



University of Montana Presents

The 13th Annual  
UM Conference on  
Undergraduate Research



Program  
and  
Abstracts

April 11, 2014 ~ Missoula, Montana



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Abhishek Chatterjee, Political Science  
Dan Doyle, Sociology  
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## **Paint & Print Exhibition:**

Gwen Landquist, Art Program - University Center

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

# UMCUR 2014



University of Montana

## **Conference on Undergraduate Research April 11, 2014**

### **Sponsored By:**

The Office of the President

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The Davidson Honors College

# UMCUR Welcome

We are pleased to welcome students, faculty, staff, and alumni to the thirteenth annual University of Montana Conference on Undergraduate Research (UMCUR). Over 130 students will present their research today, and we are delighted to celebrate their accomplishments!

This conference has been a tradition at the University of Montana since 2001. Undergraduate research is an important endeavor for both students and faculty because it has the potential to create a tremendous sense of empowerment, confidence, and intellectual growth. Since people will continually encounter problems without established answers throughout their professional careers, the skills gained through participation in original research will have long-lasting, beneficial consequences for students of all majors.

We extend special thanks to President Royce Engstrom and Provost Perry Brown for their support of this conference and their commitment to undergraduate research and creative scholarship. Many undergraduate research projects at UM are carried out with scholarship support, and for that support we are truly grateful to many private donors. We also extend our sincere appreciation to all faculty members who have reviewed conference proposals and mentored the students presenting at the conference. We are likewise grateful to the faculty, alumni, community members, graduate students, and undergraduates who have volunteered their time and expertise as judges and facilitators for the conference. We could not do it without you!

We trust that you will have an enjoyable day, will learn some new information, and will see that celebrating undergraduate scholarship has many benefits.

*James McKusick*

*UMCUR Director*

*Undergraduate Research Committee Chair*

*Dean, Davidson Honors College*



# UMCUR Keynote Speaker

12:20 p.m., University Center Theater ~ April 11, 2014

## The Hidden Role of Microbes in Animal Health and Nutrition



### John McCutcheon, Ph.D.

*Assistant Professor,  
Division of Biological Sciences  
University of Montana*

#### Abstract:

When most people think of bacteria and fungi—if they think of them at all—they probably think of “germs, disease, and rot.” This is understandable, as bacterial and viral epidemics have killed more people over the course of human history than all wars combined. But it is also quite wrong: animals cannot function normally without sustained, intimate interactions with microbes. In my talk, I will highlight a few interesting examples of microbe-animal interactions, drawing from recent studies in humans and insects. Finally, I will outline why, when viewed from a long-term evolutionary perspective, we should not be surprised that animals not only benefit, but *require* interactions with microbes to survive.

#### About John McCutcheon

John McCutcheon was born in Wisconsin but raised in Illinois. Torn between families that rooted for the Packers on one side and the Bears on the other, he sealed his fate as a Packers fan by doing undergraduate work in biochemistry at the University of Wisconsin. After earning a master’s degree in genetics at the University of Utah, he was lured back to the midwest (for the final time) to do his Ph.D. work in computational biology at Washington University in St. Louis. After a post-doctoral fellowship at the University of Arizona, he happily accepted a job as an assistant professor in the Division of Biological Sciences at UM, where he has been since 2010. He and the members of his laboratory study the genetic and metabolic interactions between bacteria, fungi, and insects. Some of his lab’s recent work has been highlighted in the *New York Times*, *National Geographic*, and other media outlets. He is an Associate of the Canadian Institute for Advanced Research program in Integrative Microbial Biodiversity, and is an Associate Editor at the journal *Genome Biology and Evolution*.

# UMCUR Schedule Overview

University of Montana

Conference on Undergraduate Research (UMCUR)

*April 11, 2014*

University Center 3rd Floor

- 8:00 AM** Registration & Poster Setup - UC 3rd Floor, Grand Foyer
- 9:00 - 11:20 AM** Oral Sessions - UC 326-331
- Social Sciences, Physical Sciences, Life Sciences & Humanities
- 11:00 AM - 12:00 PM** Poster Session #1 - UC Ballroom
- 12:20 AM - 1:30 PM** Keynote Speaker - UC Theater
- 1:40 - 3:00 PM** Oral Sessions - UC 326-332
- Social Sciences, Life Sciences, Physical Sciences, Humanities and Visual/Performing Arts & Creative Writing
- 3:00 - 4:00 PM** Poster Session #2 - UC Ballroom
- 4:00 - 5:00 PM** Oral Sessions - UC 326-332
- Social, Life, Physical, and Social Sciences, Humanities and Visual/Performing Arts & Creative Writing
- 4:00 - 5:00 PM** Paint & Print Exhibition - University Center Tech Lounge

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

## **Awards Ceremony**

We are pleased to announce that President Engstrom will be hosting the UMCUR Awards Ceremony on Monday, April 21, at 2:00 – 3:00 p.m. in the Theta Rho Room at the Mansfield Library. We hope you will join us to celebrate our UMCUR 2014 award winners.

# UMCUR Schedule Breakdown

<b>8:00</b>	<b>Participant Registration and Poster Set-Up - UC 3rd Floor Grand Foyer</b>
<b>Concurrent Oral Sessions: 9:00-11:20 AM</b>	
<b>UC 326 ~ Social Sciences</b>	
<b>9:00</b>	O-32 - Barriers to Housing in Missoula Montana ~ <b>Robert Howe</b> , Sociology
<b>9:20</b>	O-44 - Second Language Acquisition in Blackfeet Rhythm ~ <b>Jesse Desrosier</b> , Anthropology
<b>9:40</b>	O-45 - How Should We Teach Human Sexuality at the University of Montana? ~ <b>Sandi O'Brien</b> , English Teaching
<b>10:00</b>	O-46 - Sustainability Reporting: An Evaluation of the SASB Framework ~ <b>Tess Barker</b> , Accounting/Environmental Studies
<b>10:20</b>	O-47 - Where's the Kale? A Search for Food Security on the Northern Cheyenne Reservation ~ <b>Amy Sisk</b> , Journalism
<b>10:40</b>	O-48 - Religion and Spirituality in Counseling ~ <b>Christa Moore</b> , Psychology
<b>11:00</b>	O-49 - Access is More Than a Ramp: Assessing the Usability of Educational Information Technologies ~ <b>Courtney Damron</b> , Sociology
<b>UC 327 ~ Social Sciences</b>	
<b>9:00</b>	O-50 - The Not-So-Simple Story of International Unity ~ <b>Karla Nettleton</b> , Political Science and Accounting
<b>9:20</b>	O-51 - Addressing the Menstruation Gap in International Development Efforts for Girls' Education ~ <b>Desiree Acholla</b> , Anthropology
<b>9:40</b>	O-52 - NATO in Kosovo: Establishing Security or Purporting State Power? ~ <b>Christina Bloemen</b> , Russian and Political Science
<b>10:00</b>	O-53 - Exploring the Effects of Disclosing Versus Concealing Sexual Identity on Self-Esteem ~ <b>Parker Sanders</b> , Psychology
<b>10:20</b>	O-54 - The Deadliest Road: Analysis of Drunk Driving Fatalities in Montana ~ <b>Jessica Lareau</b> , Social Work
<b>10:40</b>	O-55 - Effect of Stigmatizing Beliefs on Depression Vulnerability ~ <b>Matthew Wier</b> , Psychology
<b>11:00</b>	
<b>UC 330 ~ Physical &amp; Life Sciences</b>	
<b>9:00</b>	O-25 - Comparing the Effects of Pulsed Shortwave Diathermy and Static Stretching on Shoulder Range of Motion ~ <b>Erika Stinchcomb</b> , Athletic Training
<b>9:20</b>	O-26 - The Effects of Prozac on Aggression in Siamese Fighting Fish ~ <b>Andrew Hinkle</b> , Psychology
<b>9:40</b>	None
<b>10:00</b>	O-28 - Comparing Variations of Mood States in College Students Enrolled in Healthcare Professional Programs ~ <b>Erika Berens</b> , Athletic Training
<b>10:20</b>	O-29 - Modular Abstraction of Complex Real Time Analysis ~ <b>Benjamin Campbell</b> , Computer Science/Mathematical Science
<b>10:40</b>	O-31 - Characterizing the MINERVA Array Telescopes and Instruments ~ <b>Connor Robinson</b> , Physics with Astronomy option
<b>11:00</b>	O-27 - The Role of RNase Y in Gene Regulation During Transmission of <i>B. burgdorferi</i> ~ <b>Jeanette Comstock</b> , Human Biology



## UC 331 ~ Humanities

<b>9:00</b>	O-10 - Environmental Justice & HidroAysén: Pristine Waters to Power Santiago, Multinational Mining Interests in Chile ~ <b>David Schaad</b> , Environmental Studies
<b>9:20</b>	O-6 - Straightening out Queer Stereotypes through Literature ~ <b>Paige Ferro</b> , English: Creative Writing and Literature
<b>9:40</b>	O-9 - Creating a New Literature: Shimazaki Tōson's Poetry and the Japanese Literary Reform Movement ~ <b>Grace Yon</b> , Japanese, English-Creative Writing
<b>10:00</b>	O-5 - Driven to Distraction ~ <b>Lauren Robinson</b> , Journalism- RTV
<b>10:20</b>	O-11 - Women's Sphere to Women's Strength: Changing Strategies of Dress Reformers from 1850-1900 ~ <b>Eliza Visscher</b> , History
<b>10:40</b>	O-35 - Ocean Around, Ocean Above: Intersections of Archaeoastronomy and Wayfinding in Oceanian Folklore and the Evolution of Environmental Knowledge across Polynesian History and Place ~ <b>Michael Capozzoli</b> , Geography

## Poster Session #1: 11:00 -12:00 PM

### UC Ballroom

Life Sciences			
6	Are problem invaders bigger and more fecund in the introduced versus native range? ~ <b>Natasha Boote</b> , Wildland Restoration and Resource Conservation	4	Preference of Insect Attraction to Different Wavelengths of Light ~ <b>Michael Weston</b> , Biology
7A	Identifying octopamine receptor expressing neurons in the adult Drosophila male ~ <b>Terra Hanks</b> , Biology	11	Creating a PTEN-Deficient Mesothelial Model and Growth Analysis ~ <b>Kellee Glaus</b> , Human Biology
7B	Deciphering the role of the octopamine receptor OAβ1R in Drosophila male aggression ~ <b>Alonda Paddock</b> , Ecology and Organismal Biology	<b>Physical Sciences</b>	
8	Evaluating neurite outgrowth and signal integration in response to NGF and GDNF in neuroblastoma cell lines ~ <b>Sarah Hendricks</b> , Human Biology	19	Air and Soil Temperature Variability in Northern Alaska ~ <b>Katrina Keleher</b> , Geosciences
2	Comparing the Effects of Ice Pack, Ice Bath and Cold Whirlpool on Ankle Skin Surface Temperature ~ <b>Nora Ifft</b> , Athletic Training	30	Disability levels in cerebral vascular accident (CVA) survivors: the ICF model in action ~ <b>Mirian David</b> , Kinesiology/Physical Therapy
5	The Counseling Role of the Speech Language Pathologist ~ <b>Sara Markuson</b> , Communicative Sciences and Disorders	28	Minimal amino acid sequence supporting a gross fold within a protein. ~ <b>Alexandra Heyneman</b> , Chemistry
9	Monitoring herbicide and seeding efficacy on a <i>Bromus inermis</i> dominated rangeland. ~ <b>Harrison Stein</b> , Wildland Restoration	23	Stratigraphic and Sedimentologic Analysis of the Bear Gulch Limestone (Mississippian-Pennsylvanian) near Grass Range, Montana ~ <b>Pamela Lavering</b> , Geoscience
3	Functionality Variables and Accelerometry Energy Expenditure Estimate Improvement in Individuals with Locomotor Dysfunction ~ <b>Rodolfo Villarreal</b> , Biology	31	Investigating The Mesoproterozoic-Paleozoic Great Unconformity of Western Montana: Detrital Zircon Geochronology And Implications For Terminal Evolution Of The Belt Basin ~ <b>Patrick Moffitt</b> , Geoscience

Continued

**Poster Session #1: 11:00 -12:00 PM  
UC Ballroom - Continued**

<b>Physical Sciences - Continued</b>		<b>Social Sciences - Continued</b>	
26	Absolute Photoionization Cross-Sections for Xe+ and Xe2+ ~ <b>Allison Mueller</b> , Physics	51	Clarifying Correlations between Eating Pathology and Trauma Exposure ~ <b>Callie Jacobson</b> , Psychology
25	The Effects Of Forest Litterfall On Snow Melting Rates In Northern Rockies Mixed-Conifer Forests ~ <b>Michael Schaedel</b> , Forestry	55	Identifying Child Abusers: Defeating Their Efforts to “Fake Good” ~ <b>Trudie Jones-Revious</b> , Psychology
29	Investigating Unconformities through Detrital Zircon Geochronology: Initial Results From Precambrian, Cambrian, and Devonian Formations of NW Montana ~ <b>Michael Schmechel</b> , Geoscience	56	Turning Tribal Programs into Tribal Non-Profits ~ <b>Jim O’Neill</b> , Business Management Information Systems
		48	An Examination of Religiosity Among Rural, Suburban, and Urban School Psychologists ~ <b>Zoe Potter</b> , Psychology
27	Minimizing Direct Competitions in Complete Components of (1,2)-Step Competition Graphs ~ <b>Nathan Sponberg</b> , Mathematics	49	A Qualitative Study of Successful Aging in Older Adults ~ <b>Kate Reese</b> , Psychology
20	The Amazon River Basin As An Analog For The Pre-Ice Age Bell River Basin Of North America ~ <b>Alexander Vaught</b> , Geosciences	50	Including Everyone: Training Typically Developing Children to Employ Positive Inclusion Practices ~ <b>Shelby Swant</b> , Communicative Sciences and Disorders
21	An Evaluation of the Depositional Setting of the Virgelle Sandstone in Northwestern Montana ~ <b>Sarah Washko</b> , Geoscience	57	New Role in Response-to-Intervention: A Speech-Language Pathologist’s Perspective ~ <b>Melissa Bunch</b> , Communication Sciences and Disorders
24	Physical Activity and Body Composition Measures of Elementary-Aged School Children on an American Indian Reservation ~ <b>Brian Yonts</b> , Health and Human Performance	62	Neuroplasticity, Dosage and Repetition Priming Effects in Individuals with Stroke Induced Aphasia ~ <b>Jesse Engen</b> , Communicative Sciences and Disorders
<b>Social Sciences</b>		58	Attachment in close relationships and its influence on parenting practices ~ <b>Kimberly Garrow</b> , Psychology
53	Child Phonology: Dynamic Assessment of Speech Adaptability ~ <b>Isabel Archilla</b> , Communicative Sciences and Disorders	60	Child Abusers: Can we accurately predict them by personality? ~ <b>Johanna McCormick</b> , Psychology
54	Public Perceptions in the Nonprofit Sector ~ <b>Amy Beale</b> , Classics, Nonprofit Administration Minor	63	Communication Partners’ Social Acceptance of Augmentative and Alternative Communication in Persons with Amyotrophic Lateral Sclerosis ~ <b>Dani Perry</b> , Communicative Sciences and Disorders
46	A Qualitative Analysis on Discourse in Occupational Segregation along a Gender Dimension ~ <b>Christina Bilunka</b> , Sociology	59	Donors to Social Welfare Organizations: Are they avoiding gift tax? ~ <b>Jill Sharp</b> , Accounting
47	Are You Satisfied? A Qualitative Study on Job Satisfaction in Rural School Psychologists Roles and Functions ~ <b>Madison Evans</b> , Psychology	61	Attitudes and Perspectives of Preschool and Kindergarten Teachers on Writing Development and Instruction ~ <b>Janelle Wilson</b> , Communicative Sciences and Disorders

## Concurrent Oral Sessions: 1:40-5:00 PM

### UC 326 ~ Social Sciences

1:40	O-33 - Wilderness as a Social Movement: Expanding Cultural Relevance in the 21st Century ~ <b>Dylan Lang</b> , Wildlife Biology/Resource Conservation
2:00	None
2:20	O-36 - Voices from Campus: Strategies for Strengthening University Tobacco Free Policy Implementation ~ <b>Larisa Carter</b> , Environmental Studies- Project in Public Health
2:40	O-37 - Balancing Efficiency and Compassion: Researching Best Practices for Homeless Shelter Policy Manuals ~ <b>Ally Guldborg</b> , Sociology
3:00	O-43 - A Theoretical Look at Sexual Minority Victimization and Outness to Family as a Protective Factor against Lifetime Suicide Attempts ~ <b>Charlotte Siegel</b> , Psychology
3:20	O-38 - Arctic Climate Change and the Effects on Bowhead Whales and Their Environment ~ <b>Kelly Wimmert</b> , Geography
3:40	O-39 - Maternal Healthcare and the Effects on Infant Mortality in Indonesia ~ <b>Thomas Flies</b> , Economics
4:00	O-40 - Can Personality Traits Predict Drug Use Preference?: A Discriminant Functions Analysis of Substance Use in the LGBTQ Population ~ <b>Adam Gott</b> , Psychology
4:20	O-41 - Maternal Education and Child Health Outcomes: An empirical analysis of the relationship ~ <b>Priscilla Lekalkuli</b> , Economics
4:40	O-42 - Placebo Effects, Ritual Causes ~ <b>Tessa Weyrauch</b> , Anthropology with option in Medical Anthropology

### UC 327 ~ Life Sciences

1:40	O-12 - Layer Specific Distribution of Cholinergic Interneurons in the Hippocampus ~ <b>Elizabeth Catudio-Garrett</b> , Psychology
2:00	None
2:20	O-14 - The Origin of Novel Morphologies: A Case Study of a Rhinoceros Beetle ~ <b>Dylan Gomes</b> , Biology: Ecology and Organismal
2:40	O-15 - Mercury Contamination in the Local Osprey Population ~ <b>Harrison Cooper</b> , Biology
3:00	None
3:20	None
3:40	O-19 - Comparing the Effects of Ultrasound and Stretching on Hip Flexor Flexibility and Postural Control ~ <b>Cali VanValkenburg</b> , Athletic Training
4:00	O-16 - Novel CYP26 Inhibitors as a Treatment for Alzheimer's Disease ~ <b>Jade Bosic</b> , Chemistry - Pharmacology
4:20	O-17 - The role of RNase Y in rpoS transcript processing in <i>B. burgdorferi</i> ~ <b>Richard LeCoutre</b> , Biochemistry
4:40	O-18 - Experimental Evolution of Multicellularity in <i>Chlamydomonas reinhardtii</i> ~ <b>Jacob Boswell</b> , Biology - Genetics and Evolution

Continued

## Concurrent Oral Sessions: 1:40-5:00 PM - Continued

### UC 330 ~ Physical & Life Sciences

1:40	O-20 - Wireless & Autonomous Control of Portable, Low-Power Electroluminescent Displays ~ <b>Stephen Whiteley</b> , Electronics Technology
2:00	O-21 - Do Muscle Contractile Mechanics Alter Blood Flow and Explain the Onset of Muscle Fatigue? ~ <b>Cara Saxon</b> , Health and Human Performance
2:20	O-22 - The Geometry of Corkscrew Tangles ~ <b>Holt Bodish</b> , Math, Physics & Finance
2:40	O-23 - Evolution of bacterial endoparasites as a model for the origin of mitochondria ~ <b>Eric Wall</b> , Genetics and Evolution
3:00	None
3:20	None
3:40	None
4:00	O-24 - Mining Capability of the MINERVA Observatory from Simulated Observations ~ <b>Chantanelle Nava</b> , Physics
4:20	O-30 - Halogen-bonding Catalysis ~ <b>George Neuhaus</b> , Chemistry
4:40	None

### UC 331 ~ Humanities & Social Sciences

1:40	None
2:00	None
2:20	None
2:40	None
3:00	O-1 - Dr. Horatio Storer and the Abortion Battle of the Nineteenth Century ~ <b>John Chaussee</b> , History
3:20	O-2 - Homeless at Home in Missoula: Homelessness for the Mentally Ill ~ <b>Tyler Cheesman</b> , Pre-Nursing
3:40	O-3 - Gender Construction in Contemporary Latin American Literature and Film ~ <b>Jada Kishimoto</b> , Sociology/Criminology
4:00	O-4 - Environmental Gentrification in West Oakland: Inequitable Impacts of Urban Renewal ~ <b>Ellen Myers</b> , Environmental Studies
4:20	O-7 - Of Love and Lonesomeness ~ <b>Sophie O'Brien</b> English Teaching
4:40	O-8 - Coxe's Army, Corporate Interests, and Competing Conceptions of Public Welfare in the Gilded Age: The Evolution of Political Dissent in the 1894 March on Washington ~ <b>Eamon Ormseth</b> , History

### UC 332 ~ Visual and Performing Arts (including Creative Writing)

1:40	None
2:00	O-56 - Cyberstage: A New Era of Theatre Practice ~ <b>HanaSara Ito</b> , Theatre/Anthropology
2:20	O-57 - Dancing Through the Lens ~ <b>Brooke Carlisle</b> , Wildlife Biology
2:40	O-58 - The Personal And Civic Importance Of Performance ~ <b>Alicia Connolly</b> , Theatre
3:00	O-59 - Behind the "Behind the Scenes" of Avenue Q ~ <b>Isaac Iverson</b> , Theatre Design/Technology, English Education
3:20	O-62 - David Edgar: Connection in Political Theatre ~ <b>Sally McHugh</b> , Theatre
3:40	O-63 - <i>Organized Chaos in the Silence of Solitude</i> : A Demonstration of Meditation Practice through Modern Dance Choreography ~ <b>Claire Christensen</b> , BFA in Dance, specializing in Choreography and Performance
4:00	O-60 - Shakespeare's fairies set in 1950 ~ <b>Rita Sam-Venn</b> , Theater
4:20	O-61 - Pseudo Synesthesia on the Bakken Oil Field - Discovery of Place through Creative Non-Fiction ~ <b>Patrick Myers</b> , Environmental Studies (emphasis in writing and literature)
4:40	None

**Poster Session #2: 3:00 -4:00 PM  
UC Ballroom**

Humanities		Physical Sciences Continued	
1	Propaganda with the World at War ~ <b>Nicholas Connor</b> , History & Communication Studies	41	Isolation of the Uranyl Dication ~ <b>Geoffrey Glidewell</b> , Chemistry
Life Sciences		40	The Effects of an Off-Season Exercise Program For Special Olympic Athletes ~ <b>Shawnee Good</b> , Exercise Science - Pre-Professional
10	Utilizing the NLRP3KO cell line to visualize inflammasome formation in the presence of cholesterol-trafficking modifiers ~ <b>Emilie Jacobsen</b> , Microbiology	42	Offseason Training Programs Improve Fitness of Special Olympic Athletes ~ <b>Brittany Graham</b> , Exercise Science
12	Peer Mediated Intervention and Instruction: Mutually Beneficial Throughout the Lifespan ~ <b>Lacey Kvam</b> , Communicative Sciences and Disorders	39	The Effects of Offseason Training on Special Olympics Athletes ~ Tayler Holder, Health and Human Performance
13	Telepractice in the Field of Speech-Language Pathology ~ <b>Rebecca Riordan</b> , Communicative Sciences and Disorders	36	Early Cenozoic Fluvial Deposits Of The Renova Formation In SW Montana: Links To Southern Nevada And Utah? ~ Aidan Jarvis, Geosciences
17	Plants and Fungi Unite: A Significant Symbiosis ~ <b>Nicolas Glynos</b> , Biology	37	Balanced And Restored Cross- Sections Representing Post-Miocene Crustal Extension Of Fluvial Deposits, North-Central Montana To Southeast Idaho ~ Benjamin Johnson, Geoscience
74	Chitin: an alternative nitrogen source for algae growth and the treatment of pulp and paper mill wastewater ~ Ryan Parks,		
16	Leaky Moss in Montana's Grasslands ~ <b>Ryan Milling</b> , Wildlife Biology	35	Do Montana's Sixmile Creek Cobbles Have Nevada Origins? Evidence For Headwaters Of The Miocene Bell River Basin ~ <b>Stacia Martineau</b> , Geoscience
15	The Role of Chromatin Modification in Germ Cell Specification and Development ~ <b>Jenessa Olson</b> , Biochemistry	38	Monitored fitness programs can improve fitness for special olympic athletes. ~ <b>Brooke Nearpass</b> , Health and Human Performance
18	Which Trees Do Mountain Pine Beetles Attack? ~ <b>Gilia Patterson</b> , Biology	43	Continuous measures of blood flow during all-out dynamic exercise ~ <b>Payton Skawinski</b> , Biology
Physical Sciences		44	Modeling Long-Term Streamflow Response to Precipitation Change Using an Ecohydrologic Model ~ <b>Brandon Veth</b> , Geosciences
33	Investigating Sequence Boundaries between Middle Proterozoic Bonner, McNamara, and Garnet Range Units through Detrital Zircon Geochronology ~ <b>Dylan Davis</b> , Interdisciplinary Geosciences	45	Generating the Demographic Attributes of the Synthetic Electronic Health Record ~ <b>Russell Klein</b> , Information Technology
34	Examining Airborne Infrared Fire Detection Data in the Context of Fire Severity ~ <b>Benjamin Garrett</b> , Forest Resource Management	Social Sciences	
32	Test-Retest Reliability of the Big Sky Aphasia Program-Assessment of Language in Context ~ <b>Jenny Silvernale</b> , Communicative Sciences and Disorders	65	Enviromental Barriers and Pain Catastrophizing ~ <b>Cathy Berendts</b> , Psychology

**Poster Session #2: 3:00 -4:00 PM**

**UC Ballroom - Continued**

**Social Sciences -Continued**

64	Missoula Middle School Climates as Perceived by Respect Club Members ~ <b>Heather Engblom</b> , Psychology
71	Revisions to the Coding of Maternal Mind Mindedness ~ <b>Kelsey Halvorson</b> , Psychology
66	The Effects of Environmental Context on Correct and False Recognition Memory ~ <b>Kevin Kuper</b> , Psychology
72	Sports-Related Concussion Management in Montana Youth: Rural vs. Non-Rural Settings ~ Tiffany Martin, Psychology
67	Moderating Stereotype Judgments Through a Priming Anecdote ~ Michele Schahczenski, Psychology and Anthropology
68	Analysis of Factors that Influence Visits to a Healthcare Professional ~ Alexandra Schiwal, Psychology
69	Family Size and Socioeconomic Status in Humla District, Nepal~ Lucy Tompkins, Journalism
73	Women's Health Seeking Behavior in Rural Uganda ~ Sophia Bay, Anthropology

**New this year: UMCUR Painting and Print Exhibition**

**4:00 - 5:00 PM, UC Tech Lounge**

Undergraduate students submitted a JPEG image of a single two-dimensional artwork along with an artist statement. All submissions have been evaluated by professional artists, and only artworks of the highest professional quality have been selected for display.

