respiration. This ‘stream metabolism’ has also been implicated in daily cycles of dissolved and particulate metal and metalloid contaminants observed in the Upper Clark Fork River, Montana. To test the linkage between stream metabolism and metal concentrations in stream water, we conducted experiments in small artificial streams with low and high algal abundance. To do this, water, cobbles with algae, and sediments were collected from the Clark Fork River in Arrow Stone State Park, Deer Lodge, and Montana. The experiment was run for 24 hours, during which dissolved oxygen, pH, temperature, and photosynthetically active radiation were monitored. Water samples were taken every two hours to measure the concentration of dissolved and particulate metals. We observed daily cycles of DO and pH with higher values during the daytime. As expected, the magnitude of this daily cycle was larger with high algal abundance due to elevated photosynthesis and ecosystem respiration. Dissolved forms of aluminum and arsenic (< 1nm) were dominant with little to no particulate forms (1-450 nm) of these elements moving through the system. Both copper and manganese, however, had a large proportion of their total concentration in the particulate fraction. At low algal abundance, concentrations in both size fractions declined over the duration of the experiment. At high algal abundance, manganese declined during the daytime and increased at nighttime; in contrast, particulate copper increased during the duration of the experiment while dissolved copper remained relatively constant. Taken as a whole, these results seem to bolster the argument that stream metabolism is likely an important driver of metal/metalloid concentrations on daily time scales in the Upper Clark Fork River.

Mentor Name: Ben Colman

Exploring Death in the Russian Experience

Author(s): Maree Herron

Category: Humanities

Abstract / Artist Statement: Death is a topic that many find depressing. However, the true significance behind its grim existence is not the end result, but the journey toward. Death uncovers a raw and vulnerable part of our minds that often stays hidden when we live out an unchanging status quo. Drawing from sources such as novels by Tolstoy, Chekhov, and Dostoevsky, and articles and academic papers published by those with interest and experience in Russian culture, I take the topic of death and apply it to the Russian people, their works of expression, and their experiences in order to uncover what the Russian soul’s response to death can teach us about human nature. Over the centuries, the Russian people have experienced many catastrophic tragedies, ranging from persecution to famine, but have emerged as a major world power in the twenty-first century. This project explores how they been shaped by these events, and what implications remain relevant in today’s day and age.

Mentor Name: Clint Walker

Exploring Perspectives on Recreational Drone Use on Public Lands

Author(s): Jennifer Allen

Category: Social Sciences

Abstract / Artist Statement: Recreational drone use has increased in popularity and accessibility over the past several years. As of early 2018, the Federal Aviation Administration (FAA) has recorded one million drone registrations with 87% of those being hobbyist registrations (Vanian, 2018). Drones have become more affordable, and, thus, more people are purchasing them for recreation. Often, drone users fly on public lands, but there are many concerns and challenges that go along with recreational drone use including privacy, safety, and impacts to wildlife and resources. For example, in August of 2014, a visitor to Yellowstone National Park flew his drone to gain a better view at the Grand Prismatic Hot Spring, but then crashed the drone into the spring and it was never recovered. Despite these challenges, there has been outstanding footage from drones flown where humans rarely go and drones can offer unique opportunities for visitor engagement on public lands. But, how do we keep our resources protected and address the privacy concerns while still allowing some managed drone use? These different management options need to be explored depending on the area and particular usage. Despite these challenges and opportunities, there has been very limited research on recreational drone use. To address this gap, 16 senior PTRM students conducted a study on recreational drone use around Missoula, MT. Surveys were conducted with the public on their perceptions about recreational drone use, the public lands where drone use can take place, and the types of management actions. The study offers initial findings on public perceptions and can inform local management of drones and inform future research and policies on public lands.

Mentor Name: Jennifer Thomsen

Exploring the role of a novel RpoD protein in *Borrelia burgdorferi*

Author(s): Bethany Crouse, Scott Samuels

Category: Life Sciences

Abstract / Artist Statement: The bacterium *Borrelia burgdorferi* is the causative agent of Lyme disease, the most common arthropod-borne disease in the Northern Hemisphere. This ailment affects 400,000 people annually, and can cause symptoms such as fever, joint stiffness, fatigue, carditis, and neurological issues. One of the most fundamental processes in any cell, including *B. burgdorferi*, is the transcription of DNA into an RNA messenger, which is later translated into proteins. Transcription is carried out by a multisubunit molecular complex called RNA polymerase, which is recruited onto the DNA strand and synthesizes RNA by reading the DNA. RpoD, also known as $\sigma 70$, is the subunit of RNA polymerase in bacteria that recognizes the correct binding site on DNA. In all bacteria studied to date, the size of RpoD is 70 kilodaltons (kDa). Although the *rpoD* gene in *B. burgdorferi* appears to encode a 70-kDa subunit, two lines of evidence suggest that only a 50-kDa protein is produced in these bacteria. In order to biochemically dissect the function of this truncated RpoD in *B. burgdorferi*, I have overexpressed and purified it to near homogeneity using recombinant DNA methodologies. The putative RpoD protein was then assayed for transcriptional activity using an in vitro transcription assay. Future directions for this project would include obtaining a crystal structure of the truncated RpoD from *B. burgdorferi* and analyzing its regulation.

Mentor Name: Scott Samuels

Extreme Smoke Events: Climate Change and Human Health in Western Montana

Author(s): Sarah Luth

Category: Social Sciences

Abstract / Artist Statement: Projections of climate change show that Western Montana will experience hotter and drier summers that may extend already drastic fire seasons. Extended fire seasons can lead to extreme smoke events, which are known to have harmful impacts on human health. However, there is not extensive research on these human health effects or on adaptation strategies pertaining to Montana. Research in this project was conducted through literature reviews as well as personal interviews. A final booklet draws on available research to provide readers with a clear understanding of the relationship between climate change, extreme smoke, and human health impacts, as well as possible adaptation strategies. The interviews in this study supplement the literary research with personal experience, and ensure that findings regarding adaptation strategies and prevention are grounded in community insight. This booklet can act as a resource and needs assessment for individuals living in areas of Montana affected by fire. It is incredibly important for community and public health workers, citizens, organizations, and policymakers to understand how climate change can influence smoke emergencies, what the actual and perceived health impacts are of these events, and the options for adapting to and preventing future extreme smoke events.

Mentor Name: Nicky Phear

Face Perception and Identification

Author(s): Audrey Aamot

Category: Social Sciences

Abstract / Artist Statement: The focus of this research is how the own-race effect and own-age bias affect memory. The own-race effect refers to the phenomenon that individuals perform better when asked to remember faces of the same race, as opposed to faces of a different race (Meissner, Brigham & Butz, 2005). Own-age bias refers to the phenomenon that a participant's accuracy is increased when asked to remember faces from their own age group (Rhodes & Anastasi, 2012). It is hypothesized that when recognizing faces of a different age and race, memory accuracy will be poorer, compared to faces of either a different age or a different race. Psychology students will be recruited using SONA systems. For the purpose of this study, data will only be analyzed from the participants who are between the ages of 18 and 30 years old and Caucasian. The experiment will be conducted on a computer, in a lab in the Skaggs Building. Participants will be asked to remember a series of face pictures, which will consist of (1) white-young; (2) white-old; (3) black-young; and (4) black-old faces (Minear & Park, 2004). Their memory will be assessed by an "old-new" recognition memory test in which half of the test items are old or studied faces, and the other half are new or non-studied faces. Although previous studies have separately examined how the own-race effect or own-age bias affects memory performance, few have attempted to combine both into a single study. Often these two phenomena collide in daily life, and it can be important in eyewitness identification, reducing implicit bias, as well as other aspects of life that rely heavily on memory performance. This study is especially important considering the low level of diversity and high number of Caucasians living in Montana (U.S. Census Bureau, 2016).

Mentor Name: Yoonhee Jang

Fantasy versus Reality: A Twenty-First Century Film Series to Explore How the Absurdity of Alternate Realities Affects the Individual in the Audience

Author(s): Courtney Wunderwald

Category: Humanities

Abstract / Artist Statement: The purpose of this study is to understand how film viewers contextualize on-screen alternate realities with their personal perspectives, and if that is accurately represented by scholarly film critique. I will then compare my findings with filmmaker interviews, which discuss their reasons for including specific imagery, symbols, and characters to evoke certain emotions or reactions from their audiences. My project aspires to offer a method that might redefine how viewers reflect on films and to open a discussion to gather data from audiences before assuming their reactions for film critique. I was always fascinated by the power of cinema, particularly how absurd scenes stuck in my mind for years afterward and changed my perspectives. This project developed as I was curious to whether other viewers had similar reactions, or if they interpret the films completely different than I would have analyzed myself. As a social aspect of the project, I hosted a three-part film series of Christopher Nolan's *Inception* (2010), Guillermo del Toro's *Pan's Labyrinth* (2006), and Richard Linklater's *Waking Life* (2001) at the University of Montana in November 2017 and February 2018. Participants who attended the separate events took part in a forty minute discussion immediately after the film, as a form of qualitative research. The discussion consisted of a set of open-ended questions to determine specific film aspects that were most important to the participants. I hypothesized that the viewers would find the most absurd or grotesque scenes to be most vividly memorable, but to compensate for the alienating nature of the alternate reality, they would subconsciously gravitate to scenes depicting a positive human exchange or connection by overcoming negative struggles. I based my concept on the logic that the viewer has more firsthand experiences of human relationships rather than absurd dreamscapes and depicted character imaginations.

Mentor Name: Robert Tuck

Finding Hope in the Face of Climate Change: Lessons from Costa Rican Activists

Author(s): Lindsay Ashton

Category: Humanities

Abstract / Artist Statement: Four years of Environmental Studies and Climate Change Studies classes have left me with a deep understanding of climate change and the ways it affects the world around us. However, recognizing the complexity and magnitude of this global problem is undeniably overwhelming. After long days in the classroom, learning about the latest news, statistics, economic roadblocks, political inaction, and social consequences of climate change it is difficult for me and my classmates to not feel discouraged and anxious about the future. Climate change education is essential, but these negative feelings aren't productive to the actions we must take to solve the problem. Students, especially soon-to-be college graduates, need inspiration and motivation to prepare for the professional world. This research project is designed to enhance experiential education opportunities, and cultivate inspiration through stories of innovative solutions to climate change. I collected these stories in Costa Rica, a small yet progressive nation, by speaking with individuals who are working to help their community, their nation, or the world mitigate or adapt to climate change. I interviewed scientific researchers, farmers, business owners, and staff of grassroots organizations. Each person taught me about their work, perception of climate change, and personal sources of motivation. Findings from the field will be translated into a series of short stories and shared through a website accessible to students and the public. During my travels, I discovered many alternative ways of living, unique examples of problem solving, and testimonies of the power of collective action. This project encapsulated my undergraduate education and helped me gain the skills, inspiration, and confidence I need for my future career. This paper includes my project's purpose and methods, a discussion of what I learned, and recommendations for a Climate Expedition program

to help provide similar education opportunities for other students.

Mentor Name: Nicky Phear

Folk or Forgotten?: The Collection of Marginalized Folk Culture Under New Deal Programs

Author(s): Noah Johnston

Category: Humanities

Abstract / Artist Statement: During the New Deal, government-sponsored efforts to record folk culture began nationwide and gradually coalesced under the WPA (Works Progress Administration). These projects were notable for their autonomy and regionality. Within this framework, three women— Sidney Robertson Cowell of the California Folk Music Project, Zora Neale Hurston of the Florida Federal Writer’s Project, and Helen Chandler Ryan of the New Mexico Federal Music Project—designed and conducted regional projects. Seeking to capture previously overlooked aspects of folk culture, they also developed pioneering methods of collection. Materials included in the American Folklife Center, a collection of digitized material at the Library of Congress, provides the bulk of primary sources. This collection includes administrative memos, correspondence, material captured in the field, and published products. The New Mexico Federal Music Project archive at the University of New Mexico provides similar sources to supplement investigation into Helen Chandler Ryan’s work. The investigation aims to situate the work of these collectors in the context of their contemporaries, evaluating comparative successes and failures. Scholars often (and justifiably) critique Depression-era folk collectors for their bias and editorial heavy-handedness. This investigation seeks to highlight the ways in which materials published by female collectors departed from those of their male counterparts. I ask in what ways, and to what extent, did women folk collectors approach their work differently than did men?

Mentor Name: Anya Jabour

Fostering Resilience in Middle School Students

Author(s): Hannah Zuraff; Kaitlin Cyr

Category: Social Sciences

Abstract / Artist Statement: Resilience is a pivotal attribute for young children to possess during their developmental journey. Research has examined the importance of resilience and how its presence can increase the likelihood of positive outcomes for youth. One key factor that has been shown to increase resilience is connection with a supportive and caring adult. The Kaleidoscope Connect Program is one resilience program that targets this specific factor and investigates how it affects functioning for at-risk youth in rural areas. The goal of this research is to evaluate the effectiveness of the Kaleidoscope Connect program with seventh and eighth grade students in Western Montana, to determine whether students display significant increases in resilience and significant decreases in problem behavior following the implementation of the program. For the current study, we will use and build upon data from the 2016-2017 school year, and add data from the 2017-2018 school year. Data consists of self-report rating scales, including the Resiliency Scales for Children and Adolescents (RSCA), the BASC-3 Behavioral and Emotional Screening System (BASC-3 BESS), and the Student Support Card. In addition, we will also provide effective school-based strategies to increase resilience in youth. The long-term goal of the research program is to collect extensive data throughout the course of the upcoming school years, as well as examine longitudinal data. Research targeting resilience is especially significant in Montana, due to its rural composition and consistent rank as a state with high rates of youth suicide. The current project will help school-based professionals identify problems and intervene early, to ensure that at-risk youth obtain necessary adult support.

Mentor Name: Jacqueline Brown

How Do You Love?: Conversations About Love and Lust in Morocco, Sweden, and the United States

Author(s): Margaret Finlay; Audrey Brosnan; Autumn Fraser; Emily Morrison; Julia Maxon; Paris Summers

Category: Global Leadership Initiative (GLI)

Abstract / Artist Statement: Casual sexual relationships are now more common than romantic relationships on college campuses. Hookup culture is currently popularized in the media, while open discussion about sex and sexuality is still stigmatized globally. Even in the most “progressive” of schools, sex education programs provide little to no assistance in navigating the blurred lines between love and lust. In this research project, we wish to explore how the spectrum of emotional intimacy affects interpersonal relationships, personal wellbeing, and sexuality. Specifically, our project examines questions about what intimacy is, how it is being practiced, and what healthy sexuality means to the age group of emerging adults. In order to better understand how college students experience a culture of love and lust, we will conduct interviews of college students, those between the ages of 18-26, in the countries where we have established contacts, namely Morocco, for its traditional values; Sweden, for its progressive ideals; and the United States, for its nearness and intermediary qualities concerning emotional intimacy. We will ask students questions like “How do we differentiate between love and lust?”, while professionals will receive questions like “How do you think healthy relationships are defined for young people?” Then, we will post excerpts, audio selections, and images of those we interview in order to explore personal experiences and professional insights about the range and effect of intimacy. We will present those answers through the social media site Instagram, with the hashtag #howdoyoulove, in hopes of reaching a global audience with conversation about this universal matter. Students are looking for a discussion opportunity about relationships and intimacy, opportunities they are not receiving in traditional education settings. We are providing the context for an open and honest conversation among young adults about how love and lust interact with one another in their own lives.

Mentor Name: Ramona Grey

Identity Construction Among Pilgrims on el Camino de Santiago

Author(s): Claire Babcock

Category: Social Sciences

Abstract / Artist Statement: In the summer of 2017, I spent a month walking the Camino de Santiago in Spain, where I engaged in participant observation research and conducted in-depth qualitative interviews of pilgrims. After receiving IRB certification and designing a research schema, I asked individuals from a variety of backgrounds about their time on the Camino: their motivation for walking, their positive experiences, their challenges, and their interactions with others. As a sociology student interested in inequality, I set out to understand how race, class, and gender shaped the pilgrims’ experience. My interviews surprised me: although these social categories were relevant, the people I met were far more interested in asserting their identities as pilgrims undergoing authentic and transformative journeys. The thesis of my paper is that pilgrimage is an extraordinary means to escape, reflect upon, and transform the experience of ordinary life. On the Camino, pilgrims told me, they perceived and navigated numerous tensions: tourism and pilgrimage; secular and religious; collective and individual; modern and ancient. Their perspectives and stories provide insight into the alienating and negative conditions of contemporary life and work, and the extent to which travel and self-discovery are viable means of escape.

Mentor Name: Daisy Rooks

Imperfect Pearls: Baroque Influence on Contemporary Painting

Author(s): Erin Langley

Category: Visual and Performing Arts (includes Creative Writing)

Abstract / Artist Statement: The painting *But She Bites So Well...* represents my ongoing research into the relationship between the over-the-top, dramatic tension of baroque art and the fraught and frenzied nature of contemporary society. Whereas baroque artists prized clarity of narrative in order to communicate a story, I paint abstractly because I have found that abstraction is the most direct way to communicate the ineffable glut of daily life. By combining subtle visual cues from art history with distinctly unsubtle color and material choices, I create boisterous works that acknowledge the past, while remaining firmly in the present. My work is probably best understood as indexical information. Found materials and physical marks in the form of drips, globs, gouges and cuts suggest these works are both object and subject. As objects, my paintings are accretions. While the composition is resolved, movement and process are still evident thus making them feel like living subjects. My intention is to develop a surface of visual information, teetering between solid design and a sense of implosion. I employ raucous, oversaturated colors and thick, tactile paint, as well as the dense and dramatic compositions of baroque artists such as Peter Paul Rubens. Objects, found materials, and colors function as both artifacts and signifiers for a female cultural experience. Inherent messiness provokes questions the audience may have regarding realms of craft, sentimentality, and decoration; all perceived as historically “female” endeavors. The results present a visual and conceptual conversation between art and craft, readymade and manipulated, funny and tragic, inviting and repellent.

Mentor Name: Rafael Chacon

Improving the Accuracy of Digital Seismic Traces Generated from Images of Paper Sign Bit Seismic Sections.

Author(s): Shevin Halvorson; Joseph Pace; Jack Roddy

Category: Physical Sciences

Abstract / Artist Statement: A reflection seismic survey of Flathead Lake was recorded in August 1970. These data exist today in two media: analog magnetic tape recordings of full-waveform seismic traces (digitized to .wav) and redisplayed paper sections of the data using sign bit rendering. Sign bit rendering only indicated when the amplitude of the trace signal was above zero, which resulted in a considerable loss of dynamic range. Unfortunately, of the 200 km of data recorded, less than 60 km are preserved on magnetic tape. This project processed the scanned images of the paper sign bit sections in an attempt to generate digital seismic traces for the whole set of lines. We contrast our method with an earlier proof-of-concept method implemented by Robert Lankston. The results of this method are available through the University of Montana ScholarWorks site (<https://scholarworks.umt.edu/flathead/>). Our new development employs additional steps of conditioning the scanned images. The original mechanical redisplay method caused the seismic traces in each image to exhibit a slight skew to the right as they descend the page. We correct the skew using an affine transformation. Once the traces are aligned vertically, we use an automatic algorithm of our design for identifying individual traces. After conditioning, the software offers the user options for converting the scanned image to digital traces. These generated traces are then compared numerically to the data recovered from magnetic tape to gauge the quality of the transformations. For comparison, this step is repeated with traces generated by the proof-of-concept method. Our software can be used for recovering traces from legacy hardcopy sections whose tape component has been lost or was never recorded.

Mentor Name: Yolanda Reimer

Individuality and Identity Among New England's Nineteenth Century Mill Women

Author(s): Breann "Ellen" Watterson

Category: Humanities

Abstract / Artist Statement: Not long before the Civil War, America sailed into uncharted waters on a wave of industrialization that moved work traditionally done at home to the mechanized factory. Many American-born women from agricultural backgrounds saw factory work as a promising opportunity, and left home farms for the mills. My research investigates New England textile mill women's perceptions of themselves and their work from 1830 to 1860. How did these rural farming women think of themselves as the first generation of wage earners in industrializing America? Might they have presented themselves differently in a private letter or a published memoir? Perhaps their opinions of their work and identity as mill workers were influenced by time. Do their recollections of mill work, written years after they last heard the factory bell, differ from their immediate responses to daily life in the mills? To pursue this question, I rely on the voices of these women themselves. Letters, memoirs, and magazines (such as *The New England Offering*, *The Lowell Offering*, and *The Operatives' Magazine*) created by New England's women mill workers in the nineteenth century are the central focus of my work. The feminist scholar Julie Husband convincingly shows in an analysis of select stories from *The Lowell Offering* how the authors of these pieces perceived definitions of freedom and independence differently than one of their male contemporaries, a reformer and 1840 presidential candidate. Taking inspiration from Husband, my project explores a broader source base of mill women's voices, thereby providing a deeper understanding of how these working women thought of themselves. The historian Carroll Smith-Rosenberg emphasizes how "hearing women's words" encourages us to fundamentally rethink our approach to the past. The voices of New England's working women also inspire us to consider our own perceptions of ourselves and our unique positions in the world.

Mentor Name: Anya Jabour

Integrated Design and the Backyard Astronomer

Author(s): Benjamin Seratt

Category: Physical Sciences

Abstract / Artist Statement: Astrophotography is the photographing of celestial objects and phenomena commonly used by amateur and professional astronomers. Due to Earth's rotation, the stars and constellations appear to move overhead and therefore become blurred in long exposure photographs. To counteract these 'star trails' a barn door tracker can be used to move the camera synchronously with the sky overhead. These trackers can be as simple as two pieces of wood with a hinge or as complex as an expensive commercial product. The purpose of this project is to manufacture a barn door tracker inspired by existing methods. Each prototype progressed toward efficiency, stability, and sophistication, moving from cardboard and motor to 3D printed material and circuitry to metal and microcontroller. The design and manufacturing techniques are subject to change to enhance reliability, performance, and portability as needed in response to field experiments. This ongoing project explores design and manufacturing practices while providing means of capturing long exposure astrophotographs without star trails.

Mentor Name: Steve Shen

Investigating Water Rights and Stream Flows in Over-Allocated Streams in Montana

Author(s): Corey Hall

Category: Physical Sciences

Abstract / Artist Statement: In most Western U.S. states, including Montana, water rights determine the distribution, use, and management of water across the landscape by creating a system of private and public flow allocations based on priority dates for water use. For many streams in Montana, the state has issued more water rights than there is actual water available in streams during some parts of the year. Under potential climate change scenarios of less available water or changing distribution and timing patterns, it is important to understand if 'paper' water rights (priority dates and flow volumes) can accurately predict when irrigators will need to stop using water, as this information can influence how water rights will be managed by the state. In this research, I will use current, publically-available geospatial and hydrologic information on water rights in Montana to construct a model for water use and availability in an agriculturally-based watershed dependent on streamflow for irrigation. Using data from Montana.gov and the MT Department of Natural Resources and Conservation (DNRC) Water Right Query System, I will construct an account of water allocation via water rights on Bass Creek in the Bitterroot watershed. I will then compare this account with actual flow volumes (from USGS flow data) to determine if Bass Creek is over allocated in some years. I hope to also compare the allocation scheme and flow volumes with remotely sensed data indicating water use on the landscape, and to determine if and when water users stopped using water due to over allocation. I expect that the results will show that current information on water rights and water use does not accurately reflect the flow rates and cannot be used to predict over allocation of streamflow in agriculturally-based watersheds in Montana.

Mentor Name: Brian Chaffin

Is the protein-protein interaction discovered in the nematode conserved for mammalian proteins?

Author(s): Emily Osterli

Category: Life Sciences

Abstract / Artist Statement: The regulation of RNA-binding protein (RBP) activity in cells is a central question in gene expression studies. One important RBP is GLD-1; this protein family acts as a tumor suppressor, in both mice and nematodes. Previous research from our laboratory revealed that a small protein, DLC-1, promoted the functions of GLD-1 in *Caenorhabditis elegans* (roundworm). Understanding this relationship between DLC-1 and GLD-1 is important for understanding stem cell balance; when the balance between mitotic proliferation and differentiation is altered, it can result in serious consequences such as tumor formation and cancer. After establishing that DLC-1 promoted GLD-1 function (Ellenbecker et al., in revision), we wondered if this interaction was conserved in mammalian cells. Mice have two DLC-1 homologues, DYNLL1 and DYNLL2, and several GLD-1 homologues including Sam68, QKI6, and QKI7. We hypothesized that there would be an interaction between some of these homologous proteins found in mice because there is an interaction between DLC-1 and GLD-1 in the worm. I tested this hypothesis by performing GST pulldown assay experiments and then doing a western blot of the samples to detect any potential interaction. After testing all pairwise combinations of DYNLL1/DYNLL2 and Sam68/QKI6/QKI7, we were able to conclude that the interaction found in the nematode was not conserved in these homologues in mice. However, there are still other mouse homologues that we have yet to test and could potentially interact. If we obtain these other homologues and identify an interaction, understanding it at a molecular level in mammalian cells would advance our understanding of certain human diseases like cancer, and potential to apply it to medical practice.

Mentor Name: Ekaterina Voronina

Isonomia: Intersecting Philosophy, Politics, and Medicine

Author(s): Jakob Wyder

Category: Humanities

Abstract / Artist Statement: Today, medicine and philosophy are considered to be two separate disciplines. This was not always the case in Antiquity, a time which focused less on systematized distinctions between fields of study and more on holistic understandings of reality at large. Medicine and philosophy, as we understand them today, were seen as unified components of a greater whole. This unification comes to life in the works of Alcmaeon of Croton, an Ancient Greek medical writer and philosopher who lived in the early Fifth Century BCE. Through close readings of primary texts and secondary sources such as Vlastos (1953), I explore Alcmaeon's concept of isonomia, a simple idea with profound implications. Isonomia can translate to "equality before the law," and is often interpreted as a political term employed by such historians as Herodotus and Thucydides in the late Fifth Century. Alcmaeon, however, had used the word isonomia a half-century earlier in a medical context to describe health as a "balance of opposing forces." Acknowledging this earlier usage enhances the richness of isonomia as a concept and, more importantly, invites us to examine the fascinating parallels between individual and political health, parallels whose roots extend deeper into history than we may have imagined. While examining isonomia I investigate the timeless interplay between personal wellness and political well-being, making a special attempt to revitalize the holistic and Pre-Socratic approach to these concepts. Language informs our understandings, and this expedition into etymological precision seeks to illumine the connections between health in a medical sense and health in a political sense, between the health of the individual and the health of the greater community.

Mentor Name: Matthew Semanoff

It's Never Been Done Before: Margery Hunter Brown and Her Indian Law Clinic

Author(s): Lauren Selleck

Category: Humanities

Abstract / Artist Statement: The state of Montana is home to seven Native American reservations, roughly making up six percent of Montana's population. The chances of a lawyer in Montana having a case that involves a tribal member or working with a tribal court and tribal government is rather high. Dr. Margery Hunter Brown, a former law professor at the Alexander Blewett III Law School at the University of Montana, saw the need to educate law students on Native American law, tribal courts, and tribal governments. While classes were one way to educate the future lawyers of Montana, it was not quite enough to Dr. Brown. In 1980, Dr. Brown began working on and advocating for the development of an Indian Law Clinic, the first of its kind in the nation. The purpose of the clinic was to give students hands on educational experience with the tribal courts and tribal governments in Montana. Despite various obstacles, the Indian Law Clinic became a working reality. Today, the Margery Hunter Brown Indian Law Clinic is the oldest Indian Law Clinic in the country. The original goal of the Indian Law Clinic was to give law students practical educational experiences; the Clinic today not only still fulfills that goal, but has also expanded. This research project examines Dr. Brown's activism for creating a legal clinic that had not existed previously anywhere in the United States. By looking at the change in public attitude towards Native Americans and their Self-Determination, will help frame the situation Dr. Brown was working with in 1980. The paper will study the various obstacles Dr. Brown experienced while creating and building the Indian Law Clinic from its conception to her retirement in 1993, by utilizing her files left to the Law Library.