Here ~  
Parker J. Beckley



Eleutheromania ~  
David M. Sampson



Concrete Jungle ~  
Hannah M. Callahan



Reflecting on Sinopah ~  
Celeste Bickford



Norms ~  
Eva J. Stone



# UMCUR Abstracts: Oral Sessions

(in numerical order by Abstract ID number)

Dr. Horatio Storer and the Abortion Battle of the Nineteenth Century  
(O-1) **John Chaussee**

This paper argues that an esteemed member of the American Medical Association, and a respected, world-renowned physician influenced the argument against abortion and shaped the laws enacted against it in the latter half of the nineteenth century. Dr. Horatio Storer based his crusade against abortion on his own interpretation of the moral and ethical codes which he felt all physicians should adhere to while practicing medicine. Author of numerous pamphlets and books, Storer led the battle to ban abortion as a spokesman for the AMA.

This research paper is the culmination of a semester of in-depth research under the guidance of Professor Volk. Numerous primary and secondary resources played a significant role in the crafting of this paper. These sources include books and tracts written by Storer, period newspaper pieces, and scholarly secondary sources. This project is unique in its scrutiny of Storer's motives. Other historiography lauds Storer as a champion of the unborn, while this paper examines Storer's personal and professional ambitions in his crusade against abortion. This research is significant in its critical approach of Storer's reasoning against abortion, including his belief that pregnancy induced a state of temporary insanity in all women. Further, this paper helps explain why abortion continues to be a controversial topic to this day.

**Mentor:** Professor Kyle G. Volk, History

Homeless at Home in Missoula: Homelessness for the Mentally Ill  
(O-2) **Tyler Cheesman**

Many homeless individuals have to battle through the hardships of meeting their daily basic needs: some of these individuals have to do this while dealing with a mental illness. In Missoula, many homeless individuals become clients of the Poverello Center; where they get help meeting their daily basic needs as well as get some support with their mental illness through case workers. This paper will discuss some of the obstacles that homeless individuals face when they have a mental illness. I will draw upon ethnographic fieldnotes describing approximately 40 hours of observation at the Poverello Center. I expect to find two things. First, I expect to find that clients of the Poverello Center with mental illnesses face many more hardships than clients without mental illnesses. Second, I expect to find that these hardships include acquiring jobs, communicating with officials, having proper medical care, and receiving correct medications. The insights into the challenges of the mentally ill homeless population that I will generate, will help the general public be more understanding of the homeless population.

**Mentor:** Daisy Rooks, Sociology

Gender Construction in Contemporary Latin American Literature and Film  
(O-3) **Jada Kishimoto**

Historically, societies have been predominately patriarchal; the Americas are no exception. Patriarchy and male-dominated societies are still a presence in the world in general, but my focus is on Latin America, a region where sexism and misogyny continue to have a great impact on the overarching culture. My presentation will draw on articles that range from *Feminist Review* to *St. Thomas Law Review* to the Journal of International Women's Studies and such works as Phillip Swanson's *Companion to Latin American Studies* and Raphael Lopez-Corvo's *Woman within: A Psychoanalytic Essay on Femininity*. These works, coupled with a literary analysis of the poem "Kinsey Report" by Rosario Castelanos, and an analysis of the two films, *Central do Brasil* (Central Station) and *The Official Story*, as shown in my Race, Class, Gender, and Sexuality Class last semester, are going to support the theory that 'gender' and therefore 'gender roles' are socially constructed.

I argue that gender definitions of women are based on how women complement men. Women, then, are by definition secondary and hence inferior. If gender is a social construct and society propagates said constructs, then anything that defies or challenges the status quo is dangerous on social, political, economic, and cultural levels. These kinds of assumptions about how women are second-class citizens must be analyzed and deconstructed to help eliminate sexism, discrimination, intolerance, and violence. It is my hope, that my presentation will make a small yet important contribution to gender equality.

**Mentor:** Clary Loisel, Department of Modern and Classical Languages and Literatures

Environmental Gentrification in West Oakland: Inequitable Impacts of Urban Renewal  
(O-4) **Ellen Myers**

Gentrification alters the characteristics of a neighborhood by increasing the number of wealthy residents; it results from policies by government entities and investments by community members, business groups, and developers. In West Oakland, gentrification has altered the community and displaced low-income residents. Solutions aimed at mitigating negative impacts of gentrification are in place, but displacement of residents continues to occur. A good understanding of underlying factors contributing to gentrification is necessary to prevent further displacement. This research seeks to analyze existing prevention and mitigation measures such as low-income housing designations in new developments, and propose alternatives aimed at further reducing burdens on low-income and minority residents. Using an environmental justice framework, a concept focused on the fair distribution of environmental benefits and burdens, this research examines issues of social and environmental injustice. It seeks to characterize the nature of gentrification in West Oakland through the collection and analysis of Census data, news stories, city government records, and policy reports. Secondly, it works to identify social, economic, environmental, and cultural factors contributing to gentrification by analyzing this information. Using scholarly articles and similar case studies, this research also seeks to suggest additional methods of preventing and mitigating the negative effects of gentrification on low-income and minority residents. Preliminary results indicate that in West Oakland, local government attempts at increasing city tax revenue and the changing economic climate of the tech-booming Bay Area resulted in the displacement of low-income and minority people. Small community-based groups have achieved some success by organizing and fighting for improvements aimed to fulfill current community needs rather than cater to wealthier tastes. More needs to be done to eliminate the issue of displacement caused by gentrification and ensure suitable environmental quality for all. Without improved social equity, problems will continue to be relocated, rather than solved.

**Mentor:** Robin Saha, Environmental Studies



Driven to Distraction  
(O-5) **Lauren Robinson**

Today's drivers are bombarded with distractions, and distracted drivers impact hundreds of lives across the state each year. Whether it's answering a cell phone, adjusting the radio, controlling screaming children or eating some food, doing multiple tasks while driving has become normal. As part of a documentary project with Montana PBS, this presentation will focus on the emerging quantitative data of accidents caused by distracted drivers. This is a relatively new phenomenon, and researchers are just now noticing and publishing statistics and trends.

It's unknown how many people are affected by accidents caused by distracted driving, but law enforcement officials say the numbers are higher than traditionally reported, partially because it's difficult to determine distraction as the main cause of an accident, especially a fatal one. Law enforcement officials and medical examiners have told me that distracted driving causes a high percentage of accidents. I've spoken with admittedly distracted drivers; victims of accidents and their families, law enforcement and drivers' education program coordinators, and all agree that distracted drivers cause a problem on Montana's roads. The American cultural need to always be connected and productive fuels the problem, encouraging people to work, text, and network while driving. Numbers from sociological experts continue to emerge, as this phenomenon took off within the last ten years.

The documentary portion will focus on individual, character-driven stories. For my presentation, I explored the statistics and numbers created by taking these, among other stories, as part of a collective whole.

**Mentor:** Denise Dowling, Journalism- RTV

Straightening out Queer Stereotypes through Literature  
(O-6) **Paige Ferro**

Countless stigmas and prejudices abound regarding gender and sexuality issues and the dichotomy between heterosexuality and homosexuality. Even as it has existed as an accepted part of various cultures across time and continents, it continues to go undiscussed and overlooked in many communities due to the fallacies and preconceptions surrounding it. Literature, however, provides an outlet through which one may explore same-sex relationships beyond the common stereotypes and misconceptions. Literature and fiction not only give the writer an opportunity to relate his or her personal or intimate experiences to the world, but also allow the reader a socially-accepted means to approach this difficult issue. Fiction can help reveal the realities behind same-sex love and relations and may put some of the stereotypes to rest.

Through an examination of some of the foundational works in the canon of Queer Studies and Queer Theory, such as Donald E. Hall's *Queer Theories* and novels such as Emily M. Danforth's *The Miseducation of Cameron Post*, I will be looking at the ways these works reveal the realities behind same-sex relationships and help dissolve preconceptions and issues surrounding the understanding of homosexuality and what it means to be "queer".

**Mentor:** David Gilcrest, English

Of Love and Lonesomeness  
(O-7) **Sophie O'Brien**

As one of America's great authors, John Steinbeck provided readers with an astute perspective on the many joys and sorrows of American life during the early 20th century. By creating stories whose plots are built around colorful and often eccentric characters rather than a great deal of action, Steinbeck is able to focus on the nature of his characters and the ways in which they interact with each other. While these interactions move the plot forward, readers gain insight into Steinbeck's observations of human nature and the needs and desires that work to motivate the individual, influencing the way that he or she interacts with others.

For this project, I chose to explore the romantic and sexual relationships that are created in a couple of these works. After reading *Of Mice and Men* and *Sweet Thursday*, I will use Sigmund Freud's theories on sex and sexuality to interpret the way that the main characters, specifically Lennie and Doc, feel about the relationships in which they participate, whether willingly or unwillingly. The two relationships in these works are defined by the same basic human needs, but the stories conclude very differently; I hope to gain an understanding of the reasons for these differences by applying Freudian principles to a character analysis of Doc and Lennie. I expect this analysis to shed a new light on two popular works and provide readers with a more comprehensive understanding of Steinbeck's characters and the complex relationships that define them.

**Mentor:** Quan M. Ha, Department of English

Coxey's Army, Corporate Interests, and Competing Conceptions of Public Welfare in the Gilded Age:  
The Evolution of Political Dissent in the 1894 March on Washington  
(O-8) **Eamon Ormseth**

The United States boasts a rich and varied history of political dissent. Over the past three centuries, men and women have created innovative ways to challenge the injustices of the social and economic orders they lived under. However, in the 19th century, political dissent was largely confined to specific issues of more localized concerns and national political movements oriented around a societal issue were relatively uncommon. Then, the Financial Panic of 1893 happened, causing the greatest economic depression the United States had ever faced. Out of this collective societal chaos arose Coxey's Army, a group of unemployed men led by Jacob Coxey, a wealthy Ohio businessman and Carl Browne, a jack of all trades man with a talent for public spectacle. In late March, the army set out to march on Washington, D.C. to publicly petition Congress to pass two bills, the Coxey Good Roads Bill and the Coxey Non-Interest Bearing Bonds Bill. This research examines the economic and social philosophy of Coxey's underlying the bills and the temperament of the marchers.

From the ashes of the calamitous financial implosion, Coxey's Army lent popular legitimacy to his ideas for a more equitable economic system (which drew on prior Socialist thought and Populist and Greenback party politics). Foremost among these was the right to work, and implicit in it the idea that government was responsible to provide a job given the power it wielded over the economy. Through a new, novel form of political dissent, Coxey's army altered the societal discourse regarding laissez-faire economic ideals and the government's role in the economy. The Army legitimized the notion of popular dissent by providing a vehicle for the common man to become involved and voice his concerns and inaugurated the American practice of marching on the Capitol.

**Mentor:** Kyle Volk, History

Creating a New Literature: Shimazaki Tōson's Poetry and the Japanese Literary Reform Movement  
(O-9) **Grace Yon**

This research project shows how the poetry of writer Shimazaki Tōson (1872-1943) influenced Japanese literary and language reform movements during the late 19th and early 20th centuries. Although Tōson's fiction has often been the focus of critical studies and research, the impact his poetry had on these reform movements and on the shape of modern Japanese literature tends to be overlooked. In this paper, I show the importance of these overlooked works by examining a wide range of Tōson's poems and focusing on the way that they blend classical Japanese natural themes and rhythm, most commonly a 5-7-5 or related syllable pattern, with contemporary Western Romanticism. Upon examination of Tōson's poetry, it becomes clear that these works acted as a bridge between classical literature and contemporary colloquial speech patterns, as well as a bridge between classical Japanese literature and modern, more Western-influenced styles. This bridging process was key to the redefinition of Japanese literature in the modern period. In turn, these changes brought written styles closer to the Japanese actually spoken by most citizens and helped to expand the readership of Japanese literature while showing that this new style could still ring with the rhythm and beauty of traditional Japanese literary forms. Demonstrating the influential nature of Tōson's poetry for Japanese language and literary reform movements, this thesis highlights the importance of often overlooked writing during a transitional period in the history of Japanese literature.

**Mentor:** Robert Tuck, Japanese

Environmental Justice & HidroAysén: Pristine Waters to Power Santiago, Multinational Mining Interests in Chile  
(O-10) **David Schaad**

On May 9, 2011, the Chilean national government under President Sebastián Piñera approved HidroAysén, a controversial hydroelectric megaproject to be constructed in the Aysén region of southern Chile. With HidroAysén expected to flood 5,900 hectares (15,000 acres) of ecologically unique natural reserves and displace tens of thousands of local indigenous and working class people, its development raises major environmental justice concerns among Chileans and the international community. The project stalled in 2012 and was postponed indefinitely due to widespread public protests in which tens of thousands of Chileans took to the streets unified by the motto *Patagonia Sin Represas* (Patagonia Without Dams). I was studying abroad in Chile in the spring of 2012 at the height of these demonstrations and was deeply impressed by the aggressive approach and vibrant history of public protest in Chilean society and youth culture.

My research conducted in Spanish and English investigates the environmental justice issues surrounding the HidroAysén project, the various arguments for and against HidroAysén by the major parties bearing a stake in this issue, and the important role and power of mass protest by ordinary citizens who refused to be displaced from their lands and livelihoods for economic development. I highlight the testimonies and perspectives of local people, whose words and voices have been ignored and overridden by national policy. I also draw parallels between HidroAysén and contemporary North American resource development challenges as it is my hope that insights from Chile's battle for Aysén can inform our own approaches to effective environmental activism.

**Mentor:** Daniel Spencer, Environmental Studies

Women's Sphere to Women's Strength: Changing Strategies of Dress Reformers from 1850-1900  
(O-11) **Eliza Visscher**

In the latter half of the nineteenth century, women's clothing in the United States embodied the societal restrictions imposed on women. Clothing reform represented a critical cog in the holistic wheel of expanding women's rights in all fields. Through research of contemporary newspapers, meeting minutes, and secondary scholarship I analyzed the language used by these dress reformers to initiate change. The historic and societal aspects have been extensively researched, but I closely examined the specific way dress reformers persuaded men and women. Dress reformers adapted their strategy as social construction evolved over the century. Meeting little success in their initial targeting of men in popular culture, advocates of clothing reform shifted toward reaching other women, demanding that they find their own voice. My research demonstrates how woman changed their perception of themselves and discovered their ability to alter society in the late nineteenth century.

**Mentor:** Kyle Volk, History

Layer Specific Distribution of Cholinergic Interneurons in the Hippocampus  
(O-12) **Elizabeth Catudi-Garrett**

Release of the neurotransmitter acetylcholine (ACh) into the hippocampus is essential for learning and memory. Lack of hippocampal acetylcholine is associated with cognitive deficits in Alzheimer's disease. The major source of acetylcholine in the hippocampus is extrinsic and supplied by the medial septum-diagonal band of Broca (MS-DBB). However, hippocampal cholinergic interneurons may be an intrinsic source of ACh. Originally discovered using antibodies to the ACh synthesizing enzyme choline acetyltransferase (ChAT), little is known about these intrinsic cholinergic interneurons. With advances in technology, a ChATxRosa26-YFP mouse was developed that enabled the visualization of yellow fluorescent protein (YFP) in hippocampal cholinergic interneurons. The experiments were designed to investigate the localization of hippocampal cholinergic interneurons across five dimensions, spanning layers, subregions, hemispheres, ages, and gender. By identifying locations where the cholinergic interneurons are most densely populated, and identifying any differences in cell populations, one can begin to infer the physiological significance of these specialized cells. In four ChATxRosa-YFP mice, YFP+ cell counts and distributions (mean  $\pm$  SEM) were recorded in serial sections in CA3, CA1 and dentate gyrus (DG) regions. We found layer specificity within CA3, CA1, and DG regions ( $p < 0.0001$ ,  $n = 88$  slices). The greatest number of YFP+ cells was found in the CA3 stratum pyramidale layer (SP) ( $13.7 \pm 1.4$ ), which was significantly higher than in SP CA1 ( $1.6 \pm 0.1$ ,  $p < 0.0001$ ,  $n = 88$  slices). Pooled lateralization testing indicated that in the right DG, the hilus ( $p = 0.009$ ) and stratum granulosum ( $p = 0.001$ ) had higher YFP+ cells than the left DG ( $n = 31$  slices,  $n = 3$  mice). Therefore, these YFP+ cells were not randomly scattered, strongly indicating that cholinergic interneurons exhibited layer and region specificity. In conclusion, cholinergic interneurons are a highly specialized population of neurons localized to specific layers and regions, suggesting an important role of hippocampal cholinergic transmission in both physiological and pathological states.

**Mentor:** Josh Lawrence, Biomedical and Pharmaceutical Sciences

Origin of Novel Morphologies: A Case Study of a Rhinoceros Beetle  
(O-14) **Dylan Gomes**

The origin of novel morphological structures has mystified biologists for centuries. These often-impressive structures appear to spring into existence, without passing through any intermediate forms. An exciting recent discovery in evolutionary biology is that some novel morphologies evolve via cooption of existing gene networks. When these ancient networks are deployed in new locations novel structures can result.

Rhinoceros beetle horns are impressive novel morphologies; some horns are longer than their bearer's body. There is evidence that dung beetles, another group of horn-bearing beetles, have coopted the insect appendage patterning pathway (APP) for horn development. Dung beetles diverged from rhinoceros beetles roughly 150 MYA, and horns arose independently in these groups. I propose to investigate whether the APP is also responsible for horn development in the rhinoceros beetle *Trypoxylus dichotomus*.

RNA interference involves injecting RNA into an organism at a precise time in development. The animal's enzyme Dicer matches this injected RNA with its own messenger RNA strands and destroys them. Destruction turns off the targeted gene during development, allowing insight into the function of that gene. I will use this technique to silence three candidate genes from the APP in larvae of *T. dichotomus*. The larvae will then be allowed to continue metamorphosis into adults and I will measure differences in horn characteristics. If these genes are involved in horn development, I expect to see dramatic differences between the horns of treatment and control beetles. This would suggest that rhinoceros beetles have coopted the insect APP. Finding no difference in horn morphology, however, would implicate a fundamentally different mechanism for horn evolution. Either way, my studies will provide critical first insights to the origins of these novel traits, and will allow a better understanding of the relative ease of cooption of existing gene pathways for various, and often novel, functions.

**Mentor:** Douglas Emlen, Division of Biological Sciences

Mercury Contamination in the Local Osprey Population  
(O-15) **Harrison Cooper**

Osprey are birds of prey that feed exclusively on a diet of fish, and are therefore extremely susceptible to contamination in the aquatic systems. In particular, methyl mercury is known to be a very dangerous neurotoxin. This is part of a long-term study of osprey biology and demography, in which the current study focuses on ecotoxicology of methyl mercury in ospreys. The purpose of this study is twofold: to determine the extent of Mercury contamination in the Clark Fork River as well as to understand the effect it is having on osprey's reproductive success. In order to accomplish this, we surveyed many osprey nests throughout the area, in both high-mercury and low-mercury watersheds. We took small blood and feather samples as well as counting the number of eggs and chicks in each nest. We also used remote control helicopters as a relatively non-invasive method for counting eggs in the nest. I also developed an interactive map to serve both for a convenient database as well as a part of public outreach. Mercury concentration in osprey blood has a significant and disturbing effect on the survivorship of osprey chicks; over half of the eggs in some nest fail to hatch. Ospreys are a useful indicator of overall river health, and this shockingly high contamination level may have severe implications for the ecosystem and human life.

**Mentor:** Erick Greene, Department of Biological Sciences

Novel CYP26 Inhibitors as a Treatment for Alzheimer's Disease  
(O-16) **Jade Bosis**

More than 5 million Americans are living with Alzheimer's Disease (AD) and an American develops AD every 68 seconds. With no cures or significantly effective treatments available the number of Americans with AD is estimated to reach 7.1 million in 2025. AD is characterized by the increase in beta-amyloid plaques located in the extracellular space between the brain's nerve cells. The endogenous chemical, retinoic acid (RA), plays a role in learning and memory and has been shown to reduce amyloid-beta plaques and rescue learning deficits associated with AD. However, the rapid metabolism of RA by hydrolase CYP26 results in a short half-life. We propose CYP26 inhibition to cause an increase in endogenous RA. Increased concentrations of RA in the brain increase the retinoic acid receptor (RAR) and retinoic x receptor (RXR) signaling pathways which contribute to learning and memory. RAR/RXR signaling plays a critical role in learning, memory and long-term potentiation by mediating synaptic transmission and potentiation in the hippocampus. With the use of a mouse model, a novel CYP26 inhibitor can be tested using pharmacokinetic and behavioral studies, such as the Morris water maze and Y maze, as a basis to measure its effectiveness as a treatment method of AD.

**Mentor:** Josh Lawrence, Biomedical Sciences

The role of RNase Y in rpoS transcript processing in *B. burgdorferi*  
(O-17) **Richard LeCoultre**

Lyme disease affects an estimated 300,000 Americans yearly, and, if untreated, can be deadly. *Borrelia burgdorferi*, the bacterium that causes Lyme disease, is likely transmitted to hosts in a process involving rpoS messenger RNA (mRNA) processing via ribonucleases (RNases). RNases are enzymes that degrade the nucleic acid RNA and are involved in many molecular processes in cells. *B. burgdorferi* requires a change in gene expression to transmit from its tick vector to a mammalian host. Transmission depends on a complicated cascade of regulatory factors, including the alternative sigma factor, RpoS. Sigma factors are a component of RNA polymerase, the enzyme that transcribes genes. RpoS production requires the translation of a processed rpoS mRNA; however, the mechanism by which this rpoS mRNA is processed is unknown. I am investigating whether the rpoS mRNA is cleaved by RNase Y in *B. burgdorferi*. Previous research in *Bacillus subtilis* shows that this enzyme appears to be responsible for both global mRNA stability and degradation. To this end, I am attempting to obtain RNase Y by overexpression of recombinant RNase Y with a truncated transmembrane domain and subsequent purification using the IMPACT system. I am using this purified protein to characterize the potential processing site of the rpoS mRNA by using various artificial rpoS mRNA substrates through an in vitro cleavage assay. This research will contribute to a better understanding of the transmission mechanism of *B. burgdorferi* and of the function of RNase Y. Additionally, this project has the potential to provide the basis for developing new antimicrobial therapies against Lyme disease. If identified as crucial to transmission of Lyme disease to hosts, the thorough characterization of RNase Y activity in processing mRNA will reveal specific targets for drug and therapy development.

**Mentor:** Scott Samuels, Division of Biological Sciences

Experimental Evolution of Multicellularity in *Chlamydomonas reinhardtii*  
(O-18) Jacob Boswell

In Life's nearly four billion year history, organizational transitions have occurred that fundamentally altered the course of evolution. One of these, multicellularity, arose independently in at least two dozen lineages, giving rise to a remarkable variety of complex forms. In the volvocine algal family, many transitional structures are retained in extant lineages, ranging from the unicellular, flagellated *Chlamydomonas reinhardtii* to the extravagant *Volvox carterii*, which contains as many as 50,000 differentiated cells. Many hypotheses have been suggested for the selective pressure that drove the evolution of multicellularity in this group, but none have been explicitly tested. Here, we tested the hypothesis that multicellular *Chlamydomonas reinhardtii* can evolve due to predatory selective pressure. By maintaining a continuous culture of the unicellular algae *C. reinhardtii* with the predatory ciliate *Paramecium*, we were able to select for multicellular phenotypes, due to the increased fitness of algal individuals whose size exceeds the maximum particle size of the predators. After 50 weeks of culture, a range of multicellular *C. reinhardtii* individuals were isolated from the experimental populations. As our research continues, we are implementing a number of genetic and genomic techniques to map these multicellular phenotypes on to specific coding and regulatory changes in the genome of the evolved isolates.