Mentor Name: Anya Jabour

Language and Psychosocial Outcomes for Stroke Survivors with Aphasia Following an Intensive Comprehensive Aphasia Program

Author(s): Nicole Aline; Kendall Alley

Category: Life Sciences

Abstract / Artist Statement: Intensive comprehensive aphasia programs (ICAPs) are community-based rehabilitation programs designed to improve the speech, language, cognition, and psychosocial well-being of stroke survivors. ICAPs integrate individual and group therapy, current technologies, and client/family wellness and education. Although many aphasia treatment programs exist, traditional therapy models lack the therapeutic intensity and holistic intervention approach that ICAPs provide. The intensity of ICAPs allows the patients with aphasia (PWA) to engage in 72 hours of therapy in four weeks compared to traditional aphasia therapy which offers 30 hours in 10 weeks. The purpose of this retrospective study is to examine language impairment and psychosocial outcomes of PWA following participation in an ICAP at the University of Montana. **Methods:** Approximately 40 PWA participated in at least one of six ICAP sessions that occurred between 2014 and 2017. Treatment delivery included: individual evidence-based language impairment treatment, conversation groups, a weekly large group with focus on psychosocial well-being, and weekly community outings to facilitate social communication. The treatment intensity was 4-4.5 hours of therapy per day, 4 days per week, for 4 weeks. Both pre- and post-treatment assessments of language and psychosocial well-being were administered including: the Western Aphasia Battery- Revised, the Boston Naming Test-second edition, the Assessment for Living with Aphasia, and the Geriatric Depression Scale. Outcome data from the six ICAPs is currently being organized for analysis. Preliminary analyses will be presented. **Significance:** Evidence suggests that the therapeutic intensity and the holistic intervention approach offered by ICAPs are beneficial to improving quality of life and communicative rehabilitation for stroke survivors with aphasia. Future service delivery models should consider this multifaceted approach as well as ways to better support autonomy and sense of respect and dignity throughout therapy.

Mentor Name: Catherine Off

Language Use & Totalistic Social Groups

Author(s): Emily Allen

Category: Social Sciences

Abstract / Artist Statement: A totalistic social group is defined as a collection of individuals who share similar values and goals and who live together within intensive boundaries enforced by the group's leadership and/or members themselves (Lifton 1969). The focus of this project is to better understand the effect of language on (I) a totalistic group's social structure and (II) the ideologies and actions of members. The limited linguistic research on totalistic groups claims that leaders and members use language in order to enforce rules and beliefs, encourage conformity, and maintain as well as increase membership. By examining language practices in the US military and totalistic alternative religions, this project fills the current gap of limited data in the linguistic literature on totalism. My research suggests that certain language practices are created and used within totalistic communities in order to support an in-group mentality between members, dedication to the group's leaders and efforts, and a powerful social structure. This project analyzes data collected from an anonymous online survey regarding language within the US military. For instance, the results of this survey suggested that respondents regarded language as a powerful tool in reinforcing the military's hierarchical structure. This research therefore suggests that language practices are taught to military members in order to encourage certain desired behavior. This project also examines language practices within totalistic alternative religious groups. For example, the totalistic alternative religion the Love Family encouraged group conformity by utilizing phrases such as "you've fallen off the beam" to pressure a member expressing doubts about the community to abandon their negative thoughts. Therefore, this research demonstrates how language practices in

totalistic groups determine the maintenance of power and the fortification of membership. Ultimately, by providing new data on language and totalism, this project is shedding much needed light on an under-researched area of sociolinguistics.

Mentor Name: Leora Bar-el

Life History Variation in Non-Native Brook Trout

Author(s): Madeline Lewis

Category: Life Sciences

Abstract / Artist Statement: The presence of invasive Brook Trout (*Salvelinus fontinalis*) in the Western United States can have negative repercussions for native fishes. Brook Trout often outcompete native fish species for limited resources as well as hybridize with threatened Bull Trout. One potential explanation for the widespread success of Brook Trout across their non-native range is a high degree of life history plasticity, possibly allowing individuals to adjust their phenotype given environmental conditions faced in novel streams, enabling persistence across a wide range of habitats. An understanding of variation in life history strategies and population demographics of Brook Trout in creeks with varying habitat characteristics will enable more effective modeling that can be used in future efforts to eradicate established populations. We conducted a pilot analysis of life history traits, such as size and age at maturity, of Brook Trout populations in three creeks within the lower Pend Oreille River system in Washington. The creeks varied in habitat size, productivity and connectivity to the main stem. Fish were collected using backpack electrofishing, dissected to determine sex and stage of maturity, and otoliths were extracted and aged. We found that isolated populations of Brook Trout in small creeks with habitat characteristics that limit adult growth and survival matured at a significantly younger age than the population of Brook Trout in a large, connected creek. These results align with what would be expected in order to maximize fitness and population persistence each of the given habitats. Our results suggest that Brook Trout are capable of shifting their life histories to maximize fitness in a given environment, possibly contributing to their success as invaders.

Mentor Name: Andrew Whiteley

Load Carriage and Energy Expenditure during Treadmill vs. Field Trials

Author(s): Rebecca Skoric; Pia Vang; Maddison Neufeld; Kira Kamrud; Bradly Ruple

Category: Life Sciences

Abstract / Artist Statement: Field trials evaluating the metabolic rates of individuals performing sustained bouts of overground load carriage are difficult to compare to laboratory values. We evaluated whether the metabolic cost of load carriage was similar between 5min steady-speed treadmill trials administered at the average speed used during a 4.83 km outdoor field trial. Subjects ($n=10$ [4 female], $M_b = 74.4 \pm 12.4$ kg) performed a 4.83 km loaded (20.45kg) walking trial around a local athletic track. Subject speed was recorded every 400m, and expired gases were collected for 90 sec and stored in a Douglas bag for subsequent gas fraction and volume analysis at 5, 20 and 35 min. During a laboratory visit, we measured VO_2 from the subjects as they completed loaded, 5min, treadmill trials at speeds selected to match those used throughout the field trial. Average speed (1.88 ± 0.09 m s⁻¹) during the field trial fluctuated by an average maximum of $10.5 \pm 3.3\%$ per subject throughout the trials. Accordingly, we compared the measured speed during the three periods of gas collection to similar speeds administered on the treadmill (i.e. within 0.1 m s⁻¹). Measured rates of VO_2 throughout the overground trial were similar across time; $t_5 = 29.0 \pm 4.5$, $t_{20} = 30.1 \pm 4.5$, $t_{35} = 31.1 \pm 4.3$ ml kg⁻¹ min⁻¹. During treadmill walks at speeds corresponding to those used overground, laboratory measures of VO_2 were $t_5 = 27.8 \pm 5.7$, $t_{20} = 39.4 \pm 5.4$, $t_{35} = 30.4 \pm 4.8$ ml kg⁻¹ min⁻¹. As a result the greatest difference between

laboratory and field measures was $2.0 \pm 6.2 \text{ ml kg}^{-1} \text{ min}^{-1}$, obtained at the 20 min point of the trial. The strong numerical agreement and statistically indistinguishable values obtained during the overground vs treadmill loaded trials suggest that, speed dependent rather than environmental factors influence metabolic cost. We further conclude that laboratory based treadmill results can provide valid insight to the energy use patterns of overground, self-selected, locomotor patterns.

Mentor Name: Matt/Bundle

Mapping Mount Saint Helens: Capturing the Volcano's Geomorphologic Change over Time

Author(s): Jennifer Haas

Category: Physical Sciences

Abstract / Artist Statement: On the morning of May 18, 1980, in the state of Washington, Mount Saint Helens violently erupted, causing the reshaping of the volcano and the largest historical landslide on Earth. This volcanic episode caused significant modifications to the surrounding landscape, including the loss of 70% of the volcano's glacier mass and 1,314 feet of elevation. Capturing this dynamic environment cartographically has been a challenge. This paper reports on a study aimed at investigating a particular type of cartography called geomorphological mapping, which represents landscapes and their processes of change over time. The study also applies this type of mapping to Mount Saint Helens' features before its 1980 eruption and present day. Making a geomorphological map comes with many challenges, including choosing how to represent landforms with symbols, colors, lineation, shading, letters, and numbers to make the map understandable and applicable to all users. This study draws on geographic data from many sources and time eras, ground truthing, georeferencing historical maps, digitizing features, and identifying patterns. The results of this mapping process and investigation show the representation of change in Mount Saint Helens' geographic features and its surrounding landscape.

Mentor Name: Sarah Halvorson

Margaret Jane Rozsa, A Montana Suffragist

Author(s): Calyn Hitchcock

Category: Humanities

Abstract / Artist Statement: I will explore the life and activism of Margaret Jane Rozsa, a resident of Butte, Montana. Rozsa was not only an advocate of woman suffrage but also a strong proponent of accessible education and social services. She also was involved in the Progressive-era anti-prostitution movement. To learn about her life, I conducted research in federal census records, Montana newspapers, the California Death Index, and U.S. City Directories. My research on Margaret Jane Rozsa highlights many of the issues women in America cared about during the Progressive Era. By focusing on a Montana suffragist, it also offers a glimpse behind the scenes of the national suffrage movement.

Mentor Name: Anya Jabour

Mental Health Services Survey

Author(s): Riley Kack; Jessica Bailey; Tyler Ferguson; Victoria Gifford; Kelaiah Horat; Isaac Larowe; Madison Padilla; Rene Sanchez

Category: Global Leadership Initiative (GLI)

Abstract / Artist Statement: Mental health is an issue worldwide and a cohort of the mentally ill is found within universities. Our group has perceived that the University of Montana could benefit from a system that aligns the needs of the students and the mental health workers. This can be done if Curry Health Center is aware of the students' needs and the best ways they can use limited resources. This need inspired us to use student input and critique to better understand how students are using the mental health services that are provided, and which services they may not be aware of. We want to gather information on what additional resources students would like access to and reasons students may decide to use or not use available resources. We plan to create a survey to harvest quantitative and qualitative data. By reaching out to students through a survey platform, we are able to obtain a clearer, wider range of responses that will allow us an understanding of our students' needs and direct services in a way that would benefit them the most effectively. Students will be made aware of this survey opportunity in lecture halls, emails and via their different student groups and clubs on campus. We intend for this data to help establish what is needed by the students and aid in focus of the mental health resources at the University of Montana. This process will be capable of being repeated at other universities throughout the world. In addition, if students have access to mental health data, they can more effectively lobby for support of needed services. By bringing students, representatives, and university faculty together, we can gather data and opinion that can be used to effectively destigmatize mental health and serve the community on a larger scale.

Mentor Name: Robert Greene

Modeling Surface Mass Load Displacements Along The Cascadia Subduction Zone

Author(s): Cody Norberg

Category: Physical Sciences

Abstract / Artist Statement: The Earth's surface is under constant strain from different mass loads. Surface mass loads, such as the oceans, atmosphere, and continental water reservoirs, exert forces on the elastic solid Earth, inducing crustal deformation. These loads move over Earth's surface on time scales varying from less than a day to many thousand years. Since the Earth is elastic and not perfectly rigid, the pressure from these loads deforms the shape of Earth's surface. Horizontal and vertical displacement responses due to a load can be recorded using Global Positioning System (GPS) receivers. Modeling and removing surface-mass loading signals, which are present in all GPS time series, can reduce the variance in the time series. Surface deformation is of particular interest along subduction zones. A subduction zone is an area of tectonic plate collision where the more dense plate subducts, or moves underneath, the less dense plate. The Cascadia Subduction Zone extends from Vancouver Island down to Northern California. This research project focuses on using the python-based software program LOADDEF to accurately compute displacement responses of the Earth to oceanic, atmospheric, and hydrologic loads. These modeled responses are then compared to the observed displacement responses measured by the Plate Boundary Observatory along the Cascadia Subduction Zone.

Mentor Name: Hilary Martens

Moss Rehydration in the Genus *Syntrichia*

Author(s): Maggie Ross; Lloyd Stark

Category: Life Sciences

Abstract / Artist Statement: Mosses have the ability to survive desiccation and rehydration upon exposure to liquid water, a trait known as desiccation tolerance. Several factors impact the drying and rehydration processes including the rate at which the drying event occurs, how long the moss remains dry, and the rate at which the moss rehydrates. Very little research has considered this last factor, the rate of rehydration, and how it may vary for different species of moss. Understanding how the rate of rehydration varies among species and how it is impacted by the rate of drying and duration dry will provide insight into the strategies mosses use to withstand and recover from desiccation. We conducted a laboratory experiment to examine the rehydration rates of eight species of moss in the genus *Syntrichia*. Moss shoots were dried overnight in desiccation chambers equilibrated to a relative humidity of 33 RH, 54 RH, 75 RH or 98 RH which varied the rate of drying from faster to slower, respectively. The duration dry was kept constant in this study and shoots were removed from the chambers the following day. We rehydrated the moss by applying water directly to the shoot while examining them under a microscope to determine the time for the shoot to reach a full hydration phenotype. We will present a comparison of the rate of rehydration across species of *Syntrichia* exposed to different rates of drying and discuss the implications of this work for understanding the desiccation ecophysiology of these closely related species.

Mentor Name: Mandy Slate

Music through Math: Analyzing and Composing Scores Mathematically

Author(s): Katerina Hall

Category: Humanities

Abstract / Artist Statement: Math and music have always been closely tied in the minds of great thinkers. From Pythagoras' perfect ratios to the sinusoidal waves of various pitches, we can analyze and create music by utilizing the tools within mathematics. One such tool lies in modular arithmetic. By using a modulo twelve system, we can encompass all of the notes in a modern twelve-tone octave. Thus, we can translate notes to numbers and further, groups these number-notes into sets. Such sets describe musical patterns like chords, harmonies, and motifs, which, when combined, create entire compositions. While we can analyze all music in this fashion, the Second Viennese School – and most notably, Arnold Schoenberg – were the first to truly dive into the potential for composing with this method. Following their example, I have created a variety of sets based on sources ranging from the English alphabet to a simple color wheel. With one of these sets as a main motif, I composed a short piece reflecting the process of using a specific mathematical field to approach music. This method will hopefully show that both the field of mathematics and that of music are far more accessible than they may seem.

Mentor Name: Anne Basinski

Of *Betta splendens* and Speed Dating: an Analytical View

Author(s): Sarah Hecht; Susan Greene

Category: Social Sciences

Abstract / Artist Statement: *Betta splendens* have been the animal subject to test several, non-invasive drug therapies. The results can then be examined as to what effect they will have on humans. In the main experiment, *B. splendens*' innate aggressive behavior was examined when the subject were exposed to Fluoxetine, an antidepressant. Data collection comparing the male species of *B. splendens* involved exposure to a female of *B. splendens* and dosage of Fluoxetine to observe the effects on their innate aggressive behavior. My part of the experiment is centered around examining whether there was any female bias among the male subjects that would go onto skew the results of the larger study. This project was designed as a manipulation check to see that the exposure to Fluoxetine would suppress aggressive behavior and the exposure to a female would increase aggressive behavior. When the two variables were combined, it is hypothesized that they will return the subject to a baseline aggressive measure. During this experiment, three different female *B. splendens* were used at a time. The female *B. splendens* subjects were kept in separate tanks out of sight of the male *B. splendens* subjects. The male *B. splendens* alternated females each day of data collection. In order to ensure limited bias, this experiment examined the courting average of each male exposed to each female. Data was recorded with the larger experiment and averages were taken each day for each male and correlated to which female the male *B. splendens* had been exposed to. Data analysis is still ongoing to determine whether female bias among the male *B. splendens* present.

Mentor Name: Allen Szalde-Petree

Outdoor Education's Impact on Health

Author(s): Tessa Leake

Category: Social Sciences

Abstract / Artist Statement: The effect, if any, that outdoor education and experiential learning has on health was studied by interviewing students who participated in the University of Montana's Patagonia winter session study abroad course. I interviewed participants before and after the course and asked them a series of questions about their health. Questions included how they defined health, what the greatest determinants of health are, if they have control over their health, and if they considered themselves to be in good health. Students were also asked to rate their levels of health overall, mentally, and physically in regard to themselves and compared to their peers. I collected the responses from the before and after interview and then compared them to see if experiential learning like the Patagonia winter session course has any effect on health. It was my theory that outdoor education would have a positive impact on health, however based on the size of this study I can conclude no significant effect on health from outdoor education. Despite being unable to quantify a significant difference in levels of health before and after the course, responses from students nevertheless align with studies done on outdoor education and the impacts it has on students.

Mentor Name: Cara Nelson

Pedagogy of Pitch in L2 Blackfoot

Author(s): Naatosi Fish

Category: Social Sciences

Abstract / Artist Statement: Pitch in Blackfoot is characterized by the raising of relative pitch on a syllable in a word. Pitch is not a consciously recognized piece of information among native speakers or teachers. However, pitch is important as it impacts the meaning of words. This study looks at the efficacy of visual guides for Blackfoot pronunciation of pitch by second language learners. I hypothesized that use of visual assistance would improve pitch pronunciation in second language learners. Subjects were nine Blackfoot learners recruited on campus. Participants were shown 15 words with images and asked to pronounce them. Subjects were then given pitch art, a visual tool mapping pitch, and asked to pronounce the words again while looking at the visual aid. The recordings were analyzed in a phonetic program called Praat, and the measurements were inputted and organized in an excel file for further analysis. Their pronunciation was compared to that of a native speaker. Results showed that three out of the nine learners improved pronunciation overall, but the remaining participants did not. Three conclusions were drawn from these results: (i) the immediate use of images without instruction does not significantly improve pronunciation, (ii) complexity and familiarity of words impact second language pronunciation, and (iii) when words are less complex and/or familiar, learners tend to do well with pitch, and when words are complex or unfamiliar learners tend to struggle with pitch. This study contributes to the field of second language acquisition especially with Blackfoot and other languages with pitch. In addition, language in the Blackfeet community plays a significant role in identity and pride, and, as such, speakers have a desire to sound authentic and as “native-like” as possible. This study hopes to improve education of Blackfoot language, and help learners’ pronouncing Blackfoot words.

Mentor Name: Mizuki Miyashita

Phallic Mirth: Production and Destruction of Sex in Edith Wharton's The House of Mirth

Author(s): Gentry Darkenwald

Category: Humanities

Abstract / Artist Statement: Edith Wharton’s *The House of Mirth* highlights hypocrisy and superficiality in turn of the century New York City’s upper class. In order to do so, Wharton charts the decline of a socially acute and beautiful young woman Lily Bart, whose precarious position within this social elite depends upon her ability to marry a suitable partner. Framing her novel as she does, Wharton provides an insightful critique of many of the values that make up the American Dream. The promises of freedom and equality made possible by the unique social and political order founded in the New World, while a distinct break from the traditions of Europe, come with their own pitfalls and limitations. In my paper, I use Gayle Rubin’s “The Traffic in Women: Notes on the Political Economy of Sex” to analyze some of the factors leading to the hypocrisy and superficiality of a metropolitan elite that represents the putative zenith of American culture. Rubin’s essay uses anthropological evidence combined with a post-Marxian, Lacanian psychoanalytic framework to develop a sex/gender system analysis that illuminates the intransigent issues at play within Wharton’s novel. I also examine Lily Bart using criteria for a tragic figure drawing on an Aristotelian understanding of the concept. By combining Rubin’s essay and Aristotle’s conception of tragedy in a reading of *The House of Mirth*, I hope to show that the issues that plague her characters extend beyond their specific class and temporal setting; intractable qualities of American society at large, acquisitiveness of money and privilege due to physical beauty, do not free the individual from the struggles so often attributed to a lack of either. In fact, the acquisition of either further subjugates the individual if they choose to exploit them for personal gain.

Mentor Name: Brady Harrison

Physiological Contributors Affecting Heat Accumulation with a Wildland Firefighter Helmet

Author(s): Tyler Stenersen; John Center; Karenne Heinze

Category: Life Sciences

Abstract / Artist Statement: This study evaluates relationships between physiological factors and their effects on heat accumulation while wearing a wildland firefighter helmet. Eleven male subjects between the ages of 18-40 with a VO₂max between 40-65 ml/kg/min walked at 50% VO₂max for 90 min. with an ambient temperature and relative humidity of 35°C and 30% respectively. Prior to exercise, nude bodyweight (BW) was obtained, skin and rectal temperature probes were secured, and WLFF personal protective equipment (PPE) (Nomex and standard issue helmet) were donned (excluding gloves and a pack). Subjects entered the heat chamber where resting values of heart rate (HR), core temperature (CT), skin temperature on neck and chest (ST_n, ST_{ch}), perceived head heat (PHH), skin blood flow on neck and forehead (SBF_n, SBF_{ch}), and head heat (T_{ih}) were collected. Subjects walked in two 45 min. increments separated by a 5 min. rest period. Every 15 min. HR, RPE, CT, ST_n, ST_{ch}, and PHH were recorded. Subjects received 6 ml/kg of water every 30 min. HR, RPE, CT, ST_n, ST_{ch}, PHH and SBF_n, SBF_{ch} were recorded at 45 min. and at the end of the trial. Following the trial, nude BW and a urine sample were collected. Pearson correlations determined significant relationships between physiological characteristics and peak outcomes. Body surface area (BSA) related positively with end-trial CT (R=0.78; P=0.013). Increased absolute exercise intensity showed higher ST_n (R=0.82; P=0.002), SBF_n (R=0.68; P=0.020) and sweat rates (R=0.67; P=0.025) during final stages of the trials. Perceived exertion was found to correlate to PSI (R=0.73; P=0.016). SBF_n correlated positively with T_{ih} (R=0.88; P < 0.001), ST_n and ST_{ch} (R=0.7; P < 0.02). **CONCLUSION:** This data suggests larger individuals and greater absolute exercise intensity predispose wildland firefighters to overheating. Non-compensable heat gain from wildland firefighter PPE relates to elevated head heat, ST and SBF, suggesting difficulty in unloading metabolic heat.

Mentor Name: Charles Dumke

Polystyrene Surface-Absorbed Trehalose Diester as a Means for Performing Pulldown Assays

Author(s): Alexander Riffey

Category: Physical Sciences

Abstract / Artist Statement: In 2016, over 10 million people contracted Tuberculosis (TB) infections, resulting in the deaths of 1.3 million worldwide. Despite the existence of a vaccine, TB remains the number one cause of death from a single infectious disease according to the 2017 report from the World Health Organization. As a result, research and development of methods for TB prevention is ongoing. In the search for new drugs to combat this epidemic, knowledge of how a compound triggers an immune response is paramount. One method for identifying an immune protein complex is via immunoprecipitation, colloquially referred to as a “pulldown.” A pelletable, beaded support of polystyrene with surface-absorbed trehalose diester has been developed for use as a novel tool for identification of C-type lectin receptors. Confirmation of surface-absorption and characterization of beads was performed via dynamic light scattering and high-performance liquid chromatography.

Mentor Name: David Burkhart

Preservice School Professionals' Knowledge of Speech-Language Pathologists' Literacy Practices

Author(s): Kathleen Cotter; Sarah Moen; Beth Sutter; Margaret Mitzel, Al Yonovitz; Taylor Perius; Michelle Morimoto; Janis Nelson

Category: Social Sciences

Abstract / Artist Statement: Purpose: The purpose of this study was to examine school-based pre-service professionals' knowledge of speech-language pathologists' (SLPs) literacy assessment and intervention practices in K-12 students before and following participation in an interprofessional education (IPE) workshop. Methods: A pre-/post-workshop survey of school-based SLP's literacy practices was distributed to the attendees of the IPE workshop. Participation was voluntary and anonymous. Descriptive statistics were analyzed and reported. Originality: A growing body of literature suggests that collaborative interprofessional practice (IPP) is more likely to be successfully conducted when professionals have participated in IPE experiences when they were enrolled in their pre-service professional training programs. In particular, knowledge of the roles, responsibilities, and scope of practice of the other professionals with whom they will interact has been identified as a significant predictor of successful IPP. Significance: Results of this study provided preliminary data of the effectiveness of an interprofessional education (IPE) workshop with respect to informing school-based pre-service professionals on the scope of the school-based SLP's practice in literacy assessment and intervention. This is significant in that while there are numerous studies of IPE practices in medical-based fields, such as nursing and pharmacy, few such studies exist that examine the IPE experiences of school-based pre-service professionals.

Mentor Name: Ginger Collins

Quantifying false positives between two avian survey methods

Author(s): Kaitlyn Strickfaden

Category: Life Sciences

Abstract / Artist Statement: Imperfect detection is a known issue with conducting wildlife surveys. False positive detections, where an individual is counted as there when it truly is not, are often assumed to not occur. This assumption can skew detection rates and create misleading results when the detection rates are used to calculate occupancy and abundance estimates. Survey methods such as the dependent double-observer method developed by Nichols et al. (2000) are suggested to reduce the occurrence of false positives by using two collaborating observers. This study aims to quantify and compare the rates of false positives in the single-observer method and the dependent double-observer method. In addition, the study will determine the magnitude of bias that false positives introduce to detection rates in each survey method. This will be accomplished with auditory surveys of ten grassland songbird species native to central Montana. Naive observers will be asked to listen to randomly-generated surveys containing the vocalizations of these ten songbirds and identify the species. Preliminary evaluation indicates that the decrease in false positive rates using the dependent double-observer method is substantial. Further evaluation will provide information on the effectiveness of the dependent double-observer method in providing more precise and less biased population estimates.

Mentor Name: Victoria Dreitz

Quantifying the Presence of Alternative Reading Frames in the Human Genome

Author(s): Sarah Walling

Category: Life Sciences

Abstract / Artist Statement: Enabled by a growing understanding of its genetic origins, modern medicine is increasingly moving towards prevention rather than treatment of disease. Notable innovations, such as genome editing, can impact medicine only in the context of extensive knowledge of human genetics. Yet it was recently discovered that a phenomenon called “alternative reading frame” (ARF) genes appears in the human genome far more commonly than was previously understood. Exons, the coding portion of DNA, are transcribed into RNA sequences consisting of groupings of three nucleotides called codons. Codons correspond to particular amino acids, and the chain of translated amino acids form a protein based on which exons are included. Unlike canonical genes, in ARF genes one exon region can encode more than one protein sequence depending on where the cell establishes the exon’s boundary. Because amino acids are encoded in the base-three codons, shifting the reading frame over by one or two nucleotides can cause dramatic changes in the encoded protein. This research seeks to confirm the existence of more than 1000 ARFs recently identified in our lab, and to identify the conditions under which they occur. To accomplish this, RNA sequences were downloaded from trusted databases and a combination of preexisting tools and custom scripts programmed in Perl were used to test for the occurrence of putative ARF sequences. Those RNA sequences found to contain ARFs were then analyzed to determine whether there was a pattern of occurrence. The results of this analysis will assist in filling a significant gap in our knowledge of how the human genome functions. If particular ARFs can be identified as having a relationship with the development of specific diseases, the impact on the medical field would be significant.

Mentor Name: Travis Wheeler

Radiocarbon Dating of a Bitterroot Valley Peatland

Author(s): Sandra Amsden

Category: Physical Sciences

Abstract / Artist Statement: The Bitterroot Valley, located south of Missoula, Montana along US Hwy 93, has a diverse geological history including significant glacial carved canyons and evidence of Glacial Lake Missoula. Just a couple miles south of Hamilton (46-9-36 N, 114-11-29 W) is a peatland field about three hundred acres in size. As defined by Joosten and Clarke, “Peat is a sedentarily accumulated material consisting of at least 30% (dry mass) of dead organic plant material. Peatland is an area with or without surface vegetation with a naturally accumulated peat layer at the surface.” In the Bitterroot we are interested in dating the oldest lower portion of this deposit out of curiosity of understanding the geology of the Valley. George Furniss and I, with permission from landowner Coby Smith, headed out to the peatland field to obtain core samples in early February 2018. This particular area has a history of peat mining, and we know the top two to three feet of material was removed in the 1970s. Using a hand soil auger, we removed and saved three samples at: 1.8 ft., 2.5 ft., and 3.5 ft. depth. From the surface we drilled through continuous peat to the lowest depth, where we recovered one-inch diameter smooth stones, mixed with smaller pebbles and sand, indicating the bottom of the peat layer. We will report the radiocarbon age-date of the peat deposit just above the pebbles and sand, which we interpret to be the oldest layer of peat. The total thickness of the peat deposit must have been originally five feet or more. The samples were dried and then sent to Beta Analytic, Inc. in Miami, Florida for age-dating. Our goal is to determine whether the peat deposit is old enough to be considered ice age or whether it dates to the post ice age

Mentor Name: George Furniss

Reducing False Sequence Annotation Due to Alignment Overextension

Author(s): Jack Roddy

Category: Life Sciences

Abstract / Artist Statement: Sequence comparison is fundamental to modern molecular biology. The primary focus in the field is on methods that increase the speed of comparison and the sensitivity required to recognize relationships between highly divergent sequences. Our work addresses another important aspect of sequence comparison – avoidance of incorrect sequence annotation. The primary source of such incorrect annotation occurs when software correctly identifies that a substring of one sequence is related (aligns to) a substring of another sequence, but that the tool incorrectly claims that flanking regions of the two sequences are also related – this is often called alignment overextension (for example, in the annotation of transposable elements in the human genome, the developers of Dfam and RepeatMasker estimate that 2% of the annotated genome is the result of overextension). Current methods used to combat overextension are only somewhat effective, and can have the unintended consequence of reducing search sensitivity and under-extending the alignment. In our research, we develop prototypes of two methods for mitigating overextension. The first uses hidden Markov models (HMM) to recognize the point at which overextension begins in an alignment. The second employs Convolutional Neural Networks to identify the overextension boundary, much like edge detection in image analysis. I benchmark these techniques using a human-like artificial sequence dataset. We expect that results of this pilot study will lead to dramatic improvement in the annotation of genomic sequences.