**Mentor:** Frank Rosenzweig, Biological Sciences

Comparing the Effects of Ultrasound and Stretching on Hip Flexor Flexibility and Postural Control  
(O-19) Cali Van Valkenburg Britt Dickman

**Context:** Stretching has become a universally accepted practice used to increase flexibility, reduce muscle injury, and improve performance. In addition to stretching, modalities, such as ultrasound have been used to increase collagen extensibility, therefore increasing range of motion through deep heating. The premise for this study was to see if combining a stretching routine with ultrasound would improve range of motion (ROM) and postural control. **Purpose:** The purpose of this three trial study was to assess the effectiveness of both ultrasound and static stretching on hip flexor range of motion and postural control. **Participant:** Three males and three females between the ages of 18 and 30 were studied. All of the participants were moderately active and had not sustained an injury to their dominant leg six months prior to the study. **Methods:** Each participant completed all three trials (ultrasound alone, stretching alone, ultrasound and stretching combined) within one week, with a 24-hour period placed between each trial. Active hip extension and star excursion balance measurements were taken before and after each trial. **Results:** The 2 X 3 repeated measures ANOVA revealed no statistical significance for hip extension and SEBT ( $p=0.79$  and  $p=0.13$  respectively). The combo and US trials both showed a decrease in hip ROM, whereas static stretching improved hip ROM slightly (not significant). **Conclusion:** This research intended to determine ultrasound's outcomes on increasing ROM and postural control in the hip flexors and how these effects could be enhanced by a stretching routine. However, the results of this study were found to be inconclusive for all three trials performed.

**Mentor:** Valerie Moody, Health and Human Performance

Wireless & Autonomous Control of Portable, Low-Power Electroluminescent Displays

(O-20) **Stephen Whiteley**

Electroluminescent (EL) displays exist in a number of forms, the most prevalent being EL wire and EL panels. In either form, the mechanism of operation and functionality is essentially the same: high voltage AC current is passed through opposing conductors on either side of a phosphor substrate, inducing electrophosphorescence and illuminating the device. EL technology is not new, in fact EL panels have been used for years as backlighting elements for LCD displays (seen commonly in older radio sets and cell phones). More recently, the quality of EL products has increased drastically, especially with respect to the brightness and longevity of the devices. In addition to this, the cost of the technology is relatively low, for example: each of the panels in this project cost less than \$5.

EL panels and wire are bright, colorful, and completely flexible; this has made them popular in the fields of fine and performance arts. Even though they require a high voltage, and relatively high frequency AC source, their power consumption is surprisingly low. Due in large part to the complex driving circuitry required to power the electroluminescent elements, it is still uncommon to see the technology used in low cost, portable applications; where perhaps it is the most stunning.

It is the goal of my project to build several, standalone EL panel displays that would respond to a single transmitted signal. Each standalone display will be battery powered and completely portable. The transmitted signal will deliver a response (and ultimately cause the displays to respond) to an audio signal, either voice or music. Another approach is to design each panel to respond to the ambient sound in its immediate vicinity. Both methods will be explored in this project.

**Mentor:** Xueying Shen, Dept. of Applied Computing & Electronics

Do Muscle Contractile Mechanics Alter Blood Flow and Explain the Onset of Muscle Fatigue?

(O-21) **Cara Saxon, Samantha Jones, Roisin Nakada, Charles Churchill and Craig Maunder**

During brief all-out muscular activity eliciting failure between 3 and 300 s, the level of performance available from muscle decreases exponentially between the musculoskeletal maximum and the performance supported by the body's aerobic power (i.e.  $\dot{V}O_{2peak}$ ). Here, the muscle duty cycle, the ratio of the durations of muscle activity to the entire movement cycle, was experimentally manipulated to alter the level of sustainable force at the condition-specific aerobic limit. We hypothesized that the expected greater levels of sustainable force output achieved in the mode with longer rest periods between contractions, were due to the greater opportunity for vascular perfusion or muscle clearance during the longer inactive periods. Therefore, we continuously measured femoral artery blood velocity via pulsed Doppler ultrasound and artery diameter by sonogram, to calculate blood flow throughout each of the 10 exhaustive bouts of knee extension exercise administered in each experimental by every subject ( $n = 8$ ). This novel data acquisition technique allowed us to obtain what we believe to be the first-ever continuous measurements of blood flow by quantifying the femoral artery diameter and blood velocity during exhaustive trials. Applied muscle forces and powers were measured continuously from a custom knee-extension ergometer with strain gauges and an incremental encoder. We measured non-steady rates of oxygen uptake in Douglas bags evaluating whether the hypothesized unequal blood volumes conferred greater rates of aerobic metabolism or greater rates of muscle clearance. Our results showed the forces eliciting this common exercise intensity differed nearly 2-fold (60% duty cycle  $95 \pm 46N$  vs 30% duty cycle  $184 \pm 46N$ ). Rates of oxygen uptake by muscle were similar between conditions but measured blood velocities were greater in the 30% duty cycle condition, suggesting that during high intensity exercise sustainable levels of performance are achieved through removal of accumulated metabolites rather than increased aerobic respiration.

**Mentor:** Matt W Bundle, Health and Human Performance



The Geometry of Corkscrew Tangles  
(O-22) Holt Bodish, Jay Egenhoff, Dennis Price and Cody Sevier

This project highlights the connections between elastic spaces, known as topological spaces, and spaces with rigid geometric structure. It is an investigation of an infinite subset of topological spaces not yet studied which are known as corkscrew tangles. These are formed by drilling (conceptually) two tunnels out of a solid ball, from which the geometric structure of the tangles may be deduced.

Preliminary efforts have led to a description of the geometry of the simplest tangles in the family. Furthermore, a consistent method has been found to triangulate arbitrary tangles and this seems to be the key to finding geometric structures for the remaining tangles.

Three computer programs assist with computation necessary for the project: SnapPy, Regina, and Sage. Snappy provides information such as the volume of the tangles. Regina gives detailed descriptions about the triangulation of the space. Sage, a computer algebra system, is used to solve large systems of equations. This project integrates computer skills, mathematical intuition and critical thinking skills and applies them to a contemporary issue in topology. The primary objective of the project is to develop a generalization of the geometry of these corkscrew tangles, which may be achieved by the time of the UMCUR conference.

**Mentor:** Eric Chesebro, Mathematics

Evolution of bacterial endoparasites as a model for the origin of mitochondria  
(O-23) Eric Wall

Through its nearly 4 billion year history, life has undergone a number of major evolutionary transitions. One involved the acquisition of mitochondria by the ancestor of nucleated cells. The acquisition of mitochondria enabled these cells to respire oxygen, greatly increasing the energy they could obtain from resources like simple sugars and amino acids. Though it is widely accepted that mitochondria originated as free-living bacteria, little is known about how they came to be symbionts of their hosts. The aim of my research is to develop a model using extant microbial species that recapitulates the initial stages of this major evolutionary transition. To that end I will apply selection on the parasitic bacterium *Bdelle vibrio bacteriovorus* and its host/prey *Escherichia coli* that encourages the former to reside in the latter for progressively longer periods of time without killing it. My ultimate goal is to evolve a *Bdelle vibrio* bacterium that can reside indefinitely inside its host, which would serve as a model for the origin of another endosymbiont, the mitochondrion. No experimental model currently exists for the origin of mitochondria. By investigating the genetic basis of the transition from a parasitic to a commensal relationship between these bacteria I hope to gain insight into one of the key innovations that led to emergence of complex life that includes fungi, plants and animals, including humans.

**Mentor:** Frank Rosenzweig, Biological Sciences

Determining Capability of the MINERVA Observatory from Simulated Observations

(O-24) **Chantanelle Nava**

In the search for Earth analogues, astronomers are using technology designed to detect small rocky planets in the habitable zone, the annulus around a star in which temperatures could support liquid water. Small rocky planets induce RV signals easily missed in the presence of stellar noise sources of comparable or larger amplitudes. Over the next decade, the introduction of new technology such as the James Webb Space Telescope (JWST) and the Thirty Meter Telescope (TMT) will allow astronomers to search small rocky planets' atmospheres for biomarkers indicating the existence of past or present life. Before these telescopes take to the sky, however, it is essential that their operators know the most promising locations to investigate. MINERVA (MINIature Exoplanet Radial Velocity Array) is a dedicated exoplanet observatory with 1 meter per second precision to detect these low-mass Earth-like planets orbiting in the habitable zone of bright, nearby stars. We can determine how many planets we can expect to detect around these targets and optimize our observing strategy through the use of statistics from the NASA Kepler mission. I have produced computer-simulated MINERVA observations to quantify the observatory's expected exoplanet yield and develop an observing strategy that will maximize the number of detections. In preliminary results, MINERVA's expected yield is  $15 \pm 4$  new exoplanets with  $2.2 \pm 1.5$  in the habitable zone based on an average over 1000 simulations.

**Mentor:** Nate McCrady, Physics

Comparing the Effects of Pulsed Shortwave Diathermy and Static Stretching on Shoulder Range of Motion.

(O-25) **Erika Stinchcomb Taylor Baldwin**

The purpose of a warm-up is to physiologically prepare the body for upcoming physical work. The relative effectiveness of different modes of warm-up, however, is unknown. A common method is a passive warm-up, which is the therapeutic use of an external heat source to warm the muscles. To maximize the benefits of heating modalities, it is thought that an active warm-up such as stretching or exercises should be combined with a passive heating treatment to improve range of motion (ROM) or performance. We wanted to see how this combined technique compared to stretching or heating treatments in isolation. To assess this we took measurements of internal rotation, external rotation, posterior shoulder tightness and scapular movement before and after each treatment. The four treatments consisted of a control treatment, a static stretching routine, a deep heating treatment, and a treatment of deep heating followed by static stretching. 10 college aged students participated in the study by receiving treatments every Thursday for 4 weeks. In order to qualify, the participant took part in overhead activity at least twice a week and was free of significant shoulder injuries for at least one year. Most research in this field focuses on either a deep heating modality or a stretching routine; there is very little research directly comparing the two in combination for the shoulder. We found no statistical significance for all measurements but we did find a main effect for time for posterior shoulder tightness, meaning that all participants improved from pre to post treatment. We also found clinical relevance (an increase of  $2-3^\circ$ ) for posterior shoulder tightness, external rotation, and internal rotation. Even though there was no statistical significance, our results show positive trends indicating that heating and stretching the posterior shoulder capsule increases range of motion.

**Mentor:** Valerie Moody, Health and Human Performance

## The Effects of Prozac on Aggression in Siamese Fighting Fish

(O-26) **Andrew Hinkle, Theo Hanson, Lizzie Catudi-Garrett, Schuyler Hollingsworth & Sarah Olafson**

Serotonin is a common neurotransmitter found throughout the brain. Increasing evidence suggests that serotonin plays a key role in aggression and impulsivity in a variety of species. However, the underlying nature of how serotonin functionally impacts aggression has not been discovered. The present study sought to address this unexplored aim by examining the aggressive responses of male Siamese fighting fish (*Betta splendens*) to varying concentrations of Prozac. Prozac, a commonly prescribed antidepressant, is designed to increase levels of serotonin in the brain. Recent local news has indicated that Prozac appears in Missoula's water supply and it is speculated that consuming this water may have adverse effects (Mayrer, 2010). Siamese fighting fish are ideal subjects for aggression studies as they have distinct aggressive behaviors in nature that are easy to observe. Previous researchers administered Prozac via injection, neglecting less invasive methods. For this experiment, a novel method of administration was used involving a timed exposure to water treated with Prozac. To study the effects of environmental Prozac absorption, fish were exposed to different concentrations of Prozac, and their aggression responses were recorded and coded. The study's results indicated a decrease in aggression when subjects were exposed to Prozac. These data indicate that there is a link between aggression and serotonin levels. The method of administration has become increasingly relevant for modeling rising levels of Prozac in waste water. The results of this research will further our understanding of the environmental consequences of chemical pollutants for Missoula and in an aquatic systems.

**Mentor:** Allen Szalda-Petree, Experimental Psychology

The Role of RNase Y in Gene Regulation During Transmission of *B. burgdorferi*(O-27) **Jeanette Comstock**

The spirochete *Borrelia burgdorferi* is the bacterium that causes Lyme disease. *B. burgdorferi* is transmitted to mammals via a tick in an enzootic cycle; humans are incidental hosts in the cycle. Understanding the complex mechanism of gene regulation during the transmission of *B. burgdorferi* may provide clues toward developing new treatments for Lyme disease. We are interested in the alternative sigma factor RpoS, which directs the expression of genes required for transmission and mammalian infection. The *rpoS* gene is transcribed as a long mRNA and then processed into a functional, short mRNA that is translated into the alternative sigma factor. We hypothesize that the long mRNA is processed by the ribonuclease RNase Y, which is encoded by the *rny* gene. To test this hypothesis, I am generating a conditional *rny* mutant by replacing the native *rny* promoter with a synthetic flac promoter that can be artificially regulated by the sugar analog IPTG. This inducible *rny* mutant will allow us to experimentally control the amount of RNase Y in *B. burgdorferi*, so that we can genetically assay if RNase Y plays a role in *rpoS* mRNA processing.

**Mentor:** Scott Samuels, Division of Biological Sciences

Comparing Variations of Mood States in College Students Enrolled in Healthcare Professional Programs  
(O-28) **Erika Berens**

**Context:** Athletic training and nursing programs are one of the few academic programs that students obtain clinical hours concurrently with a full class schedule. The expectations for students are high as evidenced through the work they put into the program. Relationships are often strained because individuals not directly involved in the program have a difficult time understanding the long hours of the program.

**Purpose:** This study is the first to examine longitudinal changes in mood patterns among college students completing a healthcare professional program and those students not completing a professional program. The significance of this study is to allow us to better understand the effects of participating in a rigorous professional program on students. **Participants:** A convenience sampling strategy was used to recruit students currently taking classes in an athletic training program, nursing program, and community health program.

**Methods:** The Profile of Mood States (POMS) is a 65-item questionnaire that measures mood states on a 5-level adjectival scale: not at all, a little, moderately, quite a bit, and extremely. The POMS measures scores along 6 mood states: tension-anxiety, depression-dejection, anger-hostility, fatigue-inertia, confusion-bewilderment, and vigor-activity. The athletic training, nursing and community health students completed the questionnaire in September, October and December. **Results:** Mean scores over the three time points for each factor reflect an increase in tension-anxiety, depression-dejection, anger-hostility, fatigue-inertia, confusion-bewilderment and total mood disturbance for all three subject groups with nursing students having the greatest increase. As the semester progressed, vigor-activity scores decreased for all students regardless of their program. **Conclusion:** At this point in time it is evident that college students experience changes in mood regardless of their chosen program or major. Our results suggest that college is a challenging time for all students and as the semester progresses, vigor gives way to tension, depression, fatigue and confusion.

**Mentor:** Valerie Moody, Athletic Training

Modular Abstraction of Complex Real Time Analysis  
(O-29) **Benjamin Campbell**

The highly technical barrier to entry for Big Data and real time analytics has proven to be a hindrance to groups and projects that seek to find insight in large quantities of data or data with a high rate of change. A modular framework that would allow stakeholders to rapidly write and deploy filters to the IBM Infosphere Streams product would provide this level of abstraction and make Big Data technology much easier to implement and use. A common pipeline for data will be developed in tandem to this project in which a simple schema is created. This schema provides a common mechanism to rapidly identify information from a variety of sources of large and changing sets of data. In addition to this common schema, a modular interface implemented using primitive operators will provide a simple API in a common programming language for domain experts to develop filters without the need for a comprehensive understanding of the underlying IBM Infosphere Stream technical details. While a large amount of effort has been applied to make large scale data analysis more expressive and powerful, this has been at the expense of agile development and ease of implementation for non-technical users. The novel nature of this project is to bring a subset of this expressive power with the benefit of ease of use to facilitate rapid and iterative development. This allows domain experts to effectively explore data more quickly.

This research project provides value as it abstracts much of the complexity of applying filtering to a rapidly growing and changing set of data. Stakeholders can then implement Big Data and real time analysis rapidly and with technical agility. This notion, whether applied to business intelligence, academia, or government, has tremendous value as it provides a comfortable mechanism to understand data with more clarity.

**Mentor:** Joel Henry, Computer Science

Halogen-bonding Catalysis  
(O-30) **George Neuhaus**

Catalysis plays an important role in all fields of chemistry. Many catalysts used today are heavy metals, which are avoided in pharmaceutical production due to their toxicity. This limits the variety of drugs produced because some reactions are successful only in the presence of these metals. The purpose of this research is to synthesize and test novel halogen-bonding organocatalysts that will improve pharmaceutical synthesis by opening reaction pathways that are currently only available with heavy metals. The catalysts developed will improve catalysis of Michael-type additions by which Paroxetine, an anti-depressant, Zempler, which prevents kidney disease, and (+)-tanikolide, a potential anticancer drug, are all synthesized. By forming non-covalent halogen-bonds with Lewis basic species, these catalysts will lower transition state energies, which will accelerate the chemical reactions. This project develops two halogenated imidazolium groups as halogen-bond donors placed on a terphenyl scaffold that allows the correct geometry to bind with carbonyl functionality. The binding strengths of the scaffolds were obtained by NMR titrations. Future studies will include screening Michael-type addition reactions with and without the catalysts to compare the rate of reaction. As a control, a hydrogen-bonding thiourea compound, which has proven to catalyze these types of reactions, will also be screened. This project develops a new genre of organocatalyst and promises to improve pharmaceutical production by optimizing yields, minimizing waste, and opening new pathways to a greater diversity of drugs.

**Mentor:** Prof. Orion B. Berryman, Chemistry & Biochemistry

Characterizing the MINERVA Array Telescopes and Instruments  
(O-31) **Connor Robinson**

The MINERVA project consists of an array of four robotically controlled telescopes that will be dedicated to searching for extrasolar planets through precision photometry and radial velocity measurement methods. Before the search for exoplanets can begin, the telescopes, image de-rotators, camera, guide cameras and spectrograph must be calibrated and characterized. I present the characterization of several of these instruments. I measured the maximum altitude reliably observed using right ascension, declination, and position angle data for characterization of the telescope altitude and azimuth drives. This maximum altitude will be used to define a region in the sky that will be avoided during future robotic observations. I examined the effect of updating the solution used to point the telescope on the precision of the altitude, azimuth, and the image de-rotator angle. I tested the photometric abilities of the system by observing the known transiting exoplanets WASP-33B and WASP-35B. All of these tests and characterizations will allow the MINERVA telescope array to maximize the amount of time spent observing good targets. Future work preparing the MINERVA telescope array for implementation will include using the guide camera to improve pointing precision, and characterizing the camera and spectrograph.

**Mentor:** Nate McCrady, Physics and Astronomy

Barriers to Housing in Missoula Montana  
(O-32) **Robert Howe**

In Missoula, there are dozens of new apartments being built today, yet the homeless population continues to grow. The purpose of this research is to better understand what issues will keep a person out of a home and on the streets and to provide insights into alternatives to building more low-income homes. This project asks: what are the barriers to housing in Missoula for people who are already homeless or on the verge of being homeless? In order to understand what those barriers are, I will explore the perceptions that landlords hold toward the homeless population. Data will be collected from an available sample of local landlords, property managers and property developers. Additionally, I use referrals to landlords who are willing to explain their experience with the homeless population. The data consists of responses to in-depth interviews, consisting of personal experiences and suggestions for possible ways to make renting to this population more appealing. I analyze the data by searching for common themes in the interviews that reflect landlords' perceptions of homeless people, landlords' concerns about renting to people who are already homeless, and their suggestions for how renting to homeless individuals can be successful. These results will contribute to my community and to the people who are most affected by access to rental housing. I plan to share the results with Missoula's current stakeholders, primarily social service agencies that are focused on the prevention of homelessness.

**Mentor:** Kathy Kuipers, Sociology

Wilderness as a Social Movement: Expanding Cultural Relevance in the 21st Century  
(O-33) **Dylan Lang**

This year is the 50th anniversary of two monumental pieces of legislation: the Wilderness Act and the Civil Rights Act. Though these two laws exist within different arenas of public affairs, both have had significant effects on American society.

The Wilderness Act was signed into law in 1964 with almost unanimous support, at a time when American society overwhelmingly supported its passage. Since 1964, wilderness has been criticized as an elitist ideal representing a small interest group in the United States. As our country becomes increasingly diverse, and public lands protection loses popular support, making wilderness more relevant to minority populations is vital. This project examines the social constructs of wilderness in the United States in response to a changing demographic on our public lands. In this project, I aim to 1) evaluate current recreation trends of African Americans in the United States, 2) discuss criticisms of wilderness and how a focus on the social foundations of the wilderness movement can help to ameliorate those criticisms, and 3) propose changes to future wilderness education in order to increase relevance of the wilderness idea.

Research for this project focused on recreation trends, history of the wilderness movement, and modern wilderness criticisms and commentary. I collected interviews from nine individuals whose work involves the link between wilderness and society through management, education, outreach, and stewardship. Collectively, this project aims to suggest tools for wilderness education that will make wilderness, both in theory and in practice, accessible to a broader populace, hopefully increasing its relevance and assuring its existence into the future.

**Mentor:** Natalie Dawson, College of Forestry and Conservation

Ocean Around, Ocean Above: Intersections of Archaeoastronomy and Wayfinding in Oceanian Folklore and the Evolution of Environmental Knowledge Across Polynesian History and Place

(O-35) **Michael Capozzoli**

The purpose of this presentation is to examine a specific case study in place identity, environmental knowledge systems, and cultural modification amongst humans to illustrate how oral folklore can encode the practical knowledge of environmental adaptation. Specifically, we will examine how traditional Polynesian myth-motifs and astronomical observation cumulatively predicted seasonal change, allowing for successful long-distance navigation and the manipulation of marine ecosystems for harvest of foodstuffs.

Reflecting the growing prominence of interdisciplinary approaches to human ecology, my wholly qualitative research was conducted as a survey of diverse literature; thus, the project was largely confined to the library. My methodological approach involved a survey of three realms: (1) historic botanical cultivation and details of food harvest were cited to establish trends in subsistence and environmental change; (2) ethnographic publications were utilized to establish key attributes of regional mythology; and (3) archaeological reports of excavation at ancient observatories and contemporary firsthand accounts of navigation were used to explore resiliency of environmental adaptation.

The professional work of Dr. Jeffrey A. Gritzner, which articulates aspects of human ecology from a multidisciplinary perspective, has influenced both my approach to research and its written presentation. The extensive expertise of Patrick V. Kirch invaluable contributes to our discussion; additionally, regional expert Dr. David Lewis has regularly drawn correlations between oral folklore and environmental competency. I submit that my work is original because I propose that Polynesian mythology reflects an awareness of Earth as an interconnected system in the modern sense, a consideration that suggests Polynesian astronomers were relatively more correct about the functioning of ecosystems than previously assumed. Thus, the second half of this presentation situates environmental knowledge in a contemporary setting and addresses the perseverance of Polynesian navigation skills into modern times, reflecting the value and reliability of folkloric tradition as a means of environmental adaptation.

**Mentor:** Dr. Jeffrey A. Gritzner, Department of Geography

Voices from Campus: Strategies for Strengthening University Tobacco Free Policy Implementation

(O-36) **Larisa Carter**

Studies show that habitual smoking often begins during young adulthood. With many young adults in the US pursuing higher education, university campuses are examining issues associated with tobacco use including increased risks for preventable disease and exposure to secondhand smoke. College campuses are increasingly adopting tobaccfree policies that have the potential to reach large populations at risk for preventable diseases that result from smoking.

The purpose of this research was to examine attitudes of campus staff toward the Tobacco Free policy of a mid-sized U.S. University located in the rural Northwest. Researchers conducted semi-structured interviews with 16 key informants affiliated with the University. Grounded theory was used to divide and categorize the interviews into 10 themes. These themes were analyzed and used to formulate suggestions for policy improvement. Key informants identified strategies that should and should not be used to increase Tobacco Free policy compliance on campus and disagreed about whether several practices (changing physical environment, education, negative consequences) and resources (financial support) should be used to increase Policy compliance. Participants identified individuals and departments who should and should not be responsible for Policy enforcement.

Differences in opinion regarding which strategies should be used to increase Tobacco Free policy compliance indicate a need for increased clarity and consistency in Policy language. There is also a need for a more formal, effective forum where all the departments involved with the Policy can come together and work toward consistent policy implementation and enforcement. *Continued*

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Policy implementation is a dynamic process and that a policy may need to be revised and implemented several times before it can be considered effective. Although every campus that pursues implementation of a tobacco-free policy is unique, important lessons can be learned from the successes and failures of the writing and implementation of tobacco-free policies on other campuses.

**Mentor:** Kari Harris, Graduate Public Health

Balancing Efficiency and Compassion: Researching Best Practices for Homeless Shelter Policy Manuals  
(O-37) **Ally Guldborg**

The purpose of this project is to use qualitative content analysis to help improve the policies and practices of the Poverello Center. The Poverello Center acts as an emergency shelter and food bank for persons experiencing hunger or homelessness in the Missoula area. The Poverello Center aims to balance efficiency and compassion as it provides these services to all who need them. In order to meet this goal, the organization must have clear and enforceable policies for staff, volunteers, and clients. The researcher will work in collaboration with the staff and administration of the Poverello Center to examine the organization's existing policies and construct a comprehensive, functional, and organized policy manual consistent with the organization's mission and vision statements. The researcher will contact 10 to 15 homeless shelters in the Northwest United States that serve similar populations as the Poverello Center. After obtaining the policy manuals of these shelters, the researcher will use NVivo qualitative coding software to identify common themes in these manuals. The researcher will use the results of this analysis to make written policy recommendations to the Poverello Center administration. This project will benefit the organization by helping it improve its policy manual.