Mentor Name: Travis Wheeler

Rocky Mountain High: An Investigation of Downhill Snow Sports and Marijuana Use

Author(s): Silas Phillips

Category: Social Sciences

Abstract / Artist Statement: What comes to mind when you imagine a ‘stoner?’ Most stereotype the term—some couch-bound, chip-munching slouch with a foggy gaze (and perhaps a goofy grin). Marijuana and its chemical effects hold an increasing presence in American minds. With full legalization of recreational use in 8 states and various degrees of medical legality in 18 others, the substance is caught up in a cultural shift. Our society is tackling the ethicality of marijuana, and the stigmas built around the drug are changing. What was once cited for ‘reefer madness’ is becoming (to some) a medical treatment, or just another way to enjoy a Friday night. Whether legal or not, people use marijuana for their own purposes— this is where my interest lies. The phenomenon I’ve found most engaging is this: people get stoned and hurl their bodies down a mountain on a pair of skis. Anyone who hits the slopes on the weekend can witness this, especially if you’re with the right cadre of college students. This intensely physical activity flies in the face of stereotypical stoner behavior. By asking the question “why do people ski/snowboard and use marijuana?” this paper ethnographically explores the culture of downhill snow-sports (skiing and snowboarding) and its interplay with the use and experience of marijuana. Data collection consisted of semi-structured interviews and participant observations. Data analysis drew upon literature regarding the anthropology of drug use, biochemical aspects of marijuana, and ‘flow theory’ as outlined by the research of Mihaly Csikszentmihalyi. Understanding drug use through an anthropological lens offers alternatives to our societal stigmas— I suggest the effects of the drug are not purely biochemically determined, but are also mediated by the user’s culture, environment, and intention.

Mentor Name: Eliot Graham

Rostov Undone: Jews, Gentiles, and the State Mediation of Anti-Semitic Violence

Author(s): Ethan Holmes

Category: Humanities

Abstract / Artist Statement: The purpose of this research is to understand how, when, and why European anti-Semitism transformed from being largely religiously-motivated to largely politically-motivated. This project examines the Russian city of Rostov-on-Don as a microcosm of the larger rise in conflict between the Jewish and Gentile populations of Europe that occurred throughout the late 19th and 20th centuries. In doing so, this research highlights how the ethno-political histories and collective memories of Rostovian Jews and Russians have been manipulated for the purpose of fueling politically-expedient, anti-Semitic violence. By assessing the genesis and growth of the politically-motivated anti-Semitism that gave rise to both an anti-Jewish Pogrom in 1905, and the 1942 Ravine of Snakes massacre, this research aims to demonstrate how the anti-Semitism of 1905, 1942, and the present day share the same historical root: a perceptual shift that transformed the “Jewish Question” from a religious problem into a political one. This research consults both primary and secondary source material, much of which has been acquired through one week of access to the United States Holocaust Memorial Museum Archives in Washington, D.C. via a seminar entitled “Jewish Life in the Soviet Union”. This research is being performed with the objective of painting a holistic account of the two events from the perspective of victims, perpetrators, and bystanders alike, in order to best understand how and why the Jewish population of Rostov came to be targeted as an ethno-political group. By comparing and contrasting two chronologically-separate instances of anti-Jewish violence in the city of Rostov, consistent themes and patterns of mass-violence and persecution may become more clearly defined, which may prove useful in both understanding and addressing contemporary surges of anti-Semitism in the region and elsewhere.

Mentor Name: Robert Greene

"Run Like a Girl": The Rise of the Women's Marathon, 1960-1985

Author(s): Mary Butowicz

Category: Humanities

Abstract / Artist Statement: Although women were barred from officially running the Boston Marathon until 1972, women like Kathrine Switzer defied the rules to run with the men. Until the 1970s, women were not officially allowed, by the Amateur Athletic Union, to participate in events longer than 1.5 miles. These rules and regulations sparked my interest in the changes regarding popular perception of female athleticism and women’s challenges to male-dominated long-distance running. In my paper, I ask several questions: How did the development of the women’s marathon challenge societal standards of beauty from 1960 to 1985? How was women’s participation in marathons influenced by second-wave feminism? What was the impact of corporate sponsorship from companies like Avon cosmetics? I will conduct research in newspapers to create a timeline of the development of the competitive women’s marathon, as well as consulting popular periodicals to demonstrate changes in beauty standards for athletes. Periodicals also display the effects of the new “health and running craze” of the 1970s on beauty standards. I also examine company records from Avon and other sponsors to explore their impact on the development of the women’s marathon. This paper will demonstrate how women challenged the status quo by participating in competitive long-distance running. It also shows that standards of beauty are always changing and explores the role of corporations in those changing standards. In the field of history, this paper will add further contribution to arguments made by historians such as Susan Cahn and Pamela Cooper in regards to past limitations of female athletes and runners.

Mentor Name: Anya Jabour

Scraping Away at the Past: Extracting Ancient DNA from Stone Tools

Author(s): McKenzie Morgan

Category: Social Sciences

Abstract / Artist Statement: This research project seeks to explain the use of lithics found at the Bridge River site in British Columbia through the extraction and analysis of proteins and ancient DNA found on the surface of stone tools. The methods used for extraction were nondestructive, using sonication to release the trapped aDNA from microcracks on the tool's surface, and the amplification of mitochondrial DNA regions Cytochrome B and 16S in order to determine what species the tools were used to process. The findings of this project have the potential to further refine the extraction process for ancient DNA present on lithic material, as well as end archaeologists' longtime debate over whether or not certain tools were used explicitly for one particular organic material, such as with the making of bone tools, and whether or not scrapers were specifically used for one species at the Bridge River site. To date, we have worked with over 80 tools, and extracted both Puma (*Puma concolor*) and Dog (*Canis lupus familiaris*) DNA from our samples. This project provides us with a unique opportunity to both enhance our knowledge of lithic use at archaeological sites, and successfully extract more genetic material moving forward.

Mentor Name: Meradeth Snow

Screening Tool for Behavioral Cough Suppression Therapy

Author(s): Serena Haller; Lyndsay Hutton, Al Yonovitz; Emma Bozarth, Al Yonovitz; Sarah Popp

Category: Social Sciences

Abstract / Artist Statement: Behavioral cough suppression therapy (BCST) is a treatment provided by speech-language pathologists (SLPs) to reduce impairment of patients who suffer from chronic cough (CC). Research has found it to be effective in up to 88% of patients who do not respond to medical treatment. Current medical models for management of chronic cough are lengthy and expensive for patients who are ultimately easily and inexpensively treated with BCST. There are currently no published screening tools designed to detect if a patient is a good candidate for BCST. The purpose of this research was to create a self-report screening tool that can be used by physicians to identify patients who are candidates for BCST. Data has been collected on a bank of potential screening questions with a sample of 134 patients for CC. Statistical analysis for item reduction will be complete by June 2018 followed by validation testing of the screening tool to determine sensitivity and specificity. A valid screening tool has the potential to save patients considerable time, frustration, and money while providing them with an inexpensive, effective and efficient treatment option.

Mentor Name: Laurie Slovarp

Silver and Light: Salt Print Photography

Author(s): Nicholas Gilbert

Category: Visual and Performing Arts (includes Creative Writing)

Abstract / Artist Statement: Eye (2017) gold-toned salt print photograph. 8"x10" image area, frame 12"x15" I have researched the chemical and physical processes involved in the creation of a photographic image. Last semester I experimented with different chemical concentrations, types of paper, application techniques, light exposure, and photo-negative density of a 19th century photographic process called salt printing. Modern photographic technology has developed from salt prints, this one chemical reaction between silver nitrate and

salt interacting with light. My methods and results were recorded, compared, and repeated until an acceptable photographic quality was achieved. Through further experimentations and observations I discovered an aesthetically expressive method that I present here. My personal studio art practice is a contemporary engagement and expression with this historical process. My research will also serve during my internship at the Montana Museum of Art and Culture (MMAC) with MMAC curator Jeremy Canwell in Spring semester 2018. My specialized knowledge and skills with historical photographic processes, specifically salt printing, will aid the MMAC in cataloging photographic objects in the permanent collection, identifying objects of interest, and curating a collection of original negatives to produce a set of historical accurate photographic prints for the collection.

Mentor Name: Elizabeth Dove

Social learning of male dominance relationships in degus

Author(s): Alec Dalton; Kinsey Webb; Darren Sandau; Shelby Sander; Stevie Murphy

Category: Life Sciences

Abstract / Artist Statement: The goal of this study was to study social learning in an animal model. Social learning is essential for survival across most animal species, and an animal model of social learning would provide a tool for understanding the brain functions that support these behaviors. Social learning was evaluated using a paradigm known as the “tube test” (Lindzey et al. 1961) which measures dominance relationships based on whether a degu advances or retreats when they encounter one-another in a tube, as well as the amount of time this interaction takes to proceed. While previous studies have examined dominance relationships using this test, these studies do not normally examine changes over time. Dyads of either cagemate (familiar) or stranger (unfamiliar) male degus were tested every day for 5 days in the tube test. One month after the first round of trials, a second round of trials will explore how the social relationships are retained over time. Preliminary observations suggest that the latencies between when the degus met in the center of the tube and one retreated did not differ between cagemate and stranger groups and did not appear to change over days. These results suggest that the tube test method may need to be further refined before it can be used as a tool to study social learning.

Mentor Name: Nathan Insel

Social learning of safety in degus

Author(s): Dorothy Young; Purna Banerjee; Kaori Takehara-Nishiuchi; Navdeep Lidhar

Category: Social Sciences

Abstract / Artist Statement: Learning to fear dangerous situations is an essential survival skill. However, the inability to learn about the environment from the observation of others can lead to anxiety disorders. In this study we attempted to determine whether fear memories could be extinguished through social learning. We analyzed data collected in an experiment using degus (*Octodon degus*) in which one experienced individual observed a naive cagemate entering and exploring a dangerous environment. The experienced degu was conditioned in a chamber which contained a “danger” side (where they could receive a foot shock) and a “safe” side (in which they would receive no shock), separated by a neutral, “viewing” area. After conditioning, the naive cagemate, who had no previous experience with the box or the shock, was placed in the chamber with the experienced degu. The study was originally designed to test whether the experienced degu would show fear (empathy) for the naive cagemate; however, preliminary analyses showed no evidence for this. To test whether the social exposure reduced fear for the danger side (social fear extinction), we examined whether the experienced degu still avoided the danger side in subsequent sessions. The total amount of time the experienced

degu spent in the danger room was not significantly higher following testing with their naïve cagemate compared with following testing with an object (paired t-test, $p = 0.11$; $\alpha = 0.1$ based on a one-tailed test). However, when time on the danger side was considered relative to time spent in the safe partition (thus controlling for movement around the environment), avoidance of the danger side was found to be significantly higher following testing with an object (paired t-test, $p = 0.058$). The data are therefore consistent with the possibility that rodents can learn that a region of space is safe by observing others behaving normally in that space.

Mentor Name: Nathan Insel

Sometimes Hesitancy is Key: Effects of Moral Deliberations on Children's Interpretation of Credibility Cues

Author(s): Kali Taylor; Caitlin Gillespie; Shelby Rosston; Dennis Schuster; Shailee Woodard; Rachel Severson

Category: Social Sciences

Abstract / Artist Statement: Children often treat confident individuals as credible sources of information. Yet, confidence may differentially signify credibility depending upon the domain of knowledge. For example, when dealing with factual information, confident responses indicate greater credibility. However, when deliberating about moral issues, hesitancy may reflect a deeper level of thoughtfulness, and therefore credibility. This study investigated children's credibility judgments of individuals who differed in the level of confidence in two domains of knowledge. In a between-subjects design, children 3-8 years ($N=96$ planned with 52 participants thus far) listened to a confident and hesitant model make either novel factual (e.g., which animal has an omentum inside?) or moral claims (e.g., which animal should get the last piece of fish?). Across eight trials (4 confident, 4 hesitant), children rated the models on a 4-point scale (0=not at all, 3=a lot) in terms of confidence level, likeability, smartness, and agreement with her answer. Preliminary analyses using a 2 (confidence level) x 2 (domain) x 6 (age) ANOVA indicated significant main effects (p s This research will advance knowledge in how and when children use cues about individuals' credibility when determining who is a trustworthy source of new information and address larger theoretical issues regarding whether children infer underlying knowledge when using credibility cues to determine who is a trustworthy source of information.

Mentor Name: Rachel Severson

Spatial Patterns of Winter Roadside Gray Wolf (*Canis Lupus*) Sightability in Yellowstone National Park

Author(s): Jeremy SunderRaj

Category: Life Sciences

Abstract / Artist Statement: Imperfect detection is ubiquitous among wildlife research and can affect research conclusions and management. Accordingly, detection probability is often included in observation-based models. Here, we leveraged long-term research of gray wolves (*Canis lupus*) in northern Yellowstone National Park to evaluate how the probability of sighting radio-collared wolf packs from ground-based locations was affected by the characteristics of each spatial location (i.e., distance from the road and viewability [a combination of landscape "openness" and whether visible from a viewshed created from the road and nearby observation points]). To do so, we used 2,681 unique, daily observations of 17 wolf packs collected during 44 unique 30-day winter monitoring periods from 1995 – 2017 and used matched-case control logistic regression with a 1:1 sampling design between observed and random locations. We found that the probability of wolf sightings declined as wolves were farther from the road and increased when wolves were in open, viewable areas. We then evaluated whether these conclusions were affected by wolf group size or whether wolves were feeding at a

carcass and found that the probability of sightings only clearly decreased when smaller groups of wolves were farther from the road. Ultimately, we used our results to build spatial predictions for seeing radio-collared wolves in northern Yellowstone National Park. These predictions are useful to managers by identifying “hot-spots” of wolf observations, and can also be incorporated into research related to wolf ecology and predator-prey dynamics that relies on ground-based observations of wolves.

Mentor Name: Mark Hebblewhite

Speech Sound Testing: The Relationships Among Measures of Connected Speech Samples for Children with Speech Delays

Author(s): Margot Diffendaffer; Carley Stone

Category: Social Sciences

Abstract / Artist Statement: Stackhouse, Pascoe, and Gardner (2006) illustrated a psycholinguistic approach to investigating childhood speech and literacy difficulties. A psycholinguistic approach claims that speech and literacy development is the product of an intact speech processing system composed of speech input processing, stored word representations, and speech output production. The study evaluated a breadth of measures in each of these areas for understanding one child’s speech skills. The current study, however, examined more closely the relationship among measures within the production component of the psycholinguistic approach and attempts to replicate portions of the Stackhouse study. The participants included children ages 3-7 years old who had severe difficulty learning and saying speech sounds. The children were asked to tell stories from a wordless book that resulted in a connected speech sample. Each sample was then analyzed across three measures: Percentage of Consonants Correct, a sound inventory of all sounds used during the sample, and a word shapes inventory of all consonant and vowel combinations used. The measures were evaluated for relationships that may help speech-language therapists make decisions about treatment planning. Speech-language therapists routinely use connected speech samples as part of their assessment and diagnostic process, because they provide an accurate representation of a child’s natural speech patterns. This presentation will illustrate how connected speech samples support the production component of the psycholinguistic approach. Clinical applications for speech therapy will be explored.

Mentor Name: Amy Glaspey

Statistical Clustering of Glioblastoma and Glioblastoma Multiforme Data

Author(s): Jed Syrenne

Category: Life Sciences

Abstract / Artist Statement: In statistical clustering, proteins that cluster together are likely to possess a functional relationship with each other. By statistically clustering and filtering proteomic data, networks can be created so that the vast perplexity of protein-protein interaction data can be understood and meaningfully analyzed. Here, glioblastoma and glioblastoma multiforme phosphorylation data was obtained from PhosphoSitePlus and subsequently analyzed using R. The binary data were input into a dataframe and collapsed by their gene names. The Spearman-Euclidean and Euclidean distances were then calculated, with t-stochastic neighbor embedding being performed separately on the outputs. The results were then divided into discrete clusters. Offensively large clusters were broken down to a manageable size via a penalized matrix decomposition. The rank of the penalized matrix decomposition was determined by interpolating values of the data cluster using DINEOF, running PCA on the populated dataframe, plotting the number of principle components against the proportion of variance explained, and finally choosing the point of diminishing returns that still explained over 90% of the variance. Clusters were transformed into network and then visualized in Cytoscape. The final networks represent a useful tool for researchers concerned with protein-protein

interactions in glioblastomas. Work is being done to integrate these networks with those obtained from mass spectrometry peak intensities, allowing meaningful analysis of legacy datasets.

Mentor Name: Mark Grimes

Studying the Effects of Atrazine-induced Estrogen on the Development of Regulatory T-cells

Author(s): Dawit Mengistu

Category: Physical Sciences

Abstract / Artist Statement: The herbicide atrazine (ATR) is an estrogen disrupting compound and is the most common drinking water contaminant in the United States. It elevates estrogen levels through the induction of aromatase, which converts androgens to estrogen. Previous studies have shown that CD4+ cells activated in the presence of ATR show altered activation, significant decreases in proliferation and a significant increase in the frequency of Foxp3+ regulatory T cells (Treg). This phenotype is more severe with cells from male mice. Our hypothesis is that ATR is immunosuppressive due to increased estrogen production, which binds to the G-protein coupled estrogen receptor (GPER-1). In this project, we have used the GPER-1 agonist (G-1) to determine GPER-1 activation generates a phenotype similar to ATR. We also included the GPER-1 antagonist G-36 to assess whether it reduced/inhibited the ATR phenotype. To confirm the role of aromatase-induced estrogen in the ATR-mediated immunosuppressive phenotype, we blocked aromatase activity with the aromatase inhibitor YM511 in ATR-containing cultures. To date, our experiments confirm the hypothesis that aromatase-induced increased estrogen levels are contributing to the significant increase in Treg and associated immune suppression in the presence of ATR.

Mentor Name: Scott Wetzel

Suprasegmental Production by American Learners of Japanese: A Phonetic Investigation

Author(s): Yuna Hiranuma

Category: Social Sciences

Abstract / Artist Statement: This research examines second language acquisition (SLA) of English speakers learning Japanese by investigating how acoustic features of the first language influence the learners' pronunciation. According to the theoretical notion of language transfer in SLA, linguistic features of learners' first language emerge in their pronunciation of second language (Saville-Troike, 2006). Linguistic features concerned here are phonetic elements of word prominence (strongest part of a word). Beckman (1984; 1989) claims that English is considered a stress-accent language in which prominence is indicated by the combination of pitch and loudness, whereas Japanese is a pitch-accent language in which prominence is solely indicated by pitch. Based on these studies, I hypothesized that both pitch and loudness appear in prominence of the learners' pronunciation, whereas only pitch is involved in that of Japanese speakers', which indicates phonetic transfer. The data consisted of recordings of ten Japanese words pronounced by English native-speakers who are studying in a second-year Japanese class at the University of Montana. Pronunciation by three native Japanese speakers was used as control. Pitch and loudness of all vowels in each word were measured using acoustic phonetic analysis software called Praat. Correlation between the highest pitch and loudness within the words was examined, and a comparative analysis of pronunciations between English and Japanese was conducted. The result showed that correlation between pitch and loudness in the learners' pronunciation was higher than that in Japanese speakers'. This indicates that prominence transfer was occurring, and thus supports the hypothesis. This research contributes to the study of SLA and related fields: it (i) adds data regarding sound acquisition, which is less common in the field, (ii) suggests a useful method for similar research, and (iii) helps learners of a pitch-accent language to become more proficient in terms of pronunciation.

Mentor Name: Mizuki Miyashita

Switch II Region in G*ai*1: Specificity for Ric-8A

Author(s): Melissa Roseleip; Baisen Zeng; Levi McClelland

Category: Life Sciences

Abstract / Artist Statement: On the cell surface are G protein coupled receptors that bind to agonists, causing activation of intracellular G proteins, by catalyzing exchange of GTP for GDP at the G protein alpha subunit (G α). G proteins are also activated by guanine nucleotide exchange factors (GEF) inside of the cell; these include Ric-8A and Ric-8B. GTP bound G α can stimulate the activity of intracellular enzymes. For example, G α s activates adenylyl cyclase, while G*ai*1 inhibits the activity of this enzyme. Biochemical studies have shown that Ric-8A is a GEF towards G*ai*1 where as its isoform Ric-8B acts on G α s. Previous studies in our laboratory and others have shown that a region in G*ai*1 called switch II binds to Ric-8A. In this study, we test the hypothesis that differences in amino acid sequence between G*ai*1 and G α s in switch II are responsible for the ability of these G proteins to discriminate between Ric-8A and Ric-8B. The switch regions are G*ai*1 and G α s differ in only three amino acids. We predict that, by mutating these amino acids in G*ai*1 to their corresponding residues in G α s, affinity for Ric-8A will be impaired. Single mutation primers (S206D, K209R and H213Q) were made, transformed and amplified through a polymerase chain reaction (PCR). Once mutant plasmid was expressed in E. coli, it is purified, and a tryptophan fluorescence assay is performed. This assay technique detects changes in the fluorescence of tryptophan 211, a side chain in switch II that is sensitive to the exchange of GTP for GDP. Our research elucidates on how mutants in G*ai*1 in the switch II region plays an important role in specificity for Ric-8A.

Mentor Name: Stephen Sprang

Technological Approach to Recycling Incentives

Author(s): Cheyenne Goetz; Megan Franz; Tiffany Folkes

Category: Global Leadership Initiative (GLI)

Abstract / Artist Statement: Globally, a staggering 91% of plastics are not recycled. The intrinsic motivators and mainstream incentives for recycling have proven to be ineffective at motivating large parts of the global population to recycle. Instead these items, including plastics and paper goods, end up in landfills or in the oceans. However, the profusion of technology across the globe brings new avenues for pursuing recycling incentives. Leveraging the framework of technology that walks around in the pockets of university students all around the world, our group created a mobile application that offers local incentives for recycling on college campuses. Implemented at both the University of Montana and Massey University Albany Campus in Auckland, New Zealand, our mobile application, TreasureBin, allows users to earn points for recycling items. Those points are redeemable for discounts on goods and services at local vendors. Through a technological approach to recycling incentives, we are able to collect clear data, while simultaneously reaching a dense population. TreasureBin confirms that global challenges can be addressed more readily with the profusion of technology. This project affirms that stagnation in the struggle against climate challenges can be combated with innovative, technological approaches.

Mentor Name: Rob Smith

The Combinatorics of the Clarinet

Author(s): Cory Emlen

Category: Physical Sciences

Abstract / Artist Statement: The relationship between the individual key presses on the clarinet and the resulting frequency was studied in order to determine if it was possible to make a model to describe the resulting note by counting the keys that were pressed. Data was collected by making a recording to determine the multiplicative effect on the frequency, with a different recording being made for each key. The collection process went as follows: First, metadata was recorded in the form of verbal statement of the key number and any subsequent comments. A simple fingering was then played, followed by the pressing of the indicated key and then a return to the original fingering. This process was then repeated with a few different starting fingerings to allow for a more general analysis of the key. Current results show that some keys have a constant effect on the pitch regardless of the starting frequency, but most of the keys have a degrading effect on the pitch, tending towards a multiplier of one with higher starting frequencies. The next step in the process is to make more extensive recordings of the keys with degrading effect in order to model their effect as a function with respect to the starting frequency. Once the effect of these keys can be expressed as functions, they can be combined with the keys of constant effect to create one model that encompasses the entire clarinet.

Mentor Name: Mark Kayll

The Effect of Accountability on Dialectical and Elaborative Complexity

Author(s): Gavin Ploger

Category: Social Sciences

Abstract / Artist Statement: This experiment examined how the integrative, dialectical, and elaborative complexity of people's statements is affected by accountability to an audience with unknown views. The experiment tested 184 undergraduate students randomly assigned to two groups. Participants responded with their views on 4 controversial social issues: abortion, climate change, immigration, and gun rights. Participants in Group One were assured that their responses would be completely anonymous. Participants in Group Two were told that they would have to explain their views to another individual but not what that individual's views were. It was hypothesized that participants who were accountable to an audience with unknown views would make statements with higher integrative complexity than participants who were not accountable to an audience. It was also hypothesized that the ratio of dialectical to elaborative complexity would be greater for participants who were accountable to an audience than participants who were not accountable to an audience. Bonferroni-adjusted independent mean t-tests and simultaneous confidence intervals are being calculated. Preliminary analyses suggest the primary hypotheses were not supported. In addition, the results suggest that the presence of accountability caused a greater drop-out rate for participants in Group Two than those in Group One. If so, this study indicates that accountability to others may not meaningfully influence complexity, but that accountability does make some people less likely to express political views at all. As such, instead of increasing the complexity of discussions, accountability may reduce the variety of perspectives represented in online discussions.

Mentor Name: Betsy Bach

The Effectiveness of Youth Engagement Through Intervention: An Intensive Treatment

Author(s): Westley Hughes; Danika Greer; Mary Humphreys

Category: Social Sciences

Abstract / Artist Statement: Autism Spectrum Disorder (ASD) represents a range of developmental disorders involving difficulties with communication and nonverbal behaviors (American Psychological Association, 2013), and impacts roughly 1 in 68 births (Centers for Disease Control and Prevention, 2016). Those diagnosed may exhibit poor eye contact, repetitive or compulsive behavior, and inability to understand others' emotions (Barry et al., 2003). Children with ASD struggle with social interaction, often removing themselves from social situations or engaging in inappropriate behavior that can cause further isolation from their typically developing peers (Kalyva & Avramidis, 2005). The current study examines the effectiveness of Youth Engagement Through Intervention (YETI), a group-based social skills intervention that uses multiple evidence-based practices (i.e. video modeling, social narratives and visual schedules) creating individualized treatment for each child with ASD. The purpose of this study was to improve social interactions of children with ASD. We defined social interaction as 1) verbal and nonverbal greetings and goodbyes, 2) orientation of face and body towards a clinician or peer when they are being spoken to, 3) and engagement in back and forth, turn taking, communication with peers. We expected YETI would be successful in improving these skills. Method Three children with ASD participated in the current study: Two males (ages 7 and 11) and one female (age 7). Observational data using event recording was collected throughout the eight-week program (1.5-hour weekly sessions), on how often each child exhibits social interactions. YETI is provided in a limited timeframe, thus an AB single subjects design is appropriate to assess the treatment effects. However, AB designs cannot determine between-subjects effects, detect small effects, or be generalized. Implications With rising rates of ASD it is important to develop and implement effective treatments to assist individuals with social skill deficits to better navigate our social world.

Mentor Name: Anisa Goforth

The Effects of Floral Resource Removal on Plant-Pollinator Interactions

Author(s): Rachel Dickson

Category: Life Sciences

Abstract / Artist Statement: An important component of understanding the dynamics and stability of communities is to elucidate how interspecific species interactions respond to various ecological disturbances. We address this issue by removing a dominant floral resource, *Helianthella quinquenervis* (Asteraceae) from an alpine meadow and observing the effects on plant-pollinator interactions. Specifically, we examined how this removal effected pollinator visitation, pollinator community structure, and co-flowering plant reproduction. We addressed three primary questions: (1) How do pollinator visitation rates vary between unmanipulated floral communities and those where the dominant floral resource is removed? (2) How does pollinator diversity and community composition differ between natural and manipulated communities? and 3) How does variation in pollinator visitation influence the reproduction of the two other co-dominant, flowering plant species? To study these components, we conducted paired plant-pollinator observations in control and removal plots for 30 hours per week for 5 weeks. We then analyzed differences in pollinator visitation rates between control and removal plots using paired t-tests and linear mixed effects models. At the community level, we found that overall pollinator visitation rates increased in response to resource availability. At the species level, the removal increased visitation to one common co-flowering plant species, and decreased visitation to another. Our findings illustrate how the removal of a dominant resource can alter the dynamics of plant-pollinator interactions and provide insight into how ecological communities respond to disturbance.