**Mentor:** Daisy Rooks, Sociology

Arctic Climate Change and the Effects on Bowhead Whales and Their Environment  
(O-38) **Kelly Wimmert**

The purpose of this research is to identify the effects of arctic climate change on bowhead whales (*Balaena mysticetus*) and their environment. Bowhead whales are recognized internationally as a threatened species, in part, because of the dramatic declines in their population over the past century. My study is structured around three primary objectives: one, to examine the impacts of melting arctic ice and warming temperatures on species dynamics and habitat; two, to investigate the ways in which current and anticipated human activities in the arctic influence bowhead whales; and three, to assess the models of conservation science and action that are designed to support the health and resilience of bowhead whale populations. For this study I will be analyzing existing data from international databases and examine existing media reports documenting viewpoints/scientific opinion provided by arctic climate specialists, whale biologists, and whale conservation activists. I will also be surveying information on international conservation efforts that is available through government agencies and non-governmental organizations. This research on bowhead whales will provide a succinct and accessible analysis of the trends in bowhead whale population dynamics in relation to climate, human interactions, and conservation efforts.

**Mentor:** Dr. Sarah Halvorson, Geography



Maternal Healthcare and the Effects on Infant Mortality in Indonesia  
(O-39) **Thomas Flies**

I plan to present my senior Economics thesis on the effects of Maternal Healthcare on the Infant Mortality rate in Indonesia for the years 2000-2005. I have collected data via the Indonesian Family Life Survey, with detailed life, socioeconomic and political factors that influence maternal health choices. As the 4th largest country in the world and under increasing pressure from the Indonesian government to decrease the infant mortality rate, I have found that the maternal healthcare decisions to be a new and invigorating topic to explore. I hope my research will further advance the possibilities of new studies that further improve the development of healthcare access in Indonesian, specifically in the rural locations.

**Mentor:** Ranjan Shrestha, Economics

Can Personality Traits Predict Drug Use Preference?: A Discriminant Functions Analysis of Substance Use in the LGBTQ Population  
(O-40) **Adam Gott**

**Purpose:** Previous research indicates that certain personality traits (impulsivity, neuroticism, sensation seeking, etc.) are strongly linked to heavy alcohol use and higher levels of stimulant use (Brunelle et al, 2004). We hypothesize that a difference in personality traits will result in differences of reported stimulant use, which excites the central nervous system and results in higher physiological arousal, and depressant use, which inhibits function of the central nervous system and results in a calming and sedating effect. Although a stronger presence of certain personality traits (neuroticism, extroversion) has been linked with use of different substances (depressants, stimulants, etc.) (Feldman et al, 2007), no known studies have examined personality traits as discriminating factors of substance choice within lesbian, gay, bisexual, transgender, or queer populations.

**Methods:** Using a subset of data from a larger study of LGBTQ individuals (n=730), we identified 33 subjects who reported previous 30-day use of stimulant (cocaine, amphetamines, ADHD medication, or MDMA; n = 15) or depressant (opiates, sedatives, sleeping medication, or painkillers; n =17) drugs. Data were analyzed using discriminant-functions analysis. Covariates included age, gender, ethnicity, and sexual identity.

**Conclusions:** Although the overall model was not statistically significant, patterns began to emerge regarding specific personality traits. The data suggested that people reporting higher levels of neuroticism reported higher than average primary depressant use. Although the overall model was not statistically significant, this may be a result of insufficient power. The implications for this research could affect availability of treatment options for specific personality types as well as increase treatment availability for sexual minority populations. Future studies should address this possible limitation in order to further investigate this personality trait-drug preference phenomenon.

**Mentor:** Bryan Cochran, Psychology

Maternal Education and Child Health Outcomes: An empirical analysis of the relationship  
(O-41) **Priscilla Lekalkuli**

This paper provides an empirical analysis of the effect of maternal education on a child's anthropometric measures (height-to-age and weight-to-height) with the aim to determine not only the pathways in which mother's education affects child health but also whether there is a threshold in the relationship. Large variations in education policy and public investment in education in Kenya from independence (1963) facilitate the use of an instrument for endogenous mother's education using the 2008/2009 Kenya Demographic and Health Survey (KDHS) data. To the best of my knowledge, such analysis has not been conducted in Kenya using the 2008/2009 KDHS data. In addition, the use of instrumental variables has been limited and my research contributes to the literature on child health by using instrumental variable in my analysis. The results of this study have policy implications. Kenya, being a member of the United Nations, is working on reaching the United Nation's Development Goal of reducing child mortality by half by 2015. Therefore, my research is essential in contributing insights that will inform policy recommendations.

**Mentor:** Ranjan Shrestha, Economics

Placebo Effects, Ritual Causes  
(O-42) **Tessa Weyrauch**

The placebo effect is the power of belief positively manifested for the benefit of the patient. There are two ways that the placebo effect has been seen historically: a standard to clinically test the true efficacy of an active drug and as a sham given by people in a variety of medical positions from doctors to con artists. The use of the placebo effect as a treatment in and of itself has been greeted with disdain by scientific researchers and the public because the beneficial reaction the body is creating is due to belief instead of treatment. However, the placebo effect is real, actual biochemical processes take place in the brain to promote healing in the body that may not otherwise occur. There is a new light being shed on the placebo effect through understanding and research of the components of the placebo effect which may validate it as an honest tool for healing with uses beyond a clinical trial comparison standard. One of the main components that create the placebo effect is ritual- such as the sureness of the curer, what attire the curer is wearing, and the process of consulting with a curer. I review the current scholarly literature in English primarily published in the United States of the ties between the placebo effect and specific rituals in place in Western biomedicine to determine the approximate strength these rituals have on the placebo effect in the United States. Upon completion this review will show which rituals are currently the most important to emphasize in a medicinal setting, such as in a clinic or a doctor's office. This paper calls for the conscientious, honest, and compassionate use of ritual to evoke the benefits of the placebo effect.

**Mentor:** Gilbert Quintero, Anthropology

A Theoretical Look at Sexual Minority Victimization and Outness to Family as a  
Protective Factor Against Lifetime Suicide Attempts  
(O-43) **Charlotte Siegel**

**Purpose/Originality:** Lesbian, gay, bisexual, transgender, and queer (LGBTQ) individuals are at increased risk for negative mental health outcomes, which has been linked to minority stress processes (Meyer, 2003). LGBTQ individuals are also at increased risk of victimization and suicidality (Shields, 2011). In some cases, identity disclosure may protect against suicidality (Morris, 2001). However, less is known about the effects of outness to one's family. We examined the interaction of victimization and lifetime suicide attempts with family outness as a potential protective factor.

**Methods:** Sexual minority adults (n = 730, M age = 29.99, SD = 13.84) were recruited nationally from university-affiliated LGBTQ groups, community organizations, and Facebook. Hypotheses were tested using negative binomial regression. Covariates included age, gender, ethnicity, sexual identity, depression, anxiety, and general (i.e., non-family specific) outness.

**Results:** Twenty-eight percent reported one or more suicide attempts (Range = 0 - 50, M = .73, SD = 2.46). The interaction model was significant, omnibus  $\chi^2 = 205.53$ ,  $df = 14$ ,  $p < .001$ , AIC = 1364.07. As hypothesized, family outness moderated the positive association between victimization and number of lifetime suicide attempts,  $b = -.20$ , Wald  $\chi^2 = 12.86$ ,  $df = 1$ ,  $p < .001$ . A simple effect for victimization remained beyond the interaction,  $b = .60$ , Wald  $\chi^2 = 49.61$ ,  $df = 1$ ,  $p < .001$ .

**Significance:** Although victimization puts sexual minorities at higher risk for lifetime suicide attempts, it was found that family outness was a protective factor that weakened this association. The findings highlight the importance of family dialogue surrounding sexual identity, especially in the presence of victimization. Future suicide intervention strategies may benefit from consideration of this study. Theoretical explanations and limitations will be discussed.

**Mentor:** Bryan Cochran, Psychology

Second Language Acquisition in Blackfeet Rhythm  
(O-44) **Jesse Desrosier**

Second language learners are expected to have errors with pronunciation of new words. Many researchers have said that these errors are actually an influence from their native language – known as transfer effect. I investigated a transfer effect of English to Blackfeet focusing on pronunciation. The effect is anticipated to occur because rhythms of the two languages differ. Blackfeet is known as a 'pitch' accent language, while English as a 'stress' accent language. In a pitch accent language, accented syllables are pronounced with high pitch regardless of vowel length while in a stress accent language, accented syllables are pronounced with stress correlating with vowel length. Take the word saahkómaapi 'boy' for example. The second syllable kó is pronounced with a high pitch while the rest with low pitch. However, because the first and the third syllables saah and maa have long vowels, I expected English speakers would pronounce these with stress and kó without stress. In order to study this aspect, I conducted an experiment in which I recorded Native and non-native Blackfeet speakers pronouncing 20 Blackfeet words. I measured sound frequencies and vowel duration of each word, using an acoustic phonetics program (praat). Then I identified and analyzed the participants' accent patterns. In my presentation, I will report the results to my experiment. The study concludes that transfer effect does occur from English to Blackfeet. As of now there is no report on the Blackfeet language Second Language acquisition and this study will contribute to advancing linguistics research in Second Language phonology. The information of the study provides Blackfeet teachers a better understanding of how non-native speakers acquire pronunciation.

**Mentor:** Mizuki Miyashita, Anthropology

How Should We Teach Human Sexuality at the University of Montana?  
(O-45) **Sandi O'Brien**

The University of Montana offers a course, Human Sexuality cross-listed with Anthropology and Biology. As a major in Anthropology, I chose this course to gain an ethnographic cross-cultural perspective on human sexuality. In 2011, the course was taught from a health and human performance pedagogy perspective stressing biological knowledge. The cross-cultural comparison focused on different pedophilias in western, primarily U.S. society. Anthropology of human sexuality reflects every aspect of society and culture. How should the pedagogy of this course span different disciplines and integrate biological, cross-cultural, and also legal issues in K-16 sex education? My initial research reveals that college students surveyed do not understand their individual rights in both Titles Seven and Nine Civil Rights Acts; although, they have a broad range of expectations and goals for the scope and nature of human sexuality education and its importance. In 2014, I distributed an anonymous, voluntary survey to ANTY 227 (subjects were numbered). The sample population is demographically representative, drawn from ages 18-60; freshmen to seniors, and numerous majors. Of 148 students enrolled, 65 volunteered to complete the survey. My aim is to describe the changes, if any, in their opinions or knowledge about human sexuality, by repeating the survey in ten weeks. Based on comparative results of student opinions and knowledge, especially of the Civil Rights Acts, I will both describe and evaluate student receptivity for interdisciplinary pedagogy of human sexuality at the University of Montana to include knowledge of legal issues, as well as biological and cross-cultural perspectives.

**Mentor:** G.G. Weix, Anthropology

Sustainability Reporting: An Evaluation of the SASB Framework  
(O-46) **Tess Barker**

Businesses today face more performance risks than ever before. Progressively unjust social spheres, severe environmental disruptions, and corporate governance scandals are just a few issues afflicting the modern business environment. The demand is high for corporate disclosure of these and other sustainability matters. Currently, businesses are not subject to any mandatory sustainability reporting requirements. A number of sustainability reporting frameworks have therefore emerged to help businesses report on sustainability performance. The US nonprofit Sustainability Accounting Standards Board (SASB) offers one such framework. The purpose of this study is to evaluate the SASB's framework and provisional standards for its ability to promote decision-useful sustainability reports, where decision-usefulness is a function of the following reporting principles: materiality; stakeholder inclusiveness; context; completeness and accuracy; measurability and verifiability; and transparency. Sustainability reporting is a nascent field. As such, emergent sustainability reporting frameworks have yet to be critically assessed for their value and effectiveness. This study highlights the SASB framework's significant concepts and values, thereby clarifying its advantages and disadvantages for use in US business sustainability reporting.

**Mentor:** Dr. Kent Swift, Department of Accounting and Finance

Where's the Kale? A Search for Food Security on the Northern Cheyenne Reservation  
(O-47) **Amy Sisk**

Only one small grocery store serves the 5,000 people living on the Northern Cheyenne Reservation in rural southeastern Montana. Between its limited stock, fast food from a nearby convenience store and canned goods distributed to residents through the commodity program, it's hard to come by wholesome meals. That has not stopped health-conscious people from sponsoring a host of programs to curb poor nutrition. But will their efforts go far enough to make a lasting difference across the reservation? And why is accessing quality food so difficult in this part of the state? I set out to answer these questions on a trip to the Northern Cheyenne Reservation over spring break. My research will culminate in a longform story for the University of Montana School of Journalism's yearly Native News project, slated for publication on May 24 in the Missoulian and Billings Gazette. After dozens of interviews with people working in food- and health-related fields, as well as residents who struggle to find healthy food, I am compiling my notes into an article to be printed alongside other journalism students' stories of innovation in Montana's Indian Country.

**Mentor:** Jason Begay, School of Journalism

Religion and Spirituality in Counseling

(O-48) **Christa Moore**

In an increasingly secular society, religion and spirituality are not often considered legitimate resources for improving quality of life and overall well-being. My research will delve deeper into the role that they can play in counseling, particularly in the community of Missoula, Montana. I have interviewed four different counselors in the community about their experiences with religion and spirituality at a personal level and how that translates into their work. This is a new approach to this topic because these are qualitative interviews looking into the experiences of these counselors with no focus on numerical data or broad generalizations. This paper will give a deeper insight into different methods and approaches counselors take when it comes to religion and spirituality, thus broadening society's understanding and appreciation of their potential role and value in counseling.

**Mentor:** Gary Hawk, Honors College

Access is More Than A Ramp: Assessing the Usability of Educational Information Technologies  
(O-49) **Courtney Damron**

In the past at the University of Montana, architectural barriers to accessibility of the campus environment have closed the door to Post Secondary Higher Education for students with disabilities. Through effective retrofits to the existing facilities and the creation of a Strategic Plan for continued identification, most of these barriers have been removed. Today programmatic barriers to accessibility for students with disabilities have moved into a new space of fragmented accessibility within the virtual environment. Educational materials have transitioned to utilize emerging web technologies and learning management systems. However, presently, an audit has not been conducted to measure the usability and accessibility of these technologies for students with disabilities enrolled on our campus. Building a new web environment that is fully accessible to students with disabilities requires gathering information about the experiences students with disabilities have had using current technologies utilized for completion of coursework. Creating an objective assessment on the usability and navigability of university web technology is an opportunity for students with disabilities to collaborate with qualified university staff to effectively remove barriers and develop lasting measures to assess institutional procurement of future technologies. By conducting a qualitative questionnaire survey with students currently registered with Disability Services at U of M, I will be working to discover and document any barriers that have not been identified and presenting my findings from this research to the campus community in a 25 minute presentation. The need to document these barriers will help to provide the University of Montana with necessary insight for removal and assist the campus community in continued efforts to effectively implement the creation of a campus that is technologically, architecturally, programmatically, and attitudinally accessible to students with disabilities.

**Mentor:** Elizabeth Hubble, Women's and Gender Studies

The Not-Simple Story of International Unity  
(O-50) **Karla Nettleton**

In business, public policy governs the actions businesses take. Knowing both what the policy is and how it is changing allows for businesses to be more informed, efficient, transparent and sustainable. Businesses that are efficient, transparent and sustainable help to generate economic growth, which benefits the population as a whole. Additionally, well informed businesses help to generate better policy for the business and economic community as a whole. Currently, the US and the International Community have different accounting standards. The convergence of International Financial Reporting Standards with Generally Accepted Accounting Principles has been an area of tension between policy makers and businesses in the United States for several years. The purpose of this paper is to address how convergence is moving through the public policy cycle in the United States. The paper identifies the three political approaches that could be used to formulate policy to address the issue of convergence. The three approaches are rational approach theory, institutionalism, and incremental approach. This paper utilizes a policy analysis to evaluate the benefits, implications, and barriers of each approach. The paper concludes that the United States should use an incremental approach to converge international standards with US standards. The incremental approach allows the US to create understandable policy that saves on convergence costs while increasing cooperation of both boards to create better standards and more accountability.

**Mentors:** Jeffery Greene, Political Science & Casey McNellis-Greene, Accounting

Addressing the Menstruation Gap in International Development Efforts for Girls' Education  
(O-51) **Desiree Acholla**

Billions of dollars have been raised for and spent in low-income countries to increase access to education for girls. Yet despite countless projects to build additional schools, facilitate teacher training, and offer support to provide books, stationery, and school fees, there are many programs falling short of their goals due to low attendance and high dropout rates. I posit that failures in programs for girls' education are partly due to a gap in development resources committed to addressing menstrual hygiene management (MHM) and cultural taboos. In a literature review of existing development project reports and data, I examined the relationship between girls' school completion rates and limited social support during menstruation, unsanitary MHM supplies, and/or a lack of adequate bathroom facilities in school. I found that these factors affect girls' attendance and dropout rates in the crucial years before and during secondary school. In order to demonstrate the potential progress of closing the menstruation gap, I reviewed current efforts by international and grassroots organizations working to address MHM on a global and local scale. Therefore, I argue that development agencies should begin to address MHM in their ongoing efforts to promote girls' education. I further recommend that international development efforts should also endeavor to direct any new or existing MHM resources towards locally oriented and sustainable solutions to achieve objective success for girls' education programs.

**Mentor:** Kimber Haddix McKay, Anthropology

NATO in Kosovo: Establishing Security or Purporting State Power?  
(O-52) **Christina Bloemen**

Constant conflict occurs between and within states, especially in the cases of Syria and Ukraine. The role of international institutions is called into question, particularly in cases where national sovereignty and human rights are concerned. In historical cases of international intervention, the ethnic conflict and wars between post-Yugoslavic states defined the 1990's. Is it under the jurisdiction of international powers to intervene when human rights are violated or should the international community allow for states in conflict to term the rules of aid and intervention? With this in mind, I intend to explore the question: what factors led to or allowed NATO's bombing campaign of Serbian forces in Kosovo in 1999?

I will attempt to discern whether multilateral institutions provide adequate framework for all states to conduct foreign policy and relations (neoliberal institutionalism), or whether powerful states do as they like (structural realism). In order to do so, I have compiled international interventions from 1999-2013, examining whether each intervention was approved by the UN, NATO, or directly by one state. By comparing this data set, it can be ascertained whether international institutions are influential in the actions of nation states. If these states seek legitimization of their actions through international institutions and they are not approved, I will attempt to confirm whether they continue pursuing the intervention proposed or acknowledge the international community's voice.

This is a specific case sample using two exclusive international political theories to ascertain which better describes the reality of power relationships between nations during human rights violations. Little comprehensive work has been done examining NATO and the United States' interventions in the context of NATO and UN approval. It is imperative to examine interventions, as domestic conflicts are constant, and informative decisions can be based on statistical evidence to predict the behavior of nation states.

**Mentor:** Karen Adams, Political Science

Exploring the Effects of Disclosing Versus Concealing Sexual Identity on Self-Esteem  
(O-53) **Parker Sanders**

**Purpose:** Existing literature suggests that identity disclosure can be a double-edge sword for LGBT individuals (Clausell & Roisman, 2009). These individuals are often left with the choice of concealing their identity, which is associated with shame and lower self-esteem (Corrigan & Matthews, 2003), or coming out and risking discrimination and victimization. This exploratory study investigates whether it is better for an LGBT individuals' self-esteem to conceal their identity, or disclose it in spite of the increased risk for discrimination and victimization (Legate, Ryan, & Weinstein, 2012).

**Method:** A total of 730 sexual minority individuals between 18 and 91 ( $M = 30.10$ ,  $SD = 13.83$ ) were recruited nationally from university affiliated LGBT groups, LGBT community organizations, and social networking websites (i.e., Facebook). Prior to analyzing data regarding our primary hypothesis, we explored bivariate correlations between identity concealment, victimization, and discrimination, and self-esteem. To answer our question about whether it is better to conceal or disclosure one's identity, we used hierarchical multiple regression to explore the association between outness and self-esteem after accounting for age and gender in block one, and victimization and discrimination in block two; we entered outness in block three.

**Originality:** This was the first known study to consider whether disclosing a sexual minority identity is a positive predictor of self-esteem despite the increased risk of victimization and discrimination.

**Significance:** The results of this study suggest that after accounting for discrimination and victimization, outness accounted for a larger proportion of variance in a positive direction. Despite disclosure putting individuals at risk for victimization and discrimination, which decreases self-esteem, outness appears to have an overall positive effect on self-esteem, which may counter discrimination/victimization effects. This adds insight by illustrating the relative importance of identity disclosure. Clinical implications will be discussed.

**Mentor:** Bryan Cochran, Psychology

The Deadliest Road: Analysis of Drunk Driving Fatalities in Montana  
(O-54) **Jessica Lareau**

Montana holds some of the most deadly roads in the country for impaired driving fatalities. This project examines Driving Under the Influence (DUI) fatalities from the perspective of incarcerated drunk drivers whose crime resulted in the death of another. Two-hour interviews were conducted with both male and female inmates from Montana State Prison in Deer Lodge, MT, the WATCH Program in Warm Springs, MT, the Women's Prison in Billings, MT, and other Department of Corrections facilities. Inmates were asked about their personal history, specific offense, recall of the event, and what they believe would prevent others from driving under the influence. We conducted a preliminary analysis based on grounded theory of the qualitative narratives generated. Inmates' interviews were analyzed and categorized by themes. These themes were: the relationship between the inmate and their victim, the stage of grief the inmate displayed, and their opinion on how to prevent other people from driving under the influence. The results of this study aid in understanding the implications of driving under the influence. In the future, the study and publication of these first-hand accounts can contribute greatly to the reduction of drunk driving fatalities in the state of Montana.

**Mentor:** Timothy Conley, Social Work



Effect of Stigmatizing Beliefs on Depression Vulnerability  
(O-55) **Matthew Wier**

The presentation will present a proposed psychological study of the link between stigmatizing beliefs and depression vulnerability. Stigma, defined broadly as a perception of being flawed because of a socially-unacceptable characteristic (Blaine, 2000), accompanies a variety of mental health problems (Britt, 2000). One study suggests a link between stigma and vulnerability to depression (Britt et al., 2008). Recent research has distinguished between two kinds of stigma: public stigma, prejudicial views about a stigmatized group believed to be endorsed by the general public (Corrigan, 2004) and self-stigma, "reduction of an individual's self-esteem or self-worth caused by the individual self-labeling herself or himself as someone who is socially unacceptable" (Vogel, Wade & Haake, 2006). The proposed study will examine whether public stigma and self-stigma play a role in predicting depression proneness. Considering the detrimental effects self-stigma has demonstrated on those with mental illness (Vogel, Wade & Haake, 2006), it is hypothesized that self-stigmatizing beliefs will be as predictive of depression proneness as those regarding public stigma. That is, given stressors, individuals who hold self-stigmatizing beliefs are hypothesized to be more likely to be found to be depression-prone. This finding would run counter to existing work regarding the stigma-mental health relationship by shifting the model from reactive to proactive, one that would identify persons who are prone to depression because of stigma. Background study of the topic is ongoing, and application to UM's Institutional Review Board is in progress. Study will utilize a within-subjects survey design in which subjects will be asked to complete the Depression Stigma Scale, the Depression Proneness Rating Scale, and the Perceived Stress Scale. It is hoped that these measures will shed light on any relationships that exist between stigma and depression proneness. It is projected that data collection will be underway at the time of the conference.

**Mentor:** Duncan Campbell, psychology

Cyberstage: A New Era of Theatre Practice  
(O-56) **HanaSara Ito**

In the age of the internet, the World Wide Web is fully integrated in our daily lives— and careers. The internet also is increasingly important to artists for marketing and publicity—and as actual performance. My research project investigates Youtube as well as text-based social media (twitter, facebook, blogs, etc.) to ask how such forms are integrated art performances for the modern age. My project has been approved as part of an Ethnographic Field Methods course for Spring 2014, focusing on the cyber-nation of UM over the past two decades. I will focus on the artistic aspects of this process within specific communities at UM. Through interviews with Youtube users/personalities at UM, and observing social media, I aim for a comprehensive view of the internet can—and will—do for the performing arts community at UM.

**Mentor:** G. G. Weix, Anthropology

Dancing Through the Lens  
(O-57) **Brooke Carlisle**

The genre of Dance for Camera has been around for many years. This platform provides choreographers with a unique way for their work to be created and seen. Because of how dance is framed when on film, the choreographer gets to choose exactly what the audience sees. The use of editing can greatly influence a viewer's perspective of a piece of choreography.

I will demonstrate these differences using a dance I choreographed and filmed. From this footage, I edited three distinct Dance for Cameras. The first is straight from my imagination and exactly what I intended to create. The next two were not pre-planned but crafted through the editing process using different elements of time, focus and intention. My goal was to create completely separate films while using the same footage.

My presentation will be in powerpoint format. It will include a brief introduction of dance for camera and the process for my own filmmaking. I will then show the entire original video (approximately 5 minutes in length) along with a short clip of the second and third videos. To accompany the second and third films I will engage the audience in dialogue about what they saw and reveal my choices in editing.

**Mentor:** Heidi Jones Eggert, School of Theatre and Dance

The Personal And Civic Importance Of Performance  
(O-58) **Alicia Connolly**

As a student of theatre I have battled with my perception of art as firstly self-serving and consequently valuable to others. Through the study, research, rehearsal, and ultimately performance of Tony Kushner's *Angels in America, Part One: Millennium Approaches* with the School of Theatre and Dance, I began considering the influence a performance has on the individual and the community. I sought to challenge my idea of art and specifically theatre as selfish and hoped to find ways that supported actors as generous, functioning as canvases painted on by the text, the production concepts, and the audience responses. The actor then becomes the result of the endeavor instead of the self-serving force that drove it. This production was ideal for my investigation because the social issues contained in Kushner's award winning play are of particular consequence to me. For that reason, and as a process of my craft, I spent several weeks exploring books, articles, and films about the period, the social issues, and other topics essential in telling Kushner's story. Through rehearsals and performances I kept a journal documenting how my perspective changed from performer as the force affecting a performance to the performance as a force affecting the performer. Furthermore, I have discussed and will continue to discuss with the cast, crew, and community how this performance has affected them. I imagined a clean conclusion: yes, individuals are impressed upon by works of art; I found the gambit much wider and much messier. In discussing within the performer/performance relationship who is creator and who is creation, I will outline my transformation of judgment and my obligation to thoughtful, unselfish performance I have since felt. I also strive to share with others the inspiration to consider the impact art has on their community and themselves.

**Mentor:** Randy Bolton, School of Theatre and Dance

Behind the Behind the Scenes of Avenue Q  
(O-59) **Isaac Iverson**

We all know what happens on stage, and have a vague idea of what must happen behind the scenes, but what really happens behind the creation of the scenery? Designing the set for a theatrical production involves incredible communication, elaborate collaboration, and creative flair. This past year, I served as the scenic designer for the School of Theatre and Dance's production of *Avenue Q*. *Avenue Q* is best described as *Sesame Street* for adults, featuring human and puppet actors who, through song and dance, teach the audience lessons about life after college, the internet, and love. Through regular attendance at design and production meetings with the production team, my design concept became the idea of three-dimensionality popping from twodimensionality. Based on initial meetings with the director, I researched the artistic and storytelling styles of variety shows and cartoons, such as *Laugh In*, *Sesame Street* and *The Pink Panther*, examining what these forms of entertainment have in common. After cementing the design concept through staging discussions with the director and pages of sketches, I drafted the show in AutoCAD, built a ¼ scale model, and painted color elevations for all surfaces of the set. Finally, I attended the technical and dress rehearsals, fine tuning the scenic elements. *Avenue Q* opened October 1, 2013 and had very positive feedback, offering a hilarious escape for audiences. Designing this set was a great educational experience, not only for myself, but all students involved in the Design/Technology program since it gave them the opportunity to expand their technical skills as they constructed the set and worked backstage. Through this presentation, I hope that those who did not assist in the creation of *Avenue Q* will gain insight into the process and appreciate all aspects of design that take place behind the behind the scenes.

**Mentor:** Mike Monsos, Director of the School of Theatre and Dance

Shakespeare's fairies set in 1950  
(O-60) **Rita Sam-Venn**

Fairy comes in any race and in any form one wants to see them. What does a fairy look like in 1950?

Let's imagine what Shakespeare's fairies would be in the play *A Midsummer Night's Dream*.

The perception that fairy is human with wings to fly or a fairy comes in any form depending on what an individual chooses to see.

The purpose of this exercise is to develop a character concept for three fairies with the theme set in 1950. The characters: Titania is inspired by Rosa Parks, who refused to give up her seat on the bus in 1955; The Fedora hat was a popular menswear in the 1950 fashion, so Oberon is a golden scarecrow wearing a "Fedora hat" with a raven feather on it to represent intelligence and his image represents the field as a provider; Baby Boom from 1946-1964 is the theme used for Puck. Through this historical research, a selection of visual images are created by using sense of feeling, such as aroma, texture, color, line and shape in order to discover the essence of these three fairies and by adopting the modern look and real life topics to them will encourage younger audiences to connect and appreciate classical literature.

The innovation in this design is to make Titania's costume in the modern period, Oberon's costume by using some actual hay and to paint it with gold paint. The puck's costume is based on the social security card color. In costume design, sketching and rendering is part of the process to create characters that can be true to her or his personality and profession. Finally, her or his costume can be made with craftsmanship and attention to detail, so audiences see and feel the character come alive through the actor.

**Mentor:** Laura Alvarez, Theater

Pseudo Synesthesia on the Bakken Oil Field - Discovery of Place Through Creative Non-Fiction  
(O-61) **Patrick Myers**

My creative non-fiction short story, "Pseudo Synesthesia", attempts to provide a new look into how we, as humans, relate to place. The place in the story is North Dakota, in the booming towns and communities located atop the Bakken Oil Field.

To carry out this project I spent five days traveling through and staying in various towns in North Dakota that have been affected by an ongoing oil boom. The trip was partially funded by the Environmental Studies Program, through an education award.

The original component of the story lies in its name. 'Pseudo Synesthesia' refers to the narrator's state of mind throughout the telling of different events. To the narrator, certain places feel as if they are certain colors, mostly black and white. At the end of the narrative the narrator looks back and feels his experience has been dominated not by black or white, but by the color red. The color red, in this instance, helps the narrator realize that places themselves cannot be separated into bad or good, or exploitable or non-exploitable, but that all places are alive, which makes them vulnerable and in need of some form of protection.

The project is significant because it attempts to reconcile the climate of intense polarization in the social/political realm of the United States today, especially in issues related to the environment.

**Mentor:** Phil Condon, Environmental Studies

David Edgar: Connection in Political Theatre  
(O-62) **Sally McHugh**

Theatre, in its very best form, should reveal to us some truth about the human condition. Political theatre takes some of our harshest conditions and realities and forces us to face the ramifications we might otherwise ignore. This project focuses on the work of playwright David Edgar and his own personal brand of political theatre. Through a close examination and analysis of his 1995 play *Pentecost*, I utilize Edgar's focus on conflicts in Eastern Europe to highlight the importance of political theatre in our world today. As east and west collide, *Pentecost* showcases the importance of understanding the turmoil that exists in the world around us. Rather than using these stories solely for artistic value, we must view them for what they are: the human experience. In addition to *Pentecost*, I reference a variety of Edgar's other works that feature similar conflicts, to further emphasize *Pentecost's* main themes. I also look at texts that analyze Edgar's own political views and how his ideologies have influenced his plays. This approach takes a different look at political theatre as it focuses on the universal impact that more geographically specified material can have. Regardless of location, the intrinsic human experience is an all-encompassing concept, and one that all art, but especially theatre relies on. I examine where the human connections are made, and why political theatre is such an effective vehicle to communicate these realities.

**Mentor:** Bernadette Sweeney, Theatre and Dance

Organized Chaos in the Silence of Solitude: A Demonstration of Meditation Practice  
through Modern Dance Choreography  
(O-63) **Claire Christensen & Ellie Weinman**

Meditation is an act of chosen solitude and projected restfulness; the calming of one's physical self and the quieting of one's overcrowded mind. *Organized Chaos in the Silence of Solitude* is an ongoing investigation of the act of meditation practices and how those individual experiences could collectively translate through contemporary modern dance movement. This choreographic work demonstrates the contrasts between a state of calmness and the chaos of an overcrowded mind attempting active meditation. In this symbolic study, two dancers illustrate this conflict by representing one person striving to achieve inner peace.

The work, *Organized Chaos in the Silence of Solitude*, physically exhibits these mental shifts. The movement was inspired by the process of meditation. For example, the dance describes the moment in meditation when one attempts to slow down the brain just enough to enter a state of peace, only to realize how quickly one's thoughts shift. Inspiration for the work was also drawn from curiosity as to why we decide to linger on certain thoughts for longer than others. Each body is restricted to separate pools of light with no visual connection to the audience. The audience is not recognized because the dancers represent a solitary act in motion.

How much control do we really have? Over our mind, over our body? How and why do we choose to access certain thoughts, or not? How can we describe those ideas? The challenge and intrigue to discuss this topic through modern dance choreography is pivotal in my approach to generating movement material as well as my artistic invention as a choreographer and performing dance artist. One's expression of her or his own imperfections is an essential aspect of existence.

**Mentor:** Nicole Bradley-Browning, College of Visual & Performing Arts, School of Theatre & Dance

# UMCUR Abstracts: Poster Sessions

(in numerical order by Abstract ID number)

## Propaganda With the World at War (1) **Nicholas Connor**

As the world was swept into war for the second time during the twentieth century, countries across the globe turned to propaganda to increase support for the war and commitment to victory. Drawing upon propagandist films and posters from major Allied and Axis countries, several themes emerge, such as hatred for the enemy, provided a boost in civilian morale, and encouraged women's participation in the workforce. Patriotism materialized through these films and posters, but it is through the savvy world leaders that it stuck. This new wave of world leaders (Franklin D. Roosevelt, Winston Churchill, Adolf Hitler) were not like any before them, a group of men who were media-savvy, outspoken, influential, and effective public speakers. Through the use of media and public speeches, these leaders pulled their respective countries from the depths of despair to war powers, which saw civilians and soldiers alike rallying for the cause. This paper examines the effect of propaganda on civilians, both before the war, and during.

**Mentor:** Bradley Naranch, History

## Comparing the Effects of Ice Pack, Ice Bath and Cold Whirlpool on Ankle Skin Surface Temperature (2) **Nora Ifft, Jeff Spaulding**

**Context:** Cryotherapy is a form of electromagnetic energy that utilizes the therapeutic effects of cold. Mounting evidence suggests that cryotherapy is the most effective treatment for acute and sub-acute care of musculoskeletal injuries. Cryotherapy decreases secondary metabolic injury by slowing down metabolism and reducing oxygen demands in the affected area. However, existing literature is inconclusive as to whether an ice pack, ice bath, or cold whirlpool provides the longest cooling effect. Purpose: The purpose of this study was to determine which method of tissue cooling is most effective for sub-acute injury, and which modality provides the longest lasting effects.

**Participants:** Six college aged University of Montana Athletic Training students (age 18-30) participated in this study. Methods: A repeated measures design was used for this study whereby all participants underwent one cold whirlpool treatments, one ice pack treatment and one ice water immersion treatment. Each treatment lasted 15 minutes. The temperature of the dominant ankle was measured at the anterior talofibular ligament (ATFL) prior to treatment, immediately post-treatment, five minutes post-treatment, and ten minutes post-treatment using an infrared thermometer.

**Results:** A 3X4 repeated measures ANOVA revealed statistical significance between the cooling modalities and ankle surface temperature ( $p = 0.5$ ). Pairwise comparisons revealed statistical significance among the different cooling modalities immediately after, 5 minutes and 10 minutes post treatment. Ice bath cooled the ankle the most and for the longest.

**Conclusion:** Modalities that underwent a phase change (ice pack and ice bath) cooled skin surface tissue better than those that did not undergo a phase change (cold whirlpool). It was discovered that ice bath provided greater cooling when compared to an ice pack. This study also showed that the application of ice bath and cold whirlpool provided longer lasting cooling than ice pack. Further research is warranted to understand this relationship.

**Mentor:** Valerie Moody, Health and Human Performance

Functionality Variables and Accelerometry Energy Expenditure Estimate Improvement in Individuals  
with Locomotor Dysfunction  
(3) **Rodolfo Villarreal**

The act of walking is a complex series of actions involving a number of different body systems and is considered a critical contributor to quality of life. One's gait, the manner of walking, can therefore be used by healthcare providers to evaluate patient health, functionality, and prognosis.

Accelerometers serve as both a valid and reliable instrument to measure activity level in able-bodied persons over extended periods of time. Currently, the Actical® (Mini Mitter, Bend, OR, USA) accelerometer includes age, gender, height, and weight data in its calculations. For individuals with locomotor dysfunction, however, current algorithms do not suffice for accurate estimates as they underpredict actual energy expenditure. Thus, there is a need for a variable(s) to take into account the magnitude of gait impairment and produce a revised equation to accurately estimate energy expenditure.

In search of those variables this study explored various functionality measurements of subjects (n=35) with gait impairments diverse in both etiology and extent. The Timed Up and Go (TUG), 10 Meter Walk (10mW), 30-second Chair Stand (30CS), 4 stage standing balance (4SB), and Six Minute Walk (6MWT) tests were used. Using the conservative statistical model of backwards regression analyses produced an  $R=0.718$  by taking into account variables of gender, weight, age, 30CS, 4SB, the fast 10mW, and its difference to the slow 10mW. The best regression model produced an  $R=0.724$  and included height, TUG, and 6MWT in addition to those variables of the more conservative model.

Demand for accelerometer use in gait impaired individuals requires a revised equation taking into account important and frequently tested functionality variables. These variables demonstrate themselves as quality tests for better energy expenditure estimates and can lead physical therapists and healthcare professionals to the potential of providing gait impaired patients Actical® technology for more accurate results and therefore improve care.

**Mentor:** James Laskin, PhD, School of Physical Therapy and Rehabilitation Science

Preference of Insect Attraction to Different Wavelengths of Light  
(4) **Michael Weston**

The relationship between insects, specifically the orders caddisflies (*Trichoptera*), moths (*Lepidoptera*) and mayflies (*Ephemeroptera*) and different wavelengths of light was studied to determine what wavelength is most attractive to these different insect orders and how they differ in their interaction with the light source. This is important information to protect beneficial insects while also helping eradicate destructive insects. This approach is different from previous studies because it is comparing orders of insects rather than grouping them all together. The first part of my research was conducted at night, by shining a flood light on a white sheet to watch how many insects landed on this sheet. I observed this sheet for 30-minute intervals and then let the insects disperse for 30 minutes before changing the wavelength. The wavelength would range from 450 nm to 750 nm, or in other words from blue to red in the visual spectrum. I have found that all these orders of insects have shown preference towards the shorter wavelengths of light, such as of blue and green lights, and had less of a preference towards longer wavelengths, such as yellow and red lights. I have started the second part of my research, in seeing if the orders of insects react differently to the light source, but I do not currently possess enough data to make an accurate conclusion at this time.

**Mentor:** Frances Gilman, Biological Sciences

The Counseling Role of the Speech Language Pathologist  
(5) Sara Markuson

**Purpose:** The American Speech-Language and Hearing Association (ASHA) Scope of Practice in Speech-Language Pathology states that counseling is an integral component of speech-language pathologists' (SLPs') application of clinical services. This requirement was implemented in 2007, leaving SLPs who graduated prior to this date lacking in training and education regarding counseling techniques that integrate with remediation. The University of Montana housed the only Communicative Sciences and Disorders (CSD) department in Montana until 1989, when it was closed due to budgetary cuts. There were no CSD programs in Montana from 1990 until 2008 when the program was reinstated, leaving a 20 year gap in service. The SLPs who graduated prior to this closure were not under the 2007 ASHA dictation that they must provide counseling in therapeutic remediation. Although there is much information about the role of counseling in SLP services regarding acquired language disorders, fluency disorders, and developmental disorders, little is published about the role of counseling in interventions with adolescents struggling with language-literacy difficulties. The literature review discusses counseling techniques used by SLPs in remediation as well as counseling for clients with language-literacy difficulties.

**Question:** Are Montana SLP's who graduated prior to 2007 more or less likely to incorporate counseling services into therapy sessions as measured by an online survey.

**Question:** Do Montana SLPs provide counseling services to adult clients and parents of young clients more so than adolescent clients as measured by an online survey.

**Question:** Are counseling services implemented by Montana SLPs disorder specific, mostly relating to acquired disorders such as TBI and aphasia or disorders across the ASHA Scope of Practice as measured by an online survey.

**Methods:** The participants in this study will be selected from the 421 certified SLPs who are members of the Montana Speech Language and Hearing Association.

**Mentor:** Ginger Collins, Ph.D., CCC-SLP, Communicative Sciences and Disorders

Are problem invaders bigger and more fecund in the introduced versus native range?

(6) Natasha Boote, Birsen Karakuş, Muhyettin Şentürk Özkan, Eren José Hierro & Yvette Ortega

Plant invasions have detrimental effects on ecosystem structure and function, and are expensive to manage. Roughly one in ten exotic plants becomes invasive, but the underlying mechanisms that contribute to invasiveness are not well known. In an effort to better understand the relationship between plant size and fecundity and invasive success, we compared growth and reproduction of six plant species in their native (Turkey) and exotic (Montana, USA) ranges. Three species were chosen (*Bromus tectorum*, *Hypericum perforatum*, *Potentilla recta*) that represent high-impact invaders recognized as noxious weeds in Montana, while the other three (*Carduus nutans*, *Poa bulbosa*, and *Rumex acetosella*) were chosen because they are not recognized as problematic species in the area. Replicate populations for each species were collected in each range for analysis of biomass and seed production. We predicted based on EICA that successful invaders would be bigger and produce more seeds in the introduced range relative exotic plants that fail to invade.

Of the problem invaders, *B. tectorum* grew larger and produced more seeds in Montana, while *H. perforatum* and *P. recta* grew larger in Turkey. Conversely, of the species that are not problematic in the introduced range, *C. nutans* grew larger and produced more viable seeds in Montana, *P. bulbosa* did not differ in size but produced more seeds in Montana, and *R. acetosella* showed no difference in biomass or seed production. For our six species, we found no consistent relationship between invader impact and plant size or fecundity between ranges.

**Mentor:** Ylva Lekberg, College of Forestry



Identifying octopamine receptor expressing neurons in the adult *Drosophila* male  
(7A) **Terra Hanks, Jonathan Andrews**

Nearly every species utilizes aggression to secure resources or gain access to mates; however, pathways directing aggressive behavior are not well understood. Previous work in our lab identified genes and sets of neurons important in male *Drosophila* aggression. Of particular interest is a group of ~100 neurons that express the neurotransmitter, octopamine. Octopamine (OA) is structurally related to the vertebrate neuromodulator norepinephrine. Both are important in behavior, including arousal, learning, memory, opiate reward, and aggression. Specifically, we found that males without OA take longer to fight and often court the second male instead of fighting, indicating OA is necessary for males to make correct behavior decisions.

Octopamine signals subsequent neurons by binding to specific G-protein receptors called OA receptors; four are present in *Drosophila*. My goal is to examine the morphological and synaptic connections within OA $\beta$ 1R-expressing neurons. I perform brain and central nerve cord dissections followed by a series of immunohistochemical analyses and fluorescent microscopy. By labeling neurons with green fluorescent protein (GFP), I determine individual location and synaptic connection. The results help determine if octopamine neurons specifically connect to a pathway for aggression and a separate pathway for courtship. Preliminarily, I identified eight GFP-expressing neurons through the OA $\beta$ 1R-Gal4 line in the subesophageal ganglion, a region that receives pheromone input. OA $\beta$ 1R-Gal4 GFP-expressing neurons are also found in the ventral nerve cord in interneurons with cell bodies in distinct segments. Additionally, I located twenty-four OA $\beta$ 1R-Gal4 driven neurons that express GFP in the legs of the fly. The importance of a neuronal pathway map is paramount to continued research in courtship and aggression. Once morphology is understood, behavior can be correlated with specific synaptic circuits.

**Mentor:** Sarah Certel, Division of Biological Sciences

Deciphering the role of the octopamine receptor OA $\beta$ 1R in *Drosophila* male aggression  
(7B) **Alonda Paddock**

Nearly every species utilizes aggression to secure resources or gain access to mates; however, the pathways directing aggressive behavior are not well understood. Previous work in the Certel Lab has identified genes and sets of neurons important in *Drosophila* male aggression. Of particular interest are a group of ~100 neurons that express the neurotransmitter octopamine, which is structurally related to norepinephrine in vertebrates. Males without octopamine take longer to fight and exhibit a reduced number of lunges (a key aggressive behavioral pattern). Octopamine exerts its effects by binding to specific G-protein-coupled-receptors. Four octopamine receptors are present in *Drosophila* including OAMB, OA $\beta$ 1R, OA $\beta$ 2R, and OA $\beta$ 3R.

Currently I am examining the role of the OA $\beta$ 1R receptor in male aggression. To test the role of OA $\beta$ 1R, I am setting up fights between pairs of males that have the OA $\beta$ 1R receptor removed via a genetic expression system and pairs of control males. The first step in initiating aggression is gender identification from one male to the other. OA $\beta$ 1R is of particular interest as it is expressed in sensory neurons in the adult male leg, a key location in sex identification. After watching the recorded fights, I am scoring multiple parameters including how long it takes the males to start fighting, how many lunges, and occurrences of male-male courtship. To this point, I do not observe significant differences in latency to aggression or lunge number between males. However, my results indicate an increase in male-to-male courtship in pairs of experimental males without OA $\beta$ 1R versus controls. At the completion of my project, I will be able to assign specific contributions of the OA $\beta$ 1R receptor to the critical behaviors of male aggression and courtship.

**Mentor:** Sarah Certel, Division of Biological Sciences

Evaluating neurite outgrowth and signal integration in response to NGF and GDNF in neuroblastoma cell lines

(8) **Sarah Hendricks**

Neuroblastoma is a cancerous tumor that develops from cells of the neural crest. Unfortunately, the highly migratory nature of these cells causes approximately 70% of neuroblastomas to have already metastasized by the time they are diagnosed. Primarily affecting infants and children, neuroblastoma accounts for 15% of pediatric cancer fatalities. This illustrates the need for a better understanding of the mechanism by which neural cells transform into cancer. We hypothesize that neural crest cells' failure to differentiate into nerve cells is an important step leading to neuroblastoma.

The roles of receptor tyrosine kinases (RTKs) in governing cellular processes like differentiation are extensive and dynamic. Defects in RTK pathways have been linked to various cancers including neuroblastoma. While identifying each pathway involved in differentiation is important, it is as important to understand how the pathways interact; this has posed a challenge to researchers. To model RTK pathway associations, Dr. Mark Grimes has pioneered computer methods that incorporate bioinformatics and pattern recognition analysis to neuroblastoma cell line phosphoproteomic data sets. Along with finding 31 of the 58 RTKs in the human genome present and activated in neuroblastoma cells, his mapping of associations between tyrosine kinase signaling pathways has identified several networks of RTKs that represent functional cohorts.

In my study, I focused on two RTKs that cause differentiation in neuroblastoma cells that were from within the same cluster or cohort: TrkA and RET. TrkA and RET were activated with their respective ligands, NGF and GDNF, both individually and together, to analyze the effects of co-stimulation. Quantitative analysis of neurite outgrowth and activation of downstream effectors derived from western blots was used to determine if these two pathways act synergistically. Improving the current understanding of interactions among RTK pathways will help us to better understand cell differentiation and how it goes awry in neuroblastoma.

**Mentor:** Mark Grimes, Division of Biological Sciences

Monitoring herbicide and seeding efficacy on a *Bromus inermis* dominated rangeland.

(9) **Harrison Stein**

My research examines the efficacy of the herbicide glyphosate on *Bromus inermis* on an applied scale and to design and test a monitoring plan for measuring abundance and richness for grasslands dominated by one species. The experiment builds off the work of Bahm et al. (2011) where he identified effective herbicides to control *Bromus inermis*. My experiment asks whether chemical applications followed by seeding is appropriate management on an applied scale.

Additionally, I look at whether a monitoring program involving similar levels of sampling would be statistically appropriate for future monitoring efforts. Many monitoring plans use inappropriate designs to gather usable data. My experiment shows how difficult it is to collect an appropriate amount of data and I make recommendations for managers on how to monitor.

This experiment builds off of many years of work on controlling *Bromus inermis* and asks restoration questions on an applied scale rather than on a small, experimental scale. I also offer monitoring designs for managers to gather data in a rangeland in order to understand how effective management was.

**Methods:** All sampling was done over the summer of 2013 on Allied Waste of Missoula's property in the North Hills. I laid out 12 50X50 meter experimental units. Within each experimental unit I used 150 Daubenmire plots to sample species richness and abundance. In the Fall of 2013 6 assigned plots were sprayed with a glyphosate mix. Two weeks following the herbicide application I broadcast seed over 10 plots. Two plots, one with herbicide and one without herbicide, remained as a control.

**Mentor:** Cara Nelson, Natural Resource and Science Management

Utilizing the NLRP3KO cell line to visualize inflammasome formation in the presence of cholesterol-trafficking modifiers

(10) **Emilie Jacobsen**

Lysosomal Membrane Permeabilization (LMP) has long been known as a significant cause of programmed cell death. LMP causes the release of hydrolytic enzymes from the endosomal compartments of cells which signal the cell to die. Certain hydrolytic enzymes, such as the cathepsins, cause the formation of a large protein complex called the inflammasome and subsequent activation of caspase-1 induces the release of pro-inflammatory cytokines and a type of cell death called pyroptosis. In recent years, many studies have suggested that altering cholesterol levels in lysosomes can affect the severity of LMP and its effect on programmed cell death. Two drugs, U18666A and methyl beta cyclodextran (M $\beta$ CD), are known to have opposing effects on cholesterol trafficking in the endosomal compartments. U18666A impedes cholesterol trafficking in the endosomal system, causing accumulation of cholesterol and hindering programmed cell death by LMP. M $\beta$ CD, a cholesterol-chelating drug, extracts cholesterol from cells and thereby increases cell sensitivity to LMP. In this study, we will use the NLRP3KO cell line to visualize the formation of the inflammasome when cells are treated with either U18666A or M $\beta$ CD and certain nanomaterials which are known to induce LMP in certain cell lines. We expect to see that inflammasome formation induced by nanomaterial is decreased by U18666A and increased with M $\beta$ CD due to cholesterol modification in lysosomal membranes. Along with testing the effects of certain cholesterol modifiers on NLRP3KO cells, we also attempted to optimize the conditions and treatments for utilizing these cells as a model for inflammasome formation and inflammation by nanoparticles. To do this, we performed dosage response tests to nanoparticles using cell viability and IL-1 $\beta$  production assays, looked at a time course response to particulates in order to determine the timeline of inflammasome formation, and endeavored to create a protocol for quantifying inflammasome formation in particle-treated cells.