Mentor Name: Doug Emlen

The Evolution of Microaggressions Against Native Americans in Montana History Books

Author(s): Lacey DeSalles; Jacinda Lovejoy; Jack Michaels

Category: Humanities

Abstract / Artist Statement: Microaggressions are a relatively understudied phenomena in psychology and are often not immediately recognized by even keen observers (Sue, 2010). Microaggressions are defined as any verbal, behavioral, or environmental statements or actions that are derogatory or hostile and insulting in nature, specifically targeted at a person or people (Sue, Capodilupo, Torino, Bucceri, Holder, Nadal, and Esquilin, 2007). Microaggressions are a form of racism that gradually chip away at a person's well-being in a nearly unseen manner (Sue, 2010). Furthermore, Sue (2010) separates microaggressions into three types: microinvalidations, microinsults, and microassaults. However, it should be noted that an individual does not need to be a "racist" to commit a microaggression (Sue et al., 2007). The current study examines how the number of microaggressions in eighth grade Montana history books have evolved over time. Studying existing data from within the lab revealed the occurrence of many microaggressions against Native Americans in eighth grade Montana specific history books (some published as early as 1951 and the most recent being published in 2008). However, the reviewed study did not examine the specific changes in microaggressions over time. Consequently, this study seeks to enhance the growing body of research by examining the shift in microaggressions in textbooks over time and further analyzing how these microaggressive statements have evolved. Previous research has identified that having a history curriculum that includes biased information about a person's ethnic origins can be damaging to the way they perceive their school climate (Banks, 2016). This study will be beneficial to educators to help them recognize institutional racism within textbooks across time and combat this racism in their classrooms. Method This qualitative research project will use previously coded data and nVivo software to categorize the types of microaggressions presented across time in eighth grade Montana history textbooks.

Mentor Name: Olivia Holter

The Identification of 'Mystery' Seeds from Bridge River, BC

Author(s): Lauren Clark

Category: Social Sciences

Abstract / Artist Statement: Housepit 54 is a long-lived pithouse that forms part of the ancient Bridge River village in the Mid-Fraser region of southern British Columbia, Canada. It was one of over eighty pithouses in a village occupied intermittently for over a millennia by the ancestors of the Upper St'át'imc people. Prior to the gold rush, the St'át'imc, a group of complex hunter-fisher-gathers, also cultivated plants that were indigenous to this region. Present at the site are "mystery" seeds of an unknown species, which is both ubiquitous and abundant in the archaeobotanical assemblages from the floors of Housepit 54 (Lyons et al 2017), and are also present in many other village sites in the Mid-Fraser region. The purpose of my research was to determine the identity of the species of these mystery seeds in order to infer pre-contact patterns of trade, subsistence, and resource management among the St'át'imc and neighboring indigenous communities, a topic that is highly understudied. Following extraction, the chloroplast DNA was amplified using PCR. Amplification was checked on a 2% agarose gel, followed by PCR cleanup using ExoSAP-IT, and sent to the Murdoch Sequencing Core on the University of Montana campus to complete Sanger sequencing of the sample. Once the sample was returned to the lab, the resulting sequence was analyzed using Sequencher software and compared to similar sequences with the BLAST tool in the GenBank database to determine if a match could be made to an identified sequence that allows for species identification.

Mentor Name: Dr. Meradeth Snow

The Life of Montana Suffragist Margaret Jones Souders

Author(s): Anisa Ricci

Category: Humanities

Abstract / Artist Statement: This research examines the life and work of Margaret Jones Souders, a Montana woman active during the suffrage movement in the state. Souders was identified as a key suffragist in the state of Montana in the History of Women's Suffrage book, originally published in 1881. The research for this project was conducted through the use of genealogy sites Ancestry and Heritage Quest, historical Montana newspapers, digitized materials included in the Montana Memory Project, and documents from the Montana Historical Society. Through this research we are able to piece together the life of Mrs. Souders from her birth in Tennessee in 1878 to her death in Red Lodge, MT in 1940. Little if any research has been conducted about the majority of individuals included in the History of Women's Suffrage. Through this project we can understand more about Souders' life and her suffrage work by tracing her movement across the state of Montana and her interactions with various clubs and organizations. Souders was a prominent figure in the Montana Federated Women's Clubs and encouraged more women to get involved on the state level. Her life reveals previously hidden aspects of the suffrage movement at the state level.

Mentor Name: Anya Jabour

The Possible Effects of Fluctuating Selection the Gene RLG1A in Mimulus Guttatus (YellowMonkeyflower)

Author(s): Evan MacArthur-Waltz

Category: Life Sciences

Abstract / Artist Statement: Abstract The Possible Effects of Fluctuating Selection on the Gene RLG1A in Mimulus Guttatus (Yellow Monkeyflower) Evan MacArthur-Waltz and Lila Fishman, Ph.D. A central question in genetics and evolutionary biology is, "What maintains genetic variability in a population?" Fluctuating selection, or selection that changes in direction over time, has been shown to contribute to the maintenance of genetic variation. This study investigates the effect of fluctuating selection in Mimulus guttatus (yellow monkeyflower), a species that shows a great deal of local adaptation and genetic variation. Population-sequencing of phonological cohorts from a focal population in the Oregon Cascades (Iron Mountain,; IM) revealed that copy number variation at a locus (RLG1A) was associated with flowering time and flower size trait variation. Notably, some M. guttatus plants have a unique genotype that carries an unprecedented 400+ copies of RGL1A, while others have 3 or 1 copy. The current study examines year-to-year and season-to-season variation in the frequency of RLG1A 400+ carrying plants and their reproductive success (seedset). Genetic material was extracted from these samples and subjected to polymerase chain reactions to determine which variants of RLG1A were present. The percentage of plants carrying RLG1A in seasons with low versus average moisture availability were compared. Plants that germinate in spring versus fall were also compared. Chi square analyses were conducted. The number of individuals from each sampling ranged from 70-140. No statistically significant differences were found in percentage of plants with RLG1A by amount of moisture or time of germination. Further research is needed to continue to explore what factors influence the occurrence of this important gene. Further research is also being done to determine the mechanistic causes and attributes of RLG1A, as well as possible phenotypic characteristics of those individuals that carry 420+ copies.

Mentor Name: Lila Fishman

The Risk of Tax Avoidance through Charitable Donations in the U.S. Art Market

Author(s): Laura Sikoski

Category: Social Sciences

Abstract / Artist Statement: Provided in a variety of galleries, local and national museums, art is something that everyone can appreciate. Access to art through these places provides the opportunity for cultural, social and historical enrichment, functioning as an invaluable addition to the academic growth of both individuals and communities; however art is also big money. The fine arts market is one of the most poorly regulated markets in the world, allowing for extensive collusion on prices and sales which ensures that the market prices of art do not decrease. This exclusivity and collusive behavior results in pieces of art that are worth fortunes. So why would anyone willing donate art worth hundreds of thousands if not millions of dollars? Rather than solely out of altruistic motivation individuals also engage in philanthropic activity due to financial incentives found within the U.S. tax code. Using a variety of economic and journalistic sources, we explore the structure of the fine arts market, paying close attention to the pricing practices and relevant U.S. tax code to open the discussion on the value of donated art and provide possible policy changes. The current structure provided through the U.S. tax code fails to address the constant increase of values seen in art and does not provide strict enough guide lines for museum donation criteria. Policies should be implemented that aim to mitigate excessive tax avoidance through the exploitation of charitable donations.

Mentor Name: Amanda Dawsey

The Value of Silence in Finland: A Geographic and Cultural Perspective

Author(s): Meghan Kuhns

Category: Social Sciences

Abstract / Artist Statement: Silence-based tourism, an emerging tourism sector in Finland, is relatively understudied. This research is focused around three specific areas: 1) the geographical and historical context of silence farms (developed and potential), 2) the value of silence to the Finnish culture and economy, and 3) the role and motivations of Finnish farmers as they expand into this area of silence tourism, to cultivate and preserve silence spaces, and their perceptions regarding the effects that silence farms and silence experiences have on tourists. In this context, silence is referred to as natural sounds such as the chirping of birds, the rustling of wind, or the flowing of streams and rivers. Due to Finland's unique geographic and cultural context, the topic of silence emerges as a compelling area of study. Silence, as an experience and social goal, reflects values that are closely linked to the Finnish culture and economy. The overarching question posed by this study is: How does silence thrive in a modern society, especially considering its endangered status in the face of all-consuming urban noise pollution throughout many places in the world. This research aims to shed light on the Finnish tourism sector through engagement with farmers who operate silence farms or have knowledge about the silence farm tourism sector. This study will draw on the analysis of tourism sector documents and qualitative data collected through an online survey of farmers. More precisely, the study will examine the cultural and economic values that silence holds in Finland. The study will also determine whether there is a geographic pattern in silence farm tourism or concentrations of preferred locations for silence farms that are currently underway or planned for development. The hope is that this study will provide a new perspective on the experience and value of silence in our globalizing world.

Mentor Name: Sarah Halvorson

The effect of plumage coloration on interspecific competition between mountain bluebirds *Sialia currucoides* and tree swallows *Tachycineta bicolor*

Author(s): Jenna Millsap; Sara Berk; Creagh Breuner,

Category: Life Sciences

Abstract / Artist Statement: Sexual selection theory states that male ornamentation may evolve if it helps males obtain more matings by means of male-male competition or female preference. Females are likely to seek and obtain direct, or non-genetic, benefits from mates in systems where critical resources are limited. Dominant males can monopolize limited resources to attract mates, increasing variance in male reproductive success and strengthening the effects of sexual selection. While several studies have examined the function of ornaments in intraspecific (same species) contests, less is understood about the role of ornamentation in interspecific (different species) competition. In a population of mountain bluebirds near Ronan, MT, tree swallows arrive after mountain bluebirds are nesting, and compete directly for access to nest-boxes. A successful tree swallow intrusion often results in total brood mortality for bluebirds, so a male mountain bluebird's ability to defend a territory is directly linked to his and his mate's fitness. Male mountain bluebirds have structural UV-blue plumage and there is evidence that more saturated coloration is associated with increased success in defending territories. We conducted 30 minute observations at active bluebird nests and recorded the parental behavior of bluebirds such as nest attendance and feeding rate. Observations also recorded the length of tree swallow intrusions, number of intruders, and bluebird behavioral response. Later in the season, we conducted simulated territorial intrusions at active tree swallow nests using bluebird specimens displaying a range of colorations. Specimens were presented for 10 minutes to record tree swallow behavior. Through this study, we aim to explore the relationship of a male mountain bluebird's color to his behavior, his stress-hormone levels, and the characteristics of tree swallow intrusions. Our findings not only provide insight into the effect of ornamentation on interspecific competition, but also serve to support hypotheses regarding status-signal honesty.

Mentor Name: Creagh Breuner

Thing #1; Object Agency & Planned Obsolescence

Author(s): Jonathan Green

Category: Visual and Performing Arts (includes Creative Writing)

Abstract / Artist Statement: My research revolves around the impact that objects can have on the human condition when their capacity to exert power and effect is maximized. Agency is typically defined as, "The capacity, condition, or state of acting or of exerting power; a person or thing through which power is exerted or an end is achieved." Agency is attributed to objects through their created and intended function or through the ways they are used. My work interrogates agency as it pertains to functional ceramics and art objects. Our economy is dependent on planned obsolescence; everyday objects are made to be quickly used and discarded. By manipulating color, texture, proportion, and scale in my handmade objects, I suggest a timeless personality that affords them agency and refers to their ability to exert power on a continuing basis. In doing so, each form carries stories of the maker. In reconstructing objects, I place them in conversation with their original function as well as potential uses. I aim to represent both the absurd and the reliable in these art objects. Thing #1 is an exploration of materials as we understand their purpose. By combining the static elements of domestic furniture and upholstery with the absurd mobility of a bicycle rim, I hope to engage in a dialogue with the viewer about our expectations of function and use. Using what I call "thing-power," I hope to reveal the unexpected agency and power of objects not found in your generic box-store.

Mentor Name: Hipolito Chacón

Time Comparisons of Channel Lines of the Bitterroot River

Author(s): Broc Perkins; Dillon Lewis; Kathleen Cox; Aldo Rodriguez; Don Jordan Jr.; Gavin Nuttall; Jame Kowalski; Jimmy Baggett; Kendra Norton; Kimberly Martin; Thomas Dowdy

Category: Physical Sciences

Abstract / Artist Statement: The Bitterroot River is a fast moving cobble-gravel-sand-bed, braided and meandering, north flowing river with peak discharges above ten thousand cubic feet per second during spring snowmelt at our riverbank community, Hamilton, Montana. The river is the life blood of our valley with water quality good enough to support trout. Low flow of August can drop to 500 cubic feet per second at Hamilton endangering trout with high temperatures, were it not for the cooling effect of groundwater seeping into the channel and shade from trees. We examine a ten mile reach between Anglers Roost and Woodside Crossing where there is heavy visible interference from man-caused armoring (RipRap) of the banks to protect bridges, roads, homes, and irrigation diversion dams or jetties. Here the river descends at a rate of 15 to 17 feet per mile occasionally widening its active channel to half a mile and then coalescing to a single channel over and over. Our hypothesis is that increasing percentages of RipRap will not control the movement of the channel because energy of peak flow increases when the river is constrained. Even small reaches of the river can change dynamically as illustrated by two separate meander cutoffs through 18 years. We illustrate major channel changes by comparing main channels between 1995 and 2018.

Mentor Name: George Furniss

University of Montana's Anthropological Collection Facility's (UMACF) Ethnomusicology Collection

Author(s): Rachel Steffen

Category: Social Sciences

Abstract / Artist Statement: Since 1959, the University of Montana Anthropological Collection Facility (UMACF) has housed an extensive ethnomusicology collection, donated by cultural anthropologist Alan P. Merriam (1923-1980). My Senior Honors Research Project was to inventory the collection of 2,300 78 RPM records, as well as conduct historical background research. My project was also for the purpose of writing grants which would be used to purchase materials that would aid in the preservation, digitization, and cataloging of the collection. The inventory was conducted through examining each item and recording the pertinent information from each disk into an Excel spreadsheet. This information allows the correlation of the collection by various types of information, e.g., language, recording company, instruments. A major interest of mine through the research project has been identification of the records, using markers such as engraved and printed matrix numbers, label on colors, etc. The importance of this work is to preserve the collection, and to organize it in a usable form. It would be a significant loss to the discipline of anthropology were these recordings to be allowed to deteriorate beyond the point of preservation. It would also be disrespectful to the magnanimity of a foremost scholar in the field of ethnomusicology if his donation was not preserved and properly curated for the use of the students and faculty of the University.