**Mentor:** Andrij Holian, The Department of Biomedical and Pharmaceutical Sciences

Creating a PTEN-Deficient Mesothelial Model and Growth Analysis

(11) **Kellee Glaus & Ty Timmer**

Most individuals would be surprised to learn that asbestos is contained in thousands of products still marketed in the U.S. Asbestos exposures are commonplace, but few worry about the effects due to misinformation. Approximately 10% of asbestos exposures result in a deadly cancer known as malignant mesothelioma, involving lesions on the pleural and peritoneal linings of the body. Little has improved in therapy in the last 40 years. After years of negative data linking tumor suppressor PTEN to these tumors, several new publications have shown clear involvement of this gene and postulate that it is effective at encouraging tumor growth through a block to apoptosis mediated through the PTEN/PI3K/AKT/mTORc pathway. This pathway has been implicated in other cancers and is clearly one of the newest targets of cancer therapeutics.

This project aims to confirm the linkage between PTEN loss and p53 dysregulation through AKT/MDM2 in a mesothelial model system. We hypothesize that PTEN suppression by shRNA constructs will result in cells' decreased response to apoptosis-inducing signals, as well as dysregulation of the levels of critical p53 responsive genes. The project utilizes cell lines where PTEN expression has been down-regulated to mimic tumors. In these cell lines, we hope to characterize changes in the ability of normal mesothelial cells to evade apoptosis, dysregulate cell cycle, and generally behave in a more tumor-like fashion. We isolated RNA from six cell lines and performed reverse transcription to form cDNA. In PCR, the cDNA and a Taqman probe showed varying levels of PTEN suppression. Growth curves and clone morphology showed cells' resemblance to tumors. Research is ongoing, and our next step is developing a correlation between apoptosis and PTEN suppression levels using a Live Cell Caspase Activity Assay Kit that measures caspase 1 activation in cells after UV light exposure.

**Mentor:** Mark A. Pershouse, Department of Biomedical and Pharmaceutical Sciences

Peer Mediated Intervention and Instruction: Mutually Beneficial Throughout the Lifespan  
(12) **Lacey Kvam**

Significant research contributions need to be made in the area of adults with autism. There is little available research on intervention for individuals with autism spectrum disorder (ASD) over the age of 13. As a consequence, clinicians do not have evidence based treatments to implement with their clients adolescence through adulthood. Vanderbilt University reviewed 4,500 studies on autism interventions published between 1980 and 2011 and they found that only 32 of these studies focused on intervention for people aged of 13 to 30 and that “many of the 32 studies were poorly done.” (Diament, Michelle 2012.)

Through qualitative interviews this study explores the experience of one individual with ASD and his mentors in the Mentoring, Organization, and Social Support for Autism Inclusion on Campus (MOSSAIC) program. The MOSSAIC program utilizes a peer mediated intervention and instruction (PMII) model and aims to improve the college experience for individuals with ASD. Within MOSSAIC PMII targets executive functioning skills such as organization and time management while working with peers offers social support, mentoring, and inclusion. Proposed are in-person semi-structured interviews with one mentee with ASD and his previous and current mentors. Both mentors are students of the Communicative Sciences and Disorders department. The mentee interview will focus on the outcomes of the MOSSAIC program participation while mentee interviews will address the educational impacts of participating in such a program. This research should help identify the needs of college/university students with ASD while evaluating the outcomes of PMII for both mentors and mentees.

**Mentor:** Jennifer Closson, Communicative Sciences and Disorders

Telepractice in the Field of Speech-Language Pathology  
(13) **Rebecca Riordan**

The rural areas of Montana are in critical need of speech-language pathologists (SLPs). A relatively new delivery model, telepractice, was approved by the Montana legislature in November of 2013 for use by SLPs and audiologists in the state of Montana. Telepractice involves the use of telecommunication platforms to deliver speech-language pathology services for people who may not have access to services as a result of geographic, physical, or financial barriers. Telepractice has the potential to alleviate the existing SLP shortage and improve outreach to rural areas of Montana. Through the University of Montana RiteCare Speech, Language, and Hearing Clinic (RiteCare Clinic), researchers are piloting a telepractice program. The current study evaluates the concerns, perceptions, and satisfaction of patients and practitioners that participate in telepractice therapy services at the clinic. Research participants are interviewed before telepractice begins to assess their current comfort level with technology and concerns they have about telepractice before it begins. After a semester of speech and language teletherapy, participants are interviewed again. The post-treatment interview assesses the participants' comfort level with technology, positive and negative feedback about their experience with the telepractice service delivery model, and whether they would recommend using telepractice to others with similar circumstances. The qualitative results from this study will inform the Montana Speech Language and Hearing Association, the Montana Board of Speech-Language Pathologists and Audiologists, and provide important feasibility information for SLPs who are considering using this delivery model in the state of Montana. Ongoing telepractice research across the country continues to evaluate the effectiveness of telepractice compared to traditional in-person services. This project seeks to assess common complications of administering telepractice in the state of Montana and to determine what clients and practitioners find to be satisfactory and beneficial about this delivery model of therapy.

**Mentor:** Catherine Off, Communicative Sciences and Disorders

## The Role of Chromatin Modification in Germ Cell Specification and Development

(15) **Jenessa Olson**

Chromatin modifications are modifications of nuclear proteins called histones. Histones are important for the compaction of DNA. These chromatin modifications can result in activation or repression of transcription of the DNA, which is essential for the cell to synthesize proteins and pass on genetic information. Some chromatin modifications have been linked to fertility and specification of reproductive cells called germ cells. We are studying a chromatin modification that has not been previously identified in germ cells. The mechanism and enzyme involved in this reproductive cell chromatin modification is not well understood. My research has been focused on identifying the enzyme that regulates this modification. The hypothesis is that this modification will affect reproductive cells specification and fertility. I use *C. elegans*, a eukaryotic nematode, as the model organism. This nematode is optimal because it is easy and fast to culture, allowing for variant strains to be produced. *C. elegans* is also transparent, so specific cells can be tracked and cell lineages can be followed. We found a specific chromatin modification that is prominent in late embryo germ cells of the wild type *C. elegans*. I have been researching if mutant worm strains, some with fertility defects, still present the chromatin modification in germ cells. Currently, I have found that two out of four mutants have less of this modification present in their germ cells. Further studies are ongoing to observe any changes in this modification in other mutant worm strains. Since *C. elegans* shares similar biological regulation mechanisms as humans do, results from this study can contribute to a better understanding of the mechanism in the development of germ cells in humans. The results can be applied to many biomedical implications by being able to manipulate these regulations for our benefit in development and disease.

**Mentor:** Ekaterina Voronina, Division of Biological Sciences

## Leaky Moss in Montana's Grasslands

(16) **Ryan Milling**

Grasslands cover more than 40% of Montana and while much is known about the vascular plant community, little attention is paid to the role mosses play. Could these bryophytes be a key part in maintaining proper nutrient cycling and recruiting new plants? In our preliminary study we found that plant biomass is increased in the presence of moss, one explanation involves moss physiology. Mosses are fascinating organisms able to withstand extreme dehydration and can rehydrate within minutes. This rapid rehydration results in nutrient loss through ruptured cell walls, which we hypothesize is then leached into the soil and made available to surrounding organisms. In our current project we are investigating the nature of moss 'leachate' and what effect it has on native plants and nonnative plants in competition. Moss has been shown to facilitate plant growth through altering physical structure or water availability; we are focused on how mosses alter the nutrient cycling. Our common garden experiment will treat established grassland plants (*C. stoebe*, and *F. idahoensis*) with moss leachate for 4 weeks and measure final biomass. Furthermore, via elemental analysis, we will investigate the nature of moss leachate, quantifying the total organic carbon and nitrogen. Mosses grow in almost every ecosystem on the planet, and linking moss leachate as a key part of the nutrient cycle could yield many management implications.

**Mentor:** Ray Callaway, Biology

Plants and Fungi Unite: A Significant Symbiosis  
(17) **Nicolas Glynos**

**Purpose:** The abundance of fungal diversity in the Flathead Valley provides an excellent opportunity to observe and collect many different species of mushrooms, some of which form mutualistic associations with plants. The objective of this research was to collect and identify wild fungi that demonstrate mycorrhizal associations with plants, and to prepare and store specimens to allow for future laboratory studies.

**Methods:** Specimens were collected predominantly in coniferous forests of the Flathead Valley from mid-October to mid-November. Fungal samples were photographed, and details regarding their location and habitat were documented. Spore prints were made by placing severed caps, gill-side down, on a piece of construction paper and left overnight to dehisce. Spores and dried mushrooms were stored for future use. Fungal specimens with mycorrhizal associations were researched from referenced texts.

**Originality:** Mycorrhizal fungi have been examined and studied to a very large extent in recent years. However, the immense diversity of fungi necessitates research on a local level. This project aimed to focus on a small area of the Flathead Valley to provide practical information that can be used to broaden our understanding of this extensive subject.

**Significance:** The benefits of mycorrhiza for both plants and fungi are immense, and could prove to be useful in many capacities. With a better understanding of how this process works, mycorrhizal fungi could be used to greatly improve growth of agricultural plants, provide a natural and sustainable fertilizer, as well as increase our understanding of forest ecology.

**Mentor:** Dr. Mirabai R. McCarthy, Biological Sciences

Which Trees Do Mountain Pine Beetles Attack?  
(18) **Gilia Patterson**

I studied mountain pine beetle (*Dendroctonus ponderosae*) attacks in ponderosa pine (*Pinus ponderosa*) to determine how attacks are distributed through a stand, how growth rate affects a tree's likelihood of being attacked, and if there is a genetic basis for susceptibility to attack. I used a genetic trial of ponderosa pine planted in 1974 at Lubrecht Experimental Forest in northwestern Montana made up of about 4000 trees from 204 distinct genetic families. Mountain pine beetles attacked the trial during an outbreak that started in 2000 and continues today. I recorded whether or not beetles had successfully attacked each tree and mapped the results. In 2001 foresters measured the height and diameter at breast height (DBH) of each tree, and I used these measurements as growth rate. Attacked trees had more neighbors that were attacked than un-attacked trees, meaning attacks occurred in clusters. I controlled for this spatial pattern by counting the number of attacked neighbors each tree had. I found that some families were attacked more often than average, and the opposite was true for other families. Trees with larger DBHs were more likely to be attacked. These results suggest that a tree's susceptibility to attack depends on genetic source as well as growth rate and location. I identified families that were more or less likely to be attacked, and these families can be researched further.

**Mentor:** Anna Sala, Biology

Air and Soil Temperature Variability in Northern Alaska  
(19) **Katrina Keleher**

The Circumpolar Active Layer Monitoring (CALM) Project has been monitoring permafrost (perennially frozen ground) and its overlaying active layer (which freezes and thaws annually) throughout northern Alaska's Kuparuk River watershed and throughout the polar regions since the mid 1990's to detect long-term responses to our changing climate. The soil-surface temperature data is collected by thermistors that were positioned immediately below the surface of the ground at nine locations within a transect of 1-ha plots arranged from north to south across the region. Locations within each plot were individually selected to represent a full range of microsite conditions, with distinctions in vegetation, moisture, and microtopography. For my research, I am comparing temperature measurements from three different datalogger models from the same manufacturer deployed in pairs over 1-year durations from 2005-2006 and 2011-2012. Diagrams comparing daily soil-surface and air-temperature differences between the different instrumentation models will be generated, looking for systematic variations due to vegetation, air temperature, and moisture. It is hypothesized that temporal variability in the differences between instrumentation will be systematically related to seasonal cycles of temperature, with the largest differences being in winter when temperatures are near the minimum reliability range of the dataloggers. Spatial variability throughout the plots will be examined, with the larger differences hypothesized to be at the warmer, drier sites. Although instrumentation comparison is standard practice, the statistics I will be generating and analyzing are necessary to quantify the reliability and consistency of the CALM dataset and this evaluation has not yet been completed. My research will contribute to the greater understanding of our complicated climatic system, as the thickening of the active layer in Arctic regions may potentially discharge further greenhouse gases into the atmosphere, thus yielding a variety of ecological feedbacks and further intensification of climate change.

**Mentor:** Anna Klene, Geography

The Amazon River Basin as An Analog For The Pre-Ice Age Bell River Basin Of North America  
(20) **Alexander Vaught, Emilia Palenius, Kevin Power, Ashley Murray & Tara Mitchell**

The pre-ice age Bell River basin of North America was comparable in size to the modern day Amazon basin of South America. In Miocene time, it drained most of Canada and one third of the North American continent before being defeated by tectonics, volcanism, and glaciation. Beginning about 2.5 million years ago, continental glaciers re-routed the paths of the tributaries in Canada, leaving behind only traces of this once massive river basin in headwater valleys in the Rocky Mountains and in a giant river delta in the Labrador Sea. The contemporary Amazon River basin provides an analog for estimating fluvial parameters of the ancient Bell River system. Both systems had headwaters in high mountains and canyons, then drained across flat, continental-scale basins, and emptied into the Atlantic Ocean through broad continental rift zones. Both have large deltas and long submarine turbidity channels. Comparing the Amazon's delta, tributaries, stream gradients, and sediment loads to the remnants of the Bell River system could support a model for pre-ice age North American drainage. This could then augment studies of tectonic displacements in the western interior, for example, uplift of the Great Plains and Rocky Mountains, effects of Yellowstone volcanism, and faulting in the Great Basin.

**Mentor:** James W. Sears, Geosciences

An Evaluation of the Depositional Setting of the Virgelle Sandstone in Northwestern Montana  
(21) **Sarah Washko**

The Virgelle Sandstone is a grey to buff colored sandstone, deposited during the late Cretaceous along the western margin of the Cretaceous Interior Seaway. As the basal member of the Eagle Formation, the Virgelle sandstone overlies the poorly exposed mudstones of the Telegraph Creek Formation. Overlying the Virgelle is the regressive Two Medicine Formation in the Choteau Valley of northwestern Montana. Outcrops of the Virgelle Sandstone are capped by magnetite and ilmenite rich sands (up to 1 m thick) that thin to the east. To understand the change in depositional setting from west to east three measured sections were obtained in the Choteau Valley, which contains both ironstone rich and ironstone poor sandstone outcrops. Sedimentary features noted included grain size, bedforms, paleoflow indicators, inchnofacies, and heavy mineral content. All measured sections indicate a coarsening upward succession, suggestive of a deltaic and/or shoreface succession with one section capped by a coal. Heavy mineral content and grain sorting also increase up section. Sandstones are dominated by planar and trough cross bedding. Paleocurrent data suggests an easterly flow direction. Trace fossil assemblages are indicative of Skolithos and Cruziana ichnofacies or sandy shore and sublittoral environments respectively. Petrographic analysis reveals a mix of microcrystalline and polycrystalline quartz, feldspars, volcanic and metamorphic lithics, glauconite as well as the heavy mineral magnetite and ilmenite. The presence of these minerals and lithics as well as paleocurrent indicators suggest that the source terrain was an igneous and metamorphic provenance to the west. The increase in heavy mineral content up-section, particularly in the upper most meter or so, is thought to be the result of selective winnowing in a shoreline setting.

**Mentor:** James R. Staub, Geoscience

Stratigraphic and Sedimentologic Analysis of the Bear Gulch Limestone  
(Mississippian-Pennsylvanian) near Grass Range, Montana  
(23) **Pamela Lavering**

The Bear Gulch is a dolomitic limestone unit of Upper Mississippian/Lower Pennsylvanian age (~320 Ma) occurring in the Big Snowy Trough, an east/west-trending structural trough north of the Little Belt Mountains in central Montana. The Bear Gulch crops out near Grass Range, Montana, and is an informal unit within the Fergus Group. Hydrocarbon source rocks similar in age and composition to the Bear Gulch limestone have played a central role in the recent success of directional drilling and hydraulic fracturing (e.g., Bakken, Eagleford, etc.). Despite the suspected economic potential and previously-documented paleontological wealth of the Bear Gulch, no recent sedimentary analyses of outcropping Bear Gulch or its subsurface equivalents in the Big Snowy Trough have been published. The results of this study provide the basis for assessing the source rock potential of the Bear Gulch and understanding its stratigraphic affinity to other mapped units within the Big Snowy Trough. Six weeks were spent in the field collecting and cataloging rock samples and measuring laminated sections of the Bear Gulch (July-August, 2013). This was followed by laboratory analysis of the samples. Thirteen of the 75 samples collected were made into thin sections and analyzed with a petrographic microscope. Mineralogical composition, carbon content, and sedimentary fabric data were determined through X-ray diffraction, elemental analysis, and SEM studies. Using these combined data sets, sedimentary facies within the stratigraphic measured section of outcrop were defined. This information was compared to gamma ray logs from nearby oil wells and a north/south-trending cross-section across the Big Snowy Trough was constructed in order to explore the lateral variations within Bear Gulch time-equivalent strata across this structure.

**Mentor:** Marc S. Hendrix, Geoscience



Physical Activity and Body Composition Measures of Elementary-Aged School Children  
on an American Indian Reservation

(24) **Brian Yonts, Caleb Kemp, Ashley Schreiner & Devin Kavanagh**

Childhood obesity and diabetes are major public health concerns. American Indian (AI) children are at increased risk for these diseases. Physical inactivity and high body mass index (BMI) are risk factors for obesity and diabetes. The purpose of this study was to collect body composition measures and physical activity (PA) counts for elementary school-age children on an AI reservation. A total of 61 children (28 males and 33 females) participated in the body composition measures. These included weight, height, and waist circumference—BMI was calculated with the equation  $\text{weight}(\text{kg})/\text{height}(\text{m})^2$  and converted to BMI-for-age percentiles. Physical activity was measured by direct observation. Three sections of the recess playground were designated as zones: Zone 1 was an asphalt area, Zone 2 contained playground structures, and Zone 3 was an open field. Each zone was video recorded for 10 minutes during a recess period for four school days. PA counts were classified as sedentary, walking, or active. The mean BMI-for-age was at the 67th percentile and mean waist circumference was 72.3cm ( $\pm 11.7\text{cm}$ ). The PA data showed girls had more sedentary counts ( $12.2 \pm 3.5$ ) and active counts ( $8.0 \pm 2.1$ ) in Zone 2 compared to Zone 1 (sedentary counts= $2.3 \pm 1.3$ ; active counts= $2.7 \pm 1.6$ ) or Zone 3 (sedentary counts= $0 \pm 0$ ; active counts= $0 \pm 0$ ). Boys had more sedentary counts ( $4.7 \pm 2.2$ ) and active counts ( $4.7 \pm 2.8$ ) in Zone 2 than either Zone 1 (sedentary counts= $2.4 \pm 1.5$ ; active counts= $3.8 \pm 2.1$ ) or Zone 3 (sedentary counts= $0.9 \pm 1$ ; active counts= $3.8 \pm 2.9$ ). These data were the baseline results of a pilot study designed to increase PA during recess in 3rd, 4th, 5th, and 6th grade children in this AI community.

**Mentor:** Vernon Grant, Health and Human Performance

The Effects of Forest Litterfall On Snow Melting Rates In Northern  
Rockies Mixed-Conifer Forests

(25) **Michael Schaedel**

Forest litter within a snowpack changes the snow albedo, affecting springtime melt rates. Albedo, the percent of shortwave radiation a surface reflects, is high in snow and low in forest litter. Litter absorbs shortwave radiation and reemits longwave radiation, which should increase snowmelt rates. We are conducting a two-part study to (1) quantify winter litterfall rates in relation to canopy cover and local tree spacing, and (2) to determine the effects of litterfall density on melt rates. We predicted litterfall will be greatest in tree clumps, less near individual trees, and least in canopy openings; and that snow melt rates will increase with litter inputs, but potentially decrease at very high litterfall rates due to an insulation effect. The research takes place at Lubrecht Experimental Forest, at 1260 m of elevation. To quantify litterfall rates we deployed litter traps (1 m<sup>2</sup>) beneath six randomly selected tree clumps, individual trees, and canopy openings (n= 18 traps total). Traps will be collected after melting is complete and litter weighed. We are using a litter addition experiment (randomized block design) to investigate litterfall effects on snow attributes. Experimental blocks are placed in large canopy openings to limit natural litter inputs. Four litter addition amounts (0.1 kg/m<sup>2</sup>, 0.4 kg/m<sup>2</sup>, 1 kg/m<sup>2</sup>, and 4 kg/m<sup>2</sup>) or a control treatment are applied at random to 1 m<sup>2</sup> plots, replicated in nine blocks. During melt season we will measure snow depth, snow water equivalent, albedo, percent snow coverage, and date of snow disappearance in each plot. The results of this research will give land managers more information on how changes to forest canopy cover, and the resulting change in litter fall, will affect snowmelt. This will allow land managers to design forest thinning and restoration prescriptions with a better understanding of the effects on water yield.

**Mentor:** Andrew J Larson, Department of Forest Management

Absolute Photoionization Cross-Sections for Xe<sup>+</sup> and Xe<sup>2+</sup>  
(26) Allison Mueller

Elements heavier than iron, or trans-iron elements, are increasingly important to astronomers. Spectroscopic measurements reveal that these heavy elements are present in planetary nebulae (gaseous clouds that surround dying stars). From these spectra, astronomers can calculate elemental abundances that are then used to determine the chemical composition of the parent star. Accurate determinations of these elemental abundances are critical to theoretical models of stellar nucleosynthesis and our understanding of the chemical evolution of the Universe.

In order to calculate elemental abundances, astronomers first need to identify which elements' spectroscopic profiles are present in their measurements. They do so by comparing their observations to high-energy-resolution photoionization spectra measured by our research group. Our team of atomic physicists measures the absolute photoionization cross-sections for these elements at the Advanced Light Source, a third-generation synchrotron radiation source located at Lawrence Berkeley National Laboratory. To produce the required spectra we merge the element under consideration with intense beams of ultraviolet or x-ray radiation and collect the ions produced as a function of photon energy.

This analysis focuses on photoionization cross-sections for Xe<sup>+</sup> and Xe<sup>2+</sup> and includes a discussion on interesting features like Rydberg series and window resonances.

**Mentor:** Dr. David Macaluso, Physics & Astronomy

Minimizing Direct Competitions in Complete Components of (1,2)-Step Competition Graphs  
(27) Nathan Sponberg

Graph theory is a useful tool for studying systems of food webs, a concept from ecology that models the predator-prey relationships between species in an ecosystem. We have used this concept to inform and motivate our exploration of graph theory. In particular we examine the characteristics of (1,2)-step competition graphs developed by Factor and Merz in 2010, which are an extension of normal competition graphs first introduced by Cohen in 1968. Factor and Merz define the (1,2)-step competition graph of a digraph  $D$ , denoted by  $C_{1,2}(D)$ , as the graph with the same vertex set as  $D$  and an edge between vertices  $x$  and  $y$  if and only if there exists some  $z \in V(D)$  for which either  $d_D(x, z) = 1$  and  $d_D(y, z) = 2$  or,  $d_D(y, z) = 1$  and  $d_D(x, z) = 2$ . We extend this definition and say that given  $x, y \in V(D)$  such that  $(x, y) \in E(C_{1,2}(D))$ ,  $x$  and  $y$  compete directly if there exists a vertex  $z \in D$  such that  $d(y, z) = 1$  and  $d(x, z) = 1$ . We then call the edge  $(x, y) \in E(C_{1,2}(D))$  a direct competition between  $x$  and  $y$ . Otherwise, we say that  $x$  and  $y$  compete indirectly and we call the edge  $(x, y) \in E(C_{1,2}(D))$  an indirect competition between  $x$  and  $y$ . We have developed a family of digraphs that induce complete components in their (1,2)-step competition graphs that appear to have a minimum number of direct competitions.

**Mentor:** Kim Factor, Dept. of Mathematics, Statistics, and Computer Science

Minimal amino acid sequence supporting a gross fold within a protein.

(28) **Alexandra Heyneman**

Proteins are the powerhouse of cellular activity. These dynamic tools manipulate biological molecules, initiate communication between cells, transport molecules, and much more. These macromolecules are encoded by strings of amino acids that dictate the three-dimensional structure of a folded protein. Specifically, our research focuses on the minimal amino acid sequence necessary to establish a gross fold. Modeling with the Monte Carlo (MC) sampling software CAMPARI, we are able to simulate a simple peptide structure: a 42-residue polyalanine with dispersed lysines (polyAK or (A<sub>5</sub>K)<sub>7</sub>). Polyalanine is known to form long alpha helices with no tertiary interactions. Insertion of a proline segment within the middle of this structure creates the bridge between the linear polyAK and a two-helix bundle, 3D arrangement (polyAKPSDP or (A<sub>5</sub>K)<sub>3</sub>(PSDPAK)(A<sub>5</sub>K)<sub>3</sub>). The PSDP sequence creates a turn within the two-helix bundle needle proteins found in type 3 secretion systems, such as that seen within the pathogenic bacteria, *Shigella flexneri*. As expected, MC simulations show that polyAK prefers an alpha helical conformation. PolyAKPSDP, as hoped, favors a two-helix bundle. Leucines in the two-helix bundle needle proteins in nature stabilize the bundle through both short and long-range interactions. MC simulations show that short-range interactions between hydrophobic leucine residues added to polyAKPSDP reinforce its 3D structure. Each peptide was simulated over a range of temperatures, and the structure was evaluated through the radius of gyration, secondary structure content, contact maps, helicity, and other structural measures. Once those tests were complete, we compared polyAKPSDP and polyAK using a clustering algorithm embedded in the CAMPARI software. Future investigations will involve investigating the effect of long-range contacts on the turn.