Mentor Name: C. Riley Auge

Use of Capsaicin for Desensitization of the Cough Reflex

Author(s): Emma Bozarth, Serena Haller, Lyndsay Hutton, Al Yonovitz; Sarah Popp

Category: Life Sciences

Abstract / Artist Statement: Cough hypersensitivity syndrome (CHS) is a disorder that causes a chronic non-productive cough that is often resistant to medical treatments. CHS is the result of hypersensitization of nerves in the airway. This condition can be successfully treated with behavioral cough suppression therapy, which involves the use of volitional cough suppression strategies (e.g. breathing techniques). This research study determined the potential of treating CHS with programmatic desensitization using cough suppression strategies following the inhalation of capsaicin, a cough stimulant, in tiny doses. Focus was on feasibility of this method to treat patients with chronic cough, and the participants were three healthy subjects. All subjects were able to successfully suppress their cough at the highest capsaicin dose (1000 uM) following 5-6 treatment sessions. Post-treatment testing occurring one week and three weeks following treatment (without use of cough suppression strategies) revealed a significant decrease in cough sensitivity in all 3 participants. This study confirms that programmatic desensitization coupled with cough suppression strategies during exposure to capsaicin in progressive doses has the potential to be an effective treatment for CHS. The next phase of this research will be a randomized placebo-controlled trial with healthy subjects.

Mentor Name: Laurie Slovarp

Use of genetic techniques to address biases in Northern goshawk (*Accipiter gentilis*) turnover metrics

Author(s): Carly Muench; Robert Miller; Kristine Pilgrim; Michael Schwartz

Category: Life Sciences

Abstract / Artist Statement: The Northern Goshawk is listed as a management indicator species for the Minidoka Ranger District of the Sawtooth National Forest. This distinction has enhanced research interest on goshawk population health in the region. Over the past 25 years of studying goshawks, the Intermountain Bird Observatory (IBO) has observed abnormally high adult turnover at nest territories as compared to other places the species has been studied. Their estimations are based on banding and resighting birds, and may be biased high due to undetected marked birds and unknown age of birds when banded. To increase accuracy of IBO's turnover data, we conducted parentage analyses using blood samples collected from goshawks in 2012-2016. We analyzed 32 samples from nine nest territories by examining shared alleles between adults and nestlings. With this analysis, we identified previously unknown turnover and fidelity events, increased known ages of banded birds, and quantified and removed bias from IBO's turnover estimations. We suggest that band-resight alone may be insufficient to produce accurate turnover estimates, and the inclusion of genetic analyses may mitigate inaccuracies. Our results not only fundamentally altered IBO's understanding of goshawk population dynamics within the forest, they also have wide-reaching implications for future studies of marked birds and mammals.

Mentor Name: Erick Greene

Using Chimeric Proteins to determine basis of FBF-2 localization

Author(s): Benjamin Hickey

Category: Life Sciences

Abstract / Artist Statement: FBF-1 and FBF-2 are proteins within the PUF protein family that are required for stem cell maintenance in *C. elegans*. FBF-1 and FBF-2 exhibit mRNA binding activity and are involved in localization, activation and repression of their target mRNA's. The two are similar in sequence with the exception of four Variable Regions (VR's). FBF-2 localizes to P granules in germ cells of the *Caenorhabditis elegans* while FBF-1 does not. We propose that the different localization patterns exhibited between the FBF-1 and 2 are due to these VR's. Analysis of which VR or combination of VR's is responsible for this difference in localization was undertaken through chimeric protein assembly and insertion into the *C. elegans* genome. Assembly of DNA encoding chimeric proteins with various VR's and a tagging Fluorescent Protein (GFP) present was achieved through fusion Polymerase Chain Reaction (PCR) and BP/LR clonase plasmid assembly. Introduction of chimeric DNA constructs is in progress, and done through Crispr-CAS-9 genome editing. Expression of the modified proteins and assessment of localization patterns will be carried out using GFP visualization. The poster will discuss our observations and preliminary conclusions.

Mentor Name: Ekaterina/Voronina

Waltrene Willis, a Montana Suffragist

Author(s): Chloe Loeffelholz

Category: Humanities

Abstract / Artist Statement: I will investigate the club and suffrage work of Waltrene Willis, a resident of Thomson Falls, Glasgow, and Garfield, Montana between 1900 and 1920, who worked as the recording secretary for the Montana Equal Suffrage State Central Committee. I conducted research in federal census records, historical newspapers including the Glasgow Courier and The Suffrage Daily News, and the contemporary periodical, the Montana Woman, the official publication of the Montana Federation of Women's Clubs. My research on Waltrene Willis illustrates the range of activities conducted by Progressive-era women in Montana. Involved in everything from the Sunflower Art Club to Glasgow's Political Equality League, Willis's career serves as an example of the wide-ranging work women did to achieve suffrage. Understanding the activities of the women devoted to the cause of suffrage in Montana is critical to furthering our knowledge of Montana women's history.

Mentor Name: Anya Jabour

Water and Us: Education as the First Line of Defense

Author(s): Sarah Maxwell; Cassandra Sevigny; Izzy Diaz; Miranda Henrich; Kevin Mason; Kyra Searcy

Category: Global Leadership Initiative (GLI)

Abstract / Artist Statement: Access to clean water is a problem the world will continue to face in the future. Droughts, climate change, and contamination are just a few examples of water-related issues humans deal with daily. By addressing these problems through education, we targeted future adults by fostering positive environmental attitudes. To celebrate World Water Day on March 22nd, we held a Water Field Day for sixth graders in Lolo, Montana to supplement their science curriculum. Through hands-on activities, our target population was immersed in water issues related to water contamination and conservation. Our Water Field Day comprised multiple stations with activities including an art and poetry wall, a water contaminants scavenger

hunt, a filtration station, water taste test, and a water relay race. These activities represent challenges faced by people of all ages around the world as well as here in Montana. Increasing demand on water resources combined with the complexities of climate change brings a strengthened sense of urgency to spread awareness of future water states and methods for accessing clean water supplies. Educating youth about water conservation, contamination, and filtration will help them make responsible and informed decisions throughout their lives regarding water uses, or themselves and people in other regions. Making explicit references to the water problems people face in other countries fosters empathy and encourages consideration of the water issues in a global context as well. Learning about water through hands-on activities connects children with the material so it is enjoyable to learn and easier to remember, while simultaneously providing a positive experience with natural systems, which has been shown to increase concern about the environment. Our Water Field Day incorporated all these elements to effectively communicate global water issues with our future leaders.

Mentor Name: Cassandra J. Hemphill

What Lies Within a Label? The Deconstruction of “Labels” in Society

Author(s): Blaine Wilder

Category: Humanities

Abstract / Artist Statement: Would you like to be labeled? Well too late, you already have been labeled. From birth we are given a label, our name. We accept this label with a sense of honor and pride. However not all labels are a welcome gift or for that matter, are they even necessary? What would it be to like to live in a world without labels? Labeling is something that happens when you want to organize and sort things into a certain category. People are complex and unique; they are not things. Thus no label is needed to describe them. This undergraduate research project will take a deep look into a fictional character of a novel, Christopher John Francis Boone, who has had a label placed upon them by the viewing audience of the play adaptation. The label in question is “autistic”. This label is never used in either the original novel or play adaptation. In the world of the Curious Incident of the Dog in the Night Time we see a look at humanity and how we handle someone who is unique. This will show us how we, as a society, potentially limit someone’s growth without even realizing it. Where I can do anything and can I do anything, have extremely different outcomes for that individual’s life and growth.

Mentor Name: Dr. Bernadette Sweeney

What do you want to be when you grow up? : A Storybook Approach to Career Exploration

Author(s): Martha Krebill; Melanie Gagen; Melisande Slater; Anna Peterson; Nikia Reynolds

Category: Global Leadership Initiative (GLI)

Abstract / Artist Statement: Our group seeks to explore the nature of career development in children and demonstrate the importance of career exploration from a young age, especially in a globalized society. Around the world, studies have shown that children’s career aspirations are influenced by a wide range of factors, including gender stereotypes, socioeconomic status, parents’ and role models’ professions, and community. Through art and storytelling, our group will create a children’s book aimed at children in 4th to 6th grade, the age group in which career exploration tends to become most salient. The book will present many careers and paths to attaining these careers. These career descriptions will be based on interviews with professionals in a variety of occupations. By combining artistry, personal communication, career development, and global perspectives, the storybook product will seek to reduce restrictive career stereotypes that feed gender and class inequalities.

Mentor Name: Alicia Gignoux

Where there's a Will, there's a Way: Young People and Climate Change

Author(s): Emma Kiefer

Category: Social Sciences

Abstract / Artist Statement: Climate change is the defining issue of our time. It will disproportionately impact young people, less developed and impoverished nations, global agricultural systems, and vulnerable ecosystems across the globe. Current and future generations of students must be educated and empowered to tackle the problem. I look to surveys and data taken at the beginning and the end of CCS 103X: Introduction to Climate Change, and analyze the influence of the attitude of the lecturer. I draw from Dr. Charles R. Snyder's Hope Theory to understand how certain thoughts may help students achieve their objectives and develop a stronger sense of agency. I also look to multiple studies from Maria Ojala, an associate professor at Örebro University, to understand the influence of hope on young people, and how this affects their willingness to not only learn about environmental issues, but to engage in solutions. Understanding the complex role that emotions play in youth development is vital to effectively teaching climate change in the classroom. In my research from CCS 103X, I examine the correlation between negative attitudes about climate change given by lecturers to agency and pathway thoughts in students, as well as their overall emotional response to global warming. This project is compelling because it looks at the ways that professors speak about climate change and relates it back to students' own feelings about their abilities to enact change and the different ways they calculate and reach their goals. Now more than ever, it is crucial that educators use their positions of authority to empower and engage their students on a transformational level that encourages them to go outside of the class and find solutions to the problems in their own communities.

Mentor Name: Nicolette Phear

"White Folks Has Everything They Need": Diversity and Inclusivity at the University of Montana

Author(s): Emily Gillispie

Category: Social Sciences

Abstract / Artist Statement: The University of Montana has a diverse student body, consisting of individuals from a variety of different religious backgrounds, abilities, ethnic identities, gender identities and sexual orientations. Despite the diverse populations at the University, the value the school has placed on them is questionable. Providing proper support for members of marginalized communities not only helps individuals have access to resources, but it also is beneficial, to the university itself. In this research, I combine interview data with analysis of websites and campus events to evaluate how the university has been both successful and unsuccessful in reflecting a specific stance toward, responsibility for, and engagement with issues of diversity. I interviewed students and faculty, examined the websites of every department on campus, and considered events such as the Presidents Lecture Series. I found that the University's department's websites included more information on diversity than I was expecting. However, the information for resources was provided rather inconsistently; with some departments mentioning diversity while others did not have any information. This lack of consistent information surrounding diversity, is something that should be improved on by the university, as if diversity in order to increase awareness, support and the value of diverse populations here on campus.

Mentor Name: Eliot Graham

World War I, Fears of White Men, and the Black Militancy Leaders Capitalized On

Author(s): Madison Renaldo

Category: Humanities

Abstract / Artist Statement: African Americans have fought in every U.S. war since the creation of the country, but in many instances, they experienced racism while serving. Learning about the Civil Rights Movement that took place after World War II has become common, but even before the Second World War, African Americans were attempting to use their military service as a platform for gaining equal rights. During World War I, many African Americans in the U.S. military were placed under the leadership of the French military and were treated with more respect than they had experienced at home. After receiving better treatment from the French, African American soldiers returned to the U.S. radicalized and more willing to use violence to fight racism at home. Through the use of works by W.E.B. DuBois, William Colson, Marcus Garvey, and the NAACP, it is apparent that the war ushered in a new era known as the New Negro Movement. These men's work reveal that the treatment African American soldiers received abroad under the French vs. American leadership resulted in the radicalization of the soldiers and African American leaders such as Marcus Garvey, W.E.B DuBois, and William Colson capitalized on the new radicalization to promote their ideas. This movement exposes how war can radicalize minority groups and sometimes result in further equality and respect for one another. It also demonstrates the fact that the Civil Rights Movement was not African Americans' first attempt using violence to gain equality. This project outlines the violence used against African Americans that protested Jim Crow laws and segregation and the purpose of this essay was to inform the public about the long history of African Americans' fight for equality, but through the use of military service and radicalization abroad, as well as at home over the works of African American leaders.

Mentor Name: Gillian / Glaes

"You Know Where I Stand"- The Irish Catholic Response to the Boston Busing Crisis of 1974

Author(s): Meaghan Fernandes

Category: Humanities

Abstract / Artist Statement: In 1974, a federal court order mandated busing in Boston's public schools after decades of de facto segregation; in response, the city's majority Irish Catholic population became an unmovable force in their resistance to busing. In this resistance, the Boston busing crisis of 1974 emerged as the city and federal government grappled with a backlash from the Irish Catholic community. This essay argues that despite support for desegregation from most of the Archdiocese of Boston as well as the newly seated Bishop, Irish Catholics living in the area refused to support integration efforts via government intervention during the Boston busing crisis of 1974. Using the family first theology of Irish-American Cardinal William O'Connell as their justification, Boston's Irish Catholics rejected the gospel based pro-integration policies of the archdiocese. By analyzing the motivations of the anti-integration Irish through the lens of religion rather than race, this essay allows for a deeper understanding of the reasoning behind the actions taken. This new analysis comes from shift in the documents used; though government documents from the period acted as a base for information, most research came from newly released parish documents and archives of the city of Boston regarding the crisis that were unavailable previously. Most research into the crisis has focused on the racial aspects of the crisis; though race played an important part in the resistance to the archdiocese, the religious motivations acted as a central catalyst in the organization of the anti-busing members of the Catholic community. Comparing the rhetoric used by Cardinal O'Connell with that of the anti-integration activists, a link between the family first theology of O'Connell with the push to develop Catholic schools during the anti-busing efforts became apparent. Those who resisted integration encountered family-first teaching as children, a message that influenced their anti-integrationist actions as adults.

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