**Mentor:** Bruce E. Bowler, Chemistry and Biochemistry

Investigating Unconformities through Detrital Zircon Geochronology: Initial Results From Precambrian, Cambrian, And Devonian Formations of NW Montana

(29) **Michael Schmechel**

Located predominantly in NW Montana, the intracratonic Belt basin was the depositional site of the Precambrian-aged Belt Supergroup. Paleozoic formations were deposited on top of the Belt Supergroup above geologic unconformities. An unconformity is a surface boundary between two geologic formations that represents a period during which no sediment is present. Unconformities may be indicative of significant tectonic activity. I have chosen to research the sedimentary provenance of formations that overlie geologic unconformities in the region of the Belt basin, namely, the Proterozoic Garnet Range, Cambrian Flathead, and Devonian Maywood formations. This research aims to assess the sources of mineral grains within the formations and then to make inferences about the tectonic settings in which the geologic formations were originally deposited. An accurate determination of provenance involves the radiometric dating of zircon, a detrital mineral that experiences U-Th-Pb isotope decay. Dateable zircon grains were acquired from each of the three target geologic formations from localities in NW Montana. I crushed, milled, and sieved rock samples from each locality, and isolated zircon from the milled material by using a Franz Magnetic Separator, followed by heavy-liquid separation. Selected zircon mineral grains were imaged using scanning electron microscopy (SEM), and dated at the Boise State University Isotope Geochronology Lab using Laser Ablation and Inductively Coupled Plasma Mass Spectrometry (LA-ICPMS). Initial results give peak ages of 1,724 million years for the Garnet Range formation, 1,768 and 1,825 million years for samples of the Flathead Formation from two different localities, and 1,886 million years for the Maywood Formation. These dates were then used to infer sedimentary provenance for each formation, and to evaluate the tectonic setting of the Belt basin region in Precambrian, Cambrian, and Devonian time.

**Mentor:** Marc Hendrix, Geoscience

Disability levels in cerebral vascular accident (CVA) survivors: the ICF model in action  
 (30) **Mirian David, Lauriston Paixão, Camila Barbosa, Carlúcia Franco, Kátia Ribeiro  
 & Maria do Socorro-Silva**

**Purpose:** This study was designed to use the International of Classification of Functioning, Disability and Health (ICF tool) to establish an initial data base of disability levels for a group of cerebrovascular accident (CVA)

survivors within the area of Campina Grande (Brazil).

**Methods:** 38 survivors (17 females) participated in this study. 65.8% of the participants suffered ischemic CVA and 52.6% of all cases had injuries to the right cerebral cortical hemisphere. All neural injuries were considered chronic since they occurred at least five years from the date of this study. The ICF tool consisted of 49 questions distributed into 3 categories according to ICF's core set for stroke.

**Results:** The investigated group revealed high levels of dysfunction on very basic daily life activities: bipedal locomotion, use of upper limbs, and ability to interact with other citizens. Our study suggested that this population faces a much higher risk of developing secondary morbidities caused by CVA and they include, [1] depression due to the inability of interaction and recreation, and [2] higher risk of falls due their impairment in bipedal ambulation.

**Significance:** Results produced by our study have provided local public health agencies with a data base indicating what comorbidities local CVA survivors are more likely to suffer. This data base will aid these same agencies in developing effective local health policies aiming to prevent these comorbidities.

**Originality:** This study shows that the introduction of a multi-factor score that integrates environmental and social aspects of disability is an essential tool for the development and evaluation of new public health policies.

**Mentor:** Alessander Danna-dos-Santos, School of Physical Therapy and Rehabilitation Science

Investigating The Mesoproterozoic-Paleozoic Great Unconformity Of Western Montana:  
 Detrital Zircon Geochronology And Implications For Terminal  
 EVOLUTION OF THE BELT BASIN

(31) **Patrick Moffitt**

This study is focused on determining the depositional ages of geologic formations above and below the Great Unconformity to understand how the rocks changed and what that change means to western Montana's tectonic past. The Great Unconformity of western Montana represents a depositional hiatus in the stratigraphic record of over half a billion years. The movement of tectonic plates during this hiatus changed western Montana's sediment source, referred to as a change in provenance. This change in provenance is represented by Meso-Proterozoic rocks of one composition overlaid by younger Paleozoic rocks of an entirely different composition. By using detrital zircon ages and framework grain analysis of the rocks that formed before and after the Great Unconformity we can investigate the change in provenance over this enormous hiatus in deposition. The rock units analyzed include the MacNamara, Pilcher, and Garnet Range formations of the Belt Supergroup (Meso-Proterozoic) and the Lower unit of the Cambrian Flathead formation (Paleozoic). Samples were collected from Alberton, the northern flank of the Flint Creek Range (Porter's Corner), and the southern flank of the Garnet Range Mountains, all in western Montana. Zircon ages are collected by zapping hundreds of grains with a laser and measuring the decay rates of specific radioactive isotopes (U-Pb) that are blasted off of the zircon grain. The results come in the form of distinctive, provenance-defining zircon age spectra or "barcodes." By collecting detrital zircon "barcodes" from multiple formations we can reconstruct the geochronology and tectonic evolution of successive stratigraphic units. This study is significant because the Great Unconformity is poorly documented in western Montana and represents one of the longest known depositional hiatuses in geologic history. I anticipate presenting preliminary detrital zircon geochronology spectra for each of the stratigraphic units listed above and interpreting these data in context of published tectonic models to determine terminal evolution of the Belt Basin. In particular, it is expected that detrital zircon "barcodes" from the Belt's Garnet Range formation will be notably different from those of the underlying Belt units, indicating a completely different and previously undocumented Belt Basin provenance.

Mentor: Marc S. Hendrix, Geosciences

Test-Retest Reliability of the Big Sky Aphasia Program-Assessment of Language in Context  
(32) **Jenny Silvernale**

Aphasia is an acquired language disorder that most often results from a cerebral vascular accident (CVA), (ASHA 2013). Aphasia can affect both spoken language and auditory comprehension. There are several batteries that assess aphasia severity and type. The Western Aphasia Battery- Revised is one such assessment. However, most of these assessments are most informative about the communication characteristics of persons with moderate aphasia. Assessments should be designed to assess the skills and needs of each individual on the severity continuum of aphasia. The Big Sky Aphasia Program-Assessment of Language in Context (BSAP-ALC, Kennedy, 2012) is an assessment that is designed to provide information about a client's communicative effectiveness and syntactic accuracy in naturalistic communication situations. In the current study, the BSAP will be investigated for test-retest reliability for both persons with aphasia (PWA) and persons without aphasia (PWOA). This test will be administered to four participants, two of which will be PWA and the remaining two will be PWOA. Both PWA have Broca's aphasia. The test will be administered to all participants in the Spring of 2014. The test will be administered to all participants for a second time two weeks after the first test. Test-retest reliability will be measured for the PWA group and the PWOA group. Also test-retest reliability of PWA will be compared to the test-retest reliability of PWOA. High test-retest reliability scores are anticipated for this study. Keywords: Aphasia, Communication, Reliability, Western Aphasia Battery, BSAP-ALC

**Mentor:** Annie Kennedy, Communicative Sciences and Disorders

Investigating Sequence Boundaries Between Middle Proterozoic Bonner, McNamara, and Garnet Range Units  
Through Detrital Zircon Geochronology  
(33) **Dylan Davis**

I am focusing on collecting geochronologic data from detrital zircon grains within three rock units within the lower Missoula Group of the Belt Supergroup located in Western Montana. These three rock units are of Middle-Proterozoic age (~1.4-1.5 billion years old) and include, from oldest to youngest the, Bonner Formation, McNamara Formation, and Garnet Range Formation. I collected one sample from each formation as exposed along Highway 200 near Potomac, Montana. In addition, a second sample of the McNamara and Garnet Range units was collected from the Flint Creek drainage in the Northern Flint Creek Range (Porters Corner area). Each sample was trimmed of weathering rind, crushed, and milled to ~250 microns. The resulting sediment was washed and separated based on grain density on a Gemini water table. The dense fraction was further separated based on magnetic susceptibility using a Franz magnetic separator. Lithium polytungstate (density 2.85 g/cm<sup>3</sup>) was used for the final isolation of zircon grains for radiometric data.

The zircon separates are currently being mounted in epoxy for analysis and will be analyzed by laser ablation inductively-coupled mass spectrometry (LA-ICP-MS) at Boise State University in early March. This analysis will yield a set of radiometric ages for each individual zircon grain, based on the uranium-lead radiometric series. Collectively, these data should provide the ability to document detrital contributions from source terranes of specific ages. Multiple sources with similar ages should be resolvable by analyzing differences in trace element abundance. Approximately 110 individual spots (laser shot and analysis of individual zircon target grain) will be used to document provenance ages as well as provide a better understanding of changes in tectonics and regional geology across the sequence boundaries. This data will also lead to a stronger provenance model for tectonic events during the deposition of these sedimentary rock units.

**Mentor:** Marc Hendrix, Geosciences

## Examining Airborne Infrared Fire Detection Data in the Context of Fire Severity

(34) **Benjamin Garrett, LLOYD Queen**

Application of the LANDSAT-based delta-Normalized Burn Ratio (dNBR) for identifying unburned islands within fire perimeters is a subject of interest to ecologists examining vegetation refuges in burned landscapes. However, questions remain as to whether fire actually visited some these refuges but did not trigger change responses in the dNBR. This research integrated forty-one infrared fire detection acquisitions to examine the coincidence of thermal infrared heat detections and dNBR severity classes in the 274 km<sup>2</sup> Selway-Bitterroot East Complex of fires (Clearwater National Forest, ID) which burned in 2012. Delta-NBR was imputed using conventional methods from LANDSAT-5 and -8 datasets. Thermal infrared fire detection data were collected by the USDA Forest Service's National Infrared Operations (NIROPS) Phoenix System on 35 days in August and September and detection points were integrated and attributed by date and time to produce a single fire detection point layer spanning the duration of the incident. Although Phoenix data are not calibrated and have variable fire detectability thresholds depending on the amount of fire activity and background temperature, they provide a conservative map of heat locations that does not suffer from errors of commission (e.g. the heat detected is real) and is useful for identifying locations of heat at distinct points in time. For this study, IR detections were compared with dNBR polygons in a GIS. Ten percent of the total fire detections occurred in 'unburned' areas. The proximity of these detections to severity class edges was examined to account for potential spatial incongruities between the datasets as well as areas of sensor saturation (bloom). Further, detections were summarized by severity classes to identify possible relationships between detection frequency and burn severity. These comparisons will serve as an initial framework documenting the efficacy of using LANDSAT-derived dNBR to locate unburned areas within large wildfires.

**Mentor:** Carl Seielstad, Department of Forest Management: National Center for Landscape Fire Analysis

Do Montana's Sixmile Creek Cobbles Have Nevada Origins? Evidence For  
Headwaters Of The Miocene Bell River Basin(35) **Stacia Martineau, Dustin Rambur, Patrick Moffitt, Garrett Woodson & Chad Dunshee**

The Miocene Sixmile Creek Formation in Montana contains distinctive river cobbles of coarse-grained sandstone and conglomerate that include small grains of black chert, but the source of these cobbles has not been confirmed. The Paleozoic Diamond Peak Formation of Nevada may be one possible source of these cobbles. It is widespread in central Nevada's mountains but is unlike any bedrock formations found in Montana. If cobbles in the Sixmile Creek Formation were derived from central Nevada, the Miocene river that carried them would have had to have crossed the present positions of the Snake River Plain and the Idaho-Montana Continental Divide. The purpose of our study is to test the hypothesis by examining particularly distinctive cobbles along the proposed Miocene river path. We compared cobbles collected from the Sixmile Creek Formation at locations from Nevada to Great Falls, Montana, and compared these to each other and to samples collected from proposed source rocks at Pequot Summit, Nevada. We measured the percentage of black chert grains in each rock sample, as well as the shapes and size ranges of the chert grains. Our results support the hypothesis of a great Miocene river that flowed through Montana from headwaters as far south as central Nevada (Sears, 2014). This would have been possible in the Miocene because tectonics had not yet formed the Snake River Plain and modern Continental Divide. The river implied by this model would have been a tributary to the pre-ice age Bell River basin of Canada, which rivaled the modern Amazon River basin in scale. This research could lead to new understanding of the paleotopography and paleofluvial systems of the western interior of North America.

**Mentor:** James W Sears, Geoscience

Early Cenozoic Fluvial Deposits Of The Renova Formation In SW Montana:  
Links To Southern Nevada And Utah?

(36) **Aidan Jarvis, Pamela Lavering, Kevin Ledwith, Sinead Kelly & Erica Wicker**

Examination of the early Cenozoic fluvial deposits of the Renova Formation provides support for the hypothesis that a southern branch of the pre-ice age Bell River of Canada, a river thought to have been the size of the Amazon, may have originated in the southern Colorado Plateau and flowed northward through Nevada, Utah, Idaho, and Montana. The Renova Formation mostly comprises fluvially-reworked and degraded volcanic ash. Radiometric ages of zircon grains from the Renova Formation, reported in the literature, correlate with the ages of zircons from ash-flow tuffs that erupted from mega-calderas in southern Nevada and Utah. There are also older zircons present in the Renova deposits which indicate recycling of zircon grains from Precambrian and Cambrian quartzites of Utah. These results provide evidence of river transport of ash and sand from Nevada and Utah into Montana. Previous research has been reviewed and assessed in the context of the Bell River hypothesis. A field trip was taken to physically observe the composition and depositional features of the Renova. Histograms generated by mass spectroscopy of Renova Formation zircon have been re-analyzed in light of the mega-caldera origin hypothesis. This new model suggests that a major, north-flowing Cenozoic drainage system was present in the western interior of North America before being segmented and destroyed by faulting and volcanism.

**Mentor:** James W. Sears, Geosciences

Balanced And Restored Cross-Sections Representing Post-Miocene Crustal Extension Of Fluvial  
Deposits, North-Central Montana to Southeast Idaho

(37) **Benjamin Johnson, Dain Schuhmacher, Gerri Mason, Thomas Rodriguez & Jason Subatch**

This research is part of a larger project based on the theory of the existence of a pre-ice age, Amazon-scale river that had headwaters in the southern Colorado Plateau and flowed north through the western United States and Canada before discharging into the Labrador Sea. Stream-rounded fluvial deposits in Montana and Idaho provide evidence of sediment provenance in Nevada and Utah, as there are no confirmed bedrock sources for these sediments in Montana or Idaho. The Miocene river bed has been offset and tilted by dozens of extensional faults in the region. Some faults bound large mountain ranges including the Lost River, Lemhi, Beaverhead, Tendoy, Blacktail Deer, Ruby, Madison, and Big Belt Mountains. The reconstructed trend of the Miocene river bed provides a reference line against which to measure active faulting. We constructed five balanced cross-sections of the deformed subsurface along the Miocene river bed from north-central Montana to southeast Idaho across the faulted mountain ranges and restored the cross-sections to represent an un-deformed subsurface. This provided valuable insight into crustal deformation in these regions. Knowing the timing and extent of crustal deformation has many scientific and societal benefits. Western Montana and adjacent Idaho occupy the Inter-mountain Seismic Zone and have the potential for large earthquakes. Detailed cross-sections through this zone can provide information for development projects in faulted areas, and target potential aquifer locations where the thick river gravel has been down-faulted into the sub-surface. This research will be an important contribution to understanding the evolution of the tectonic landscape of Montana and Idaho.

**Mentor:** James W. Sears, Geosciences

Monitored fitness programs can improve fitness for special olympic athletes.

(38) **Brooke Nearpass**, Health and Human Performance

**Purpose:** Physical fitness is important for Special Olympic athletes, as they tend to be more sedentary. There are limited fitness programs available for Special Olympic athletes currently. I evaluated the effectiveness of individualized fitness programs for this population.

**Methods** I tested two middle age women with varying abilities. My two athletes were part of a larger group study. I worked along with five others to test and evaluate multiple athletes. The field tests I performed included: Sit n' reach, modified apley test, timed sit to stand, partial sit-up, seated push-up, multidirectional functional reach test, single leg stance (eyes open and closed), and three minute walk test. These tests fell under categories of flexibility, strength, balance, and aerobic fitness. I created two individualized programs for my athletes that fit their needs, strengths, and goals. I monitored their progress weekly, made adjustments when necessary, and retested the athletes after six weeks.

**Originality** I used the cohens statistic to evaluate my results. I calculated the average and standard deviation in order to get effect size. The effect size for sit to stand ended up being .50, which falls in the category of medium improvement. A result of 0.1-0.3 is a small improvement, whereas, 0.5 is a high improvement in results. In total, I saw improvements in flexibility and strength between my athletes.

**Significance:** This population is varying in terms of fitness abilities. The improvement I saw suggests that with more time their results could continue to improve. We were able to see improvements in many different areas between the groups. This program encouraged physical activity and provided beneficial results for Special Olympic athletes.

**Mentor:** Steven Gaskill, Health and Human Performance, Donna Bainbridge (Facility Advisor)

The Effects of Offseason Training on Special Olympics Athletes

(39) **Taylor Holder & Alex White**

**Purpose:** Many Special Olympics athletes focus on sport specific preseason training and have no fitness programs in the offseason. The purpose of this study was to evaluate the effectiveness of individualized fitness programs on fitness levels of Special Olympics athletes.

**Methods:** Participants were 3 Special Olympics athletes recruited from specialized exercise programs at the YMCA. Athletes were given an Athlete Pre-Program Survey and participated in field testing to assess their baseline needs. In the field we tested flexibility, strength, balance, and aerobic fitness levels by using the following tests: Back Saver Sit and Reach Test, Apley's Test, Timed Sit-Stand Test, Partial Sit-up Test, Seated Push-up Test, Eyes Open and Eyes Closed Single Leg Stance, Multidirectional Functional Reach and the Three Minute Walk-Run Test. Based on the baseline assessment athletes were given an individualized exercise program and were retested after six weeks.

**Results:** Our specific intervention focused on balance and aerobic fitness. We measured the greatest post-intervention improvement in these areas. We used the Cohen statistic to calculate the effect size, which measures the strength of the correlation between the intervention program and the recorded improvements. Effect Size is represented as Small (0.1-0.3), Medium (0.3-0.5), or Large (>0.5). A Large Effect Size was calculated for the following tests: Eyes Open Single Leg Stance (L/R), Eyes Closed Single Leg Stance (R), and the Three-Minute Walk/Run Distance.

**Conclusion:** From the improvements shown in the brief six week intervention, we found the program to be effective at increasing the fitness levels of our Special Olympic Athletes. We anticipate that there would be more significant improvements in balance, flexibility, strength and aerobic fitness in a longer program.

**Mentor:** Donna Bainbridge, Physical Therapist, UMontana Physical Therapy Clinics



The Effects of an Off-Season Exercise Program For Special Olympic Athletes  
(40) **Shawnee Good & Zack Bolton**

**Introduction:** The Special Olympic organization provides seasonal competition for athletes with varying disabilities. Typically, the Special Olympic program focuses primarily on in-season training. In order to increase physical activity throughout the year, we developed off-season training programs for the athletes. The aim of this study was to evaluate the effectiveness of individualized off-season workout programs ultimately improving physical fitness among Special Olympic athletes.

**Methods:** 11 Special Olympic athletes with intellectual disabilities participated in a structured exercise program study for 6 weeks. Initial testing was performed to assess the capabilities and areas of deficit among the athletes and to individualize the programs. These measures served as the baseline for pre-post intervention comparison. The battery of fitness tests assessed: balance, strength, flexibility, and aerobic abilities. Each participant either met criteria or was below criteria for each test. Participants were separated into peer groups with similar cognitive and physical abilities. The individualized programs targeted their deficits and were administered under the supervision of the investigating team.

**Results:** Pre and Post data was compared with the Cohen's D statistic. This group of athletes showed substantial improvements, for example we documented high effect size for our treatments in strength (partial sit-ups: ES 1.5) and aerobic fitness (3 minute walk test: ES .72).

**Conclusion:** Participants improved in their functional performance results. Off-season fitness programs can benefit Special Olympic athletes outside their competition season. With the addition of these training programs, athletes can increase their levels of physical activity and improve performance in their specific events.

**Mentor:** Donna Bainbridge, Physical Therapy

Isolation of the Uranyl Dication  
(41) **Geoffrey Glidewell**

This project focuses on the isolation of uranium, in the form the uranyl dication ( $\text{UO}_2^{2+}$ ), from aqueous solutions. Humanity needs new sources of energy, and a known and efficient way to create energy is by a closed nuclear fuel cycle using the element uranium. Uranium exists in various forms on earth, but aqueous uranium exists almost exclusively as the uranyl ion. The uranyl ion exists in abundance in dilute form in seawater (3 ppb), but is difficult to selectively extract from such a cation-filled ocean and an efficient method of collecting it has not been studied in detail. Also, the uranyl ion has unusual geometry making it difficult to isolate (it is a linear molecule due to two double bonded oxygens, thus is restricted to planar coordination about its equator). The purpose of this project is to combine different ligand building blocks with the uranyl ion and allow them to self-assemble around the dication. The ligands will encapsulate the ion, allowing it to be isolated. Because the ligands self-assemble without adding energy to the system, the most thermodynamically favorable structure will emerge. These self-assembly reactions are known as dynamic combinatorial chemistry (DCC). Solutions of various ligands will be reacted to elucidate the most stable ligand complexes. This project focuses on using ligands with thiol functionality which participate in disulfide bond exchange. The effectiveness, stability, and structure of the resulting ligand complexes will be analyzed by both Nuclear Magnetic Resonance, NMR, and by High Performance Liquid Chromatography, HPLC. Once robust thermodynamically stable structures have been self-assembled, future work will involve synthesizing a favorable ligand complex using non-dynamic chemistry and attaching it to a scaffold for sea water extraction.

**Mentor:** Orion Berryman, Chemistry

## Offseason Training Programs Improve Fitness of Special Olympic Athletes

(42) **Brittany Graham**

Many Special Olympic athletes have not been known to follow an off-season fitness program. The aim of this study was to provide individualized fitness programs for each of the participating athletes, and to have them work out twice weekly as part of their off-season training. Many athletes were involved in this study and each researcher was assigned to work with one athlete. The athletes were tested before the start of the program and after 6 weeks of training. Each athlete was tested in the fields of aerobic fitness, strength, balance, and flexibility. The aerobic test was a timed 3 minute walk/run. Heart rate and oxygen saturation were measured for pre-exercise, post-exercise, and 2 minutes following exercise. Strength was measured by a timed-stand test, a partial sit up test, and a seated push-up test. Balance was measured by a multidirectional, functional reach test and a timed single leg stance, once with the eyes closed and once with them open. Flexibility was measured of the shoulders by Apley's Test (for functional shoulder rotation) and of the hamstrings by a sit and reach test. Six weeks of training resulted in subject 1 with much improvement. The subject walked an extra 247.5 feet within the 3 minute time limit and exercise heart rate was significantly lowered. The subject showed substantial improvement for all flexibility measurements and both the timed-stand and partial sit-up tests. There was minimal improvement for all balance tests. The implementation of an off-season training program for Special Olympic athletes is already generating positive results. The continuation of personalized, training programs for these athletes is likely to yield even more improvement of their fitness levels.

**Mentor:** Steven Gaskill, Health and Human Performance

## Continuous measures of blood flow during all-out dynamic exercise

(43) **Payton Skawinski**

The intent of our study is to determine the mechanisms associated with muscle performance loss resulting from short-duration, high intensity muscular contraction. Previous studies conducted by Dr. Bundle and colleagues established a performance duration relationship for muscle fatigue at high and low duty cycles (Duty cycle = time of muscle contraction / total time of contraction cycle). The purpose of the current study is to show that despite higher rates of blood flow occurring at lower duty cycles, oxygen extraction by the active muscle is the same between high and low duty cycles. Thus, allowing us to assume performance loss is not associated with decreased oxygen availability, but rather decreased clearance of metabolic byproducts.

To perform this study we used Doppler Ultrasonography to acquire real-time measurements of blood velocity while subjects performed single-leg knee extension exercise. The knee extensions were performed at randomized intensities and at high, medium and low duty cycles of 0.7, 0.5, and 0.3 respectively. Each subject participated in a minimum of 12 testing sessions. Femoral artery diameter was recorded via screen capture allowing for acquisition of arterial dimension changes throughout the trial duration countenancing for precise calculation of flow volume. Along with blood flow volumes, indirect calorimetry was used to assess oxygen consumption by the contracting muscle. Blood flow volumes will be compared to the performance duration relationship for each duty cycle. We expect that despite greater periods of rest at the low duty cycle, rates of oxygen uptake by the working tissue will be similar. Thus, greater flows, providing more oxygen delivery, do not enhance muscular performance. Rather, sustained higher force outputs are possible because of the clearance of contractile byproducts which delays the onset of muscle fatigue.

**Mentor:** Dr. Matthew Bundle, Health and Human Performance & Organismal Biology and Ecology

## Modeling Long-Term Streamflow Response to Precipitation Change Using an Ecohydrologic Model

(44) **Brandon Veth**

Climate change may be producing an intensification of the global hydrologic cycle that may result in an increasing or decreasing precipitation trend over western Montana. Although direct detection of a small change in precipitation may be difficult, its effects in the streamflow record should be detectable and differentiable from other impacts. Theoretical calculations suggest that the effect of a precipitation trend on runoff is greater in the 25% wettest years than in the 25% driest years. This is the opposite of what is expected from other human impacts, such as water diversions or land-use change, which should have a greater effect on the 25% driest years. I test this hypothesis with a simulation study. I simulate precipitation data with an artificial trend over a 50 year period. Using the ECH2O watershed model to simulate runoff from an example watershed with my simulated precipitation data I study the trends of the selected streamflow percentiles. I compare the percentile trends to alternative scenarios in which precipitation is stationary but land use is changing. The behavior of the streamflow percentiles is compared to the theoretical calculations to confirm whether the effect of precipitation change is detectable and differentiable from other disturbances. My approach to this problem utilizes an advanced watershed model to test my hypothesis and generate knowledge about processes hard to observe in actual data. This paper provides a framework to analyze the streamflow record and infer whether streamflow change is due to changes in precipitation or in land use.

**Mentor:** Marco Maneta, Geosciences

## Generating the Demographic Attributes of the Synthetic Electronic Health Record

(45) **Russell Klein**

Electronic Health Record (EHR) databases are an important tool for clinician trainers and information system developers, yet access to actual EHRs remains difficult due to patient privacy concerns. A synthetic EHR would prove valuable provided it was realistic in representing the same characteristics as the actual EHR. The approach is unique as it does not involve the use of any patient Protected Health Information (PHI). Using publicly available data, a process was developed to generate the demographic attributes of a synthetic EHR based upon a given geographic region. The resulting EHR provides a realistic representation of a patient that a clinician would expect to encounter during a visit. This project is a component of a larger research effort aimed at generating a database of Realistic Synthetic EHRs (RS-EHR) from publicly available data sets.

**Mentor:** Tom Gallagher, Department of Applied Computing & Electronics, Missoula College

A Qualitative Analysis on Discourse in Occupational Segregation Along a Gender Dimension  
(46) **Christine Bilunka**

The objective of this research project is to measure attitudes associated with occupational segregation by sex. Specifically, the researcher seeks to see how subjects participating in the study participate in job typing along gender lines. To do so, the researcher will utilize qualitative methods in a lab setting. These methods will include asking female subjects to view an array of photographs of men and women in occupation-specific attire and situations and write a short response to the photos.

In one condition, subjects will view two photographs of men in female-dominated work settings, in another they will be shown females in female-dominated work settings, in yet another they will be shown males in male-dominated settings, and in the final condition, subjects will be shown females in male-dominated work settings.

The responses given will be put through data-mining software to parse the language and discourse surrounding gender in the workplace. In doing so, the researcher aims to find what kind of patterns in language surrounding gender and career expectations emerge. This component of the research method will aid the researcher in uncovering what kinds of responses are elicited when a woman is seen in a traditionally male-dominated career track. Once this test has been administered, subjects will be asked to complete a brief questionnaire with items to identify their areas of study, political orientations, and socioeconomic backgrounds. The questionnaires and the responses will be compared to see if any outstanding relationships between the subjects' backgrounds and their responses to the photo arrays emerge. In undertaking this research, we hope to find out what kind of attitudes might affect career outcomes for women at a fundamental level.

**Mentor:** Kathy Kuipers, Sociology

Are You Satisfied? A Qualitative Study on Job Satisfaction in Rural School Psychologists Roles and Functions  
(47) **Madison Evans & Jessica Skipper**

As early as kindergarten, children in rural areas are at greater risk for experiencing emotional, behavioral, social and adaptive problems (Girio-Herrera, Owens, Langberg, 2013). School psychologists are the closest network for children within the school, providing services such as assessments, interventions, and consultations (Reschly, 2000). From the limited research, rural school psychologists face unique barriers in their work such as a lack of resources to support children and experiencing professional isolation (Clopton & Knesting, 2006; McLeskey, et al., 1983). These challenges could negatively affect a rural school psychologist's professional life and job satisfaction; however, this has yet to be thoroughly researched. Previous analyses of variance suggested a significant difference in self-reported job satisfaction between rural ( $M=5.89$ ) and suburban ( $M=5.4$ ) school psychologists, but not urban school psychologists. The goal of this study is to closely examine the current roles and job satisfaction of rural school psychologists through an in-depth qualitative research methodology.

An online survey was completed by 188 school psychologists in rural ( $n=94$ ) and suburban ( $n=94$ ) areas in the Pacific Northwest and Rocky Mountain regions of the United States. Participants answered open-ended items that asked about their current and desired roles. Qualitative analyses using Nvivo Software will be used to conduct a content analyses of these open-ended responses; evaluating both common and differing themes in why rural or suburban school psychologists are satisfied or unsatisfied in their roles and functions.

Attendees of this presentation will learn about challenges faced by school psychologists in rural schools and communities. It is our goal to identify any differences found between rural and suburban school psychologists' job satisfaction, as well as recognizing ways to improve their overall perceptions of their roles and functions in rural schools. Improving their job satisfaction may result in more effective services rendered towards Montanan children.

**Mentor:** Anisa Goforth, Psychology

## An Examination of Religiosity Among Rural, Suburban, and Urban School Psychologists

(48) **Zoe Potter, Aaron Collette & Jordan Gregory**

Religion reflects an individual's culture and values, and is defined as a system of organized beliefs, attitudes and values (Gorsuch, 1988). Research has shown that almost one third of therapists believe that their religious beliefs influence their practice of psychotherapy to a very large degree, while another third believe it influences their practice moderately (Bilgrave & Deluty, 2002). For this reason, it is important for psychologists to be aware of their religious beliefs and how they may influence the provision of care. The goal of this study is to examine the religious beliefs and values of school psychologists who work in rural, suburban, and urban settings.

Furthermore, this study will examine whether or not there is an association between a school psychologist's age and their self-reported religiosity. A survey was sent to school psychologists working in public schools in the United States. The first 100 respondents were used in this study. Items on the survey include a demographic questionnaire and the Duke Religion Index (DRI). The DRI is a 5-item scale used to measure religiosity and includes statements like: "My religious or spiritual beliefs are what really lies behind my whole approach to life." Analysis of variance (ANOVA) will be used to compare the religious beliefs of rural, urban and suburban school psychologists. This research study contributes to the existing literature examining personal beliefs and how they may be associated with school psychological practice. It could also potentially aid in the appropriate preparation of a clinician going into an area with a different degree of religiosity than their own.

**Mentor:** Dr. Anisa Goforth, Psychology

## A Qualitative Study of Successful Aging in Older Adults

(49) **Kate Reese**

The purpose of this study, as informed by the socioemotional selectivity theory, was to examine what emotion goals are and how they lead to successful aging from the perspective of older adults. Additionally, this study aimed to develop a definition of successful aging that is representative of older adults' perspectives. This was conducted using an adaptation of the PhotoVoice technique as well as with qualitative interviews. Thirteen individuals, all of whom range between the old-old (70-79 years) and very-old (80 years and above) ages, took a photograph of what, in their own perspective, successful aging means. The photograph was then discussed in an individual interview. The interview also examined the details of what emotion goals are, how emotion goals are achieved, and how they lead to successful aging. The data from the interviews and photographs is currently under analysis. The expected results of the study include a deeper understanding of factors that lead to successful aging and, subsequently, a holistic definition of successful aging that is representative of older adults' perspectives and experiences. This knowledge will benefit the aging baby boom generation by combating negative stereotypes, aligning expectations about aging, and outlining specific factors that can lead to successful aging. Keywords: successful aging, socioemotional selectivity theory, emotion goals, aging

**Mentor:** Gyda Swaney, Psychology

Including Everyone: Training Typically Developing Children to Employ Positive Inclusion Practices  
(50) **Shelby Swant**

With the current prevalence of 1 in 88 people, the incidence of autism has continued to rise and some consider it epidemic. Children with autism are challenged by social interaction such as missing social cues, lack of imitation, restricted interests, and possibly preferring to play alone. Many children with autism attend public schools and are educated in the general education classroom. Researchers have found that peers with typical social skills have great potential to positively impact students with autism; however, children often do not receive training on how to implement positive inclusion strategies despite attempts to educate parents, teachers, and administrators. Our research addresses the outcome of teaching typically developing peers social situation awareness and inclusion strategies to use with their classmates with autism or low incidence disabilities. Our method of research will utilize the Montana Behavioral Initiative (MBI) strategies which implements three steps: teaching, practicing, and reinforcing positive behaviors. In combination with MBI, the evidence-based practice of video modeling will be used by showing the participants videos of peers of similar age conducting successful social interactions. A survey of speech-language pathologists in Montana conducted in January of 2014 revealed that a) asking a peer to play and b) sharing materials are priority for inclusion. These areas will be targeted in the study and data will be collected using formative and summative methods. Finding an effective and consistent method to teach typically developing peers how to implement positive inclusion strategies will result in inclusion of children with autism and other low incidence disabilities in the regular education setting.

**Mentor:** Jennifer Closson, Communicative Sciences and Disorders

Clarifying Correlations between Eating Pathology and Trauma Exposure  
(51) **Callie Jacobson**

Past research has revealed mixed results in examining the relationships between trauma exposure and eating disorder (ED) pathology. For instance, sexual abuse (SA) has been implicated in the development of bulimia nervosa (BN), and physical abuse (PA) has been associated with general eating disorder (ED) pathology and specifically with distorted body image (Treuer, 2005). Still other research suggests that emotional abuse is the only child abuse predictive of abnormal eating in adulthood due to its profound influence on self-esteem and anxiety (Kent & Waller, 2000; Polivy & Herman, 2002). A majority of the research on trauma and eating pathology has focused on EDs and ED symptoms, with less emphasis on the more generalized concept of 'disordered eating', despite the fact that more individuals are likely to experience disordered eating than threshold EDs (Dos Santos Alvarenga, Scagliusi, & Philippi, 2010; Le Grange, Swanson, Crow, & Merikangas, 2012).

**Objective:** The goal of this study was to explore the influence of different trauma exposure types on disordered eating.

**Method:** 102 participants were recruited from an undergraduate college population and administered questionnaires regarding trauma history, eating behavior (using both an eating attitudes and a ED symptom-based measure), and demographic information.

**Results:** Linear regression analyses showed a significant relationship between ED and SA according to the symptom-based measure ( $p < .05$ ); though, SA was not significantly predictive of disordered eating. Further, no other significant relationships between trauma and eating variables were found.

**Discussion:** This project contributes important information to the field of psychology as clinicians and researchers seek to understand the varying effects of trauma exposure and the complexity of disordered eating behaviors. Further this research highlights the importance of recognizing ED symptoms as well as general attitudes throughout assessment and treatment.

**Mentor:** Cameo Borntrager, Psychology

Child Phonology: Dynamic Assessment of Speech Adaptability  
(53) Isabel Archilla & Jessica Camp

Speech-language pathologists help children with speech sound disorders learn to say sounds like their peers. The purpose of this study is to determine how a child's speech changes during treatment when given help. Traditionally, speech-language pathologists have only measured children's speech sound production using assessments that provide no help. Our study is one of the first to evaluate a new assessment that measures the amount of help needed for children to be successful in producing speech sounds. We evaluated a single participant: a six-year, two-month old boy who had difficulties saying many sounds, which often were made as "t" or "d". We assessed his progress on four sounds that he practiced over eight sessions. Sounds were selected because they were the most difficult sounds for him to say. The participant's progress was recorded using the Glaspey Dynamic Assessment of Phonology (GDAP). We evaluated his average GDAP score for all sounds before and after treatment. We also evaluated his individual GDAP scores for each of the four hard sounds targeted during treatment. To gain additional information about his progress over time, we compared his GDAP scores to his pre- and post-treatment static probe scores, an assessment in which he received no help. Our study is significant as current treatment and assessment approaches for children with speech sound disorders do not address a child's improved, aided performance. As such, traditional assessments are unable to provide information about a child's specific needs. However, assessments that do provide help, take into account the child's needs in order to attain correct production. Results from our research may provide implications for treatment target selection related to the amount of progress made toward hard sounds.

**Mentor:** Dr. Amy Glaspey, Communicative Sciences and Disorders

Public Perceptions of the Nonprofit Sector  
(54) Amy Beale

In our economy there are three different sectors, (1) the government, (2) for-profit business, and (3) nonprofit organizations. Nonprofits are businesses which do not earn money/return profits for their owner(s) but instead direct all their funds towards a certain cause. Nonprofit organizations are generally recognized by the public, however, as charitable entities organized to meet community needs through the use of donated volunteer time and money. As a result of this general perception of the nonprofit sector, many people believe nonprofits do not require profit or a large overhead net to accomplish their mission. Profit and overhead costs, however, are essential for organizational effectiveness and growth to happen. Therefore, public awareness regarding these misconceptions must be addressed. By reviewing research about public perceptions of the nonprofit sector, and attending the Montana Nonprofit Association annual conference, this research study discusses the general public's confusion associated with nonprofit organizations and highlights three suggestions on altering current public perceptions. The three suggestions are (1) changing the name nonprofit organization to a more mutual/less confusing name, (2) implementing business-like features into nonprofit organizations' operations, and (3) enacting public education through different forms of communication. This study used an anonymous and voluntary survey to see which of the three suggestions the Missoula community best responded to. This research study exhibits the data from the survey and discusses the results as a conclusion. Local nonprofit organizations can utilize this information to benefit their organization in becoming more efficient businesses because they will have direct information coming from their community.

**Mentor:** Andrea Vernon, DHC/OCE

Identifying Child Abusers: Defeating Their Efforts to “Fake Good”  
 (55) **Trudie Jones-Revious, Andrew Hinkle, Kevin Miller & Robin Richardson**

When child abuse is suspected, parents and/or caregivers may be referred for evaluation by professionals. In addition to an interview, a variety of tests can be used to help differentiate abusers from non-abusers. However, potential abusers are likely motivated to respond to items in a manner that they feel will produce a positive perception of their overall caregiving, rather than answering honestly. This is an example of the Social Desirability Bias. On existing measures, such as the widely-administered Child Abuse Potential Inventory (CAPI), it may be fairly obvious to a participant what each item attempts to measure. Therefore, a participant may be motivated to respond in a socially desirable manner. We often refer to this behavior as “faking good”. To address this, a measure called the Child Guidance Inventory (CGInv) is being developed. The CGInv presents participants with specific scenarios involving problematic child behaviors. The participants are then asked to rate responses that represent how they might react. The CGInv is intended to produce information about maladaptive parenting practices in three areas: Rejection, Chaos and Coercion. These areas have been identified as the three major subcategories of maladaptive caregiving by the Parenting as Social Context Questionnaire (PASCQ) scale. A previous study of a first version of the CGInv indicated that it did not accurately distinguish between abusers and non-abusers. The measure has since been modified to include more scenarios with more comprehensive, subtle response options. Administered along with the PASCQ, individuals are instructed to “fake good” or “answer honestly” in order to test the possibility that the “fake good” motivation is defeated. It is predicted that the current CGInv will neutralize the effect of the social desirability bias on participants, potentially resulting in more accurate identification of child abusers over and above the results of the existing, standardized CAPI.

**Mentor:** Dr. Paul Silverman, Psychology

Turning Tribal Programs into Tribal Non Profits  
 (56) **Jim O'Neill**

The path to self-determination is difficult among Tribal Nation. Numerous Tribal Government programs have the desire to be self-determining but lack the template which to work from. Tribal Nations have several historical barriers preventing them from using their sovereign powers. So can long standing Tribal Programs become self-sufficient non-profit businesses?

The U.S. Government has long sought the policy of Self-Determination for the indigenous population of America. Self-determination is defined as the movement by which the Native Americans sought to achieve restoration of tribal community, self-government, cultural renewal, reservation development, educational control, and equal or controlling input into federal government decisions concerning policies and programs.

Dwindling federal funds have left most Tribal programs operating on less than shoestring budgets. The program which I will use is the People’s Center in Pablo, MT. The People’s Center was a non-profit at one time because of financial difficulties they were engulfed into the Tribal government fold. Their journey back to independence will show other programs on the Flathead Indian Reservation they can become relatively independent too.

The endeavor of turning a program into a non-profit business will consist initially in obtaining 501(c)(3) status as well as a business and strategic plan. By performing these three procedures the People’s Center will have a sounder grasp of becoming a non-profit business. Another goal is to obtain a grant writer for the organization. As a program within a Tribal government department, the People’s Center would rely on the department to provide grants which to operate. The acquisition of a grant writer will allow the new business to compete as a sole source entity instead of a piece of a bigger organization. Even though the introduction to the non-profit world may not be significant off an Indian Reservation, on the Reservation the activity would be considered revolutionary.

**Mentor:** Andrea Vernon, Office of Civic Engagement



New Role in Response-to-Intervention: A Speech-Language Pathologist's Perspective  
(57) **Melissa Bunch**

Response-to-Intervention (RTI) is a multi-tiered prevention model in which supports are immediately available when children fail to respond to evidence-based instruction. In the traditional model, students were often failing to meet expected learning benchmarks before being evaluated for educational supports, including speech language therapy. If a student met certain criteria, speech therapy could be implemented to assist the student with educational goals. The traditional method of therapy included pulling individual or small groups of students from their instructional classes. This model can cause students to miss valuable class instruction and experience less generalization of skills from the therapy treatments. The traditional model also limits teacher and speech-language pathologist (SLP) collaboration. To address these issues, the RTI model promotes providing supports before students experience critical educational delays. Under the RTI model, students are able to remain in their classrooms with opportunities for language-enriched collaborative lessons with teachers and SLPs. Students are able to participate in valuable instruction and experience better generalization of skills in a naturalistic way. RTI appears to provide strategies to address gaps in educational achievement. We gave Montana Speech-Language-Hearing Association (MSHA) members an online survey to identify areas perceived as barriers to providing speech-language therapy services under the RTI model. We used a qualitative constant-comparative design to assess and classify the results to discover themes regarding perceived advantages and disadvantages. These themes will help highlight areas for future research and provide helpful considerations for SLPs and educators planning to implement the model.

**Mentor:** Ginger Collins, Communication Sciences and Disorders

Attachment in close relationships and its influence on parenting practices  
(58) **Kimberly Garrow & Miranda Bradley**

Attachment theory proposes that caregiving experiences significantly influence children's socio-emotional development. Interactions with caregivers are internalized as working models of relationships, providing expectations about how to interact with the social world, including future offspring and partners. To contribute to the depth of research on adults, adult attachment classifications were broken down into two dimensions, anxiety and avoidance, to conceptualize attachment in adulthood. Much research has been done that links early relationships to later development, particularly to children's subsequent experiences in close relationships, including those with their own children. This project examined correlations between attachment-related anxiety and avoidance and aspects of parenting practices and behaviors, as well as the parent-child relationship, in a primarily low-income sample that included parents involved with Child and Family Services. Specifically, participants completed multiple self-report assessments measuring the two attachment dimensions, parents' coping strategies, parent-child communication and involvement, their understanding of children's mental states, as well as their own parental satisfaction and perceived support as a parent. Multiple correlations were found that linked attachment avoidance to various outcomes, such as the strategies participants used to cope with their children's negative emotions. Moreover, there was a strong link between anxiety and avoidance, and the extent to which the parent felt supported in their role. In the field of psychology, the development of maladaptive attachment styles is studied frequently in relation to how adults form and maintain intimate relationships. The current research focuses on the impact the two primary dimensions of attachment can have for parents as they respond and relate to their offspring. This research contributes to the understanding of the ways in which attachment-related anxiety and avoidance experienced in close relationships influence parenting behaviors and parent-child relationships.

**Mentor:** Paul Silverman, Psychology

## Donors to Social Welfare Organizations: Are they avoiding gift tax?

(59) **Jill Sharp**

The Internal Revenue Service recognizes numerous types of section 501(c) organizations. These include section 501(c)(3) charitable organizations, section 527 political organizations, and section 501(c)(4) social welfare organizations. Donors to charitable organizations are not taxed on their contributions and they are able to deduct their contributions on their income taxes. Donors to political organizations are also not taxed on their contributions although they see no benefit in deductions on their income taxes. Donors to social welfare organizations, however, don't have clear tax implications on their contributions due to the lack of federal gift tax regulation by the IRS. While the IRS has specifically exempted donations to political and charity organizations from federal gift tax, whether donations to social welfare organizations are exempt remains ambiguous. To determine the impact of federal gift tax on donations, I hypothesize that when donations to social welfare organizations are subject to the federal gift tax, donors are less likely to contribute.

To examine how donors' contributions to social welfare organizations are impacted by the inclusion or exclusion of federal gift tax, over one hundred subjects acting as donors have been surveyed, half of which were told their contribution would be subject to the gift tax and half of which were told their contribution would be excluded from it. Each survey contained definitions and explanations of federal gift tax and social welfare organizations as well as examples of social welfare organizations located in Montana. This paper further examines any impact on donations due to a match or mismatch between donor's views and the legislation or cause supported by social welfare organizations named in the survey. All data was collected numerically and analyzed with t-statistic and regression analysis. My final data analysis will determine the correlation between donors willingness to contribute and the tax treatment of the contribution.

**Mentor:** Joshua Herbold, Department of Accounting and Finance

## Child Abusers: Can we accurately predict them by personality?

(60) **Johanna McCormick, Kevin Miller, Aubrey Reed, Emma Crissman & Nate Ramsbacher**

Many studies label parents with certain demographic characteristics as being more prone to abuse children than others. Many predictors such as: gender, childhood abuse history, parental satisfaction, parent's attribution style, child's age, child disruptive behaviors, parental ethnicity, parental marital status, parental socioeconomic status, parental education, family size, household disorganization, coercive caregiver-child interaction patterns, and family social support are not accounting for alternative characteristic (Hanson, 2010). The Minnesota Multi-phasic Personality Inventory (MMPI-2), a measure of adult personality characteristics; might give us a more robust picture of what, if any, personality characteristics predict child abuse potential beyond the factors listed above. Archival evaluation records of at-risk parents have been collected, coded, and examined for abuse potential. Using a sample of 100 parental evaluations (63 abusers, 21 non-abusers) personality characteristics that predict abuse will be identified. If certain personality dimensions are identified as statistically significant predictors of abuse perpetration, above and beyond other predictors, this could aid in more accurately predicting child abuse and identifying at-risk individuals to better prevent abuse and keep families whole. Meanwhile, this research may help eliminate some of the stigma associated with belonging to an "at-risk demographic."

**Mentor:** Paul Silverman, Psychology

Attitudes and Perspectives of Preschool and Kindergarten Teachers on Writing Development and Instruction  
(61) **Janelle Wilson & Cristal Burnett**

Writing is very important to literacy. It is important that educators understand writing's influence on the process of letter and print awareness, letter-sound recognition, learning how to read, hand-eye coordination, and its direct relation to spelling abilities. The purpose of this study was to collect information from early childhood educators about their general perspectives about writing in preschool and kindergarten. Topics included teaching methods, attitudes, knowledge, and general views on the importance of writing. A survey was constructed using SurveyMonkey, and distributed nationwide to teachers working in preschool and kindergarten settings. Contact was made through emails to professional contacts, and notifying professional organizations. Participating preschool and kindergarten teachers voluntarily answered closed and open-ended questions containing information about demographics, background, and viewpoints about writing by hand and keyboarding. Close-ended questions were answered using a four point Likert scale in order to identify perspectives and attitudes for each question. Analysis included an evaluation of the survey results in order to identify emerging trends using descriptive statistics. Preschool and kindergarten results were reviewed separately and in comparison. Results will help to establish current trends in early childhood educator perspectives about writing and educator's roles in instruction. Currently, there is very little research on defined instructional approaches, formal training, and instructor background knowledge of writing. With our research we hope to bring awareness to the importance of writing in early ages and its influence on future literacy. We hope that this research helps educators effectively teach writing in the future.

**Mentor:** Lucy Hart-Paulson, Communicative Sciences and Disorders

Neuroplasticity, Dosage and Repetition Priming Effects in Individuals with Stroke Induced Aphasia  
(62) **Jesse Engen & Molly Jones**

Aphasia is an impairment of language production and comprehension that results from damage to the language centers of the brain following stroke and other brain injuries. Approximately 80,000 individuals acquire aphasia from stroke each year in the U.S.; approximately one million people in the U.S. currently have aphasia. The most frequently occurring symptom of aphasia is anomia, a difficulty accessing and retrieving spoken words. Anomia is a frustrating symptom of aphasia for stroke survivors and significantly impacts successful social communication. One way to treat this impairment is through repetitive and intense exposure and practice of picture naming. Our study seeks to compare low-dose and high-dose exposure and repetition of spoken words during a naming protocol. This approach differs from previous studies that have focused on either the type of treatment being offered or the overall amount of treatment provided. The purpose of this project is to evaluate the training effects within and across sessions and to evaluate inter-rater reliability across sessions. Stroke survivors engaged in 5 weeks of highly intensive picture naming training. Their naming abilities were tested before, during, and after training sessions to evaluate improvement. All sessions were video recorded. To assess within-session variability and the small, incremental daily improvements, each production made by the participant during training was analyzed. Independent variables included the frequency that the word exists in American English, syllable length, and the number of repetitions during each training session. To evaluate reliability, the video recordings of testing before, during, and after training sessions were coded as correct or incorrect by a reliability judge. This data was then compared to the original data documented by the research examiner. The results from this study will inform optimal treatment delivery techniques for speech-language pathologists working with persons with aphasia.

**Mentor:** Catherine Off, Communicative Sciences and Disorders

Communication Partners' Social Acceptance of Augmentative and Alternative Communication  
in Persons with Amyotrophic Lateral Sclerosis

(63) **Dani Perry & Jennifer Crosby**

Many people with Amyotrophic Lateral Sclerosis (ALS), a neuromuscular disease, eventually require Augmentative and Alternative Communication (AAC) in order to communicate. By digitally archiving a client's stories, sayings, and messages before ALS affects his/her voice (voice banking), the client will be able to access their own digitized voice through the use of an AAC device or speech-generating device (SGD).

Using the research model from the Richter et al. (2003) study, we used a repeated measures design using three different listening groups (ALS caregivers, people close to the storyteller, and unfamiliar listeners) and three different communication models (natural speech, and forms of synthesized speech). A speaker with ALS dictated 3 personal stories. One story was presented in its natural form (as recorded by the ALS speaker), the second and third stories were converted to computer generated speech using two levels of synthesized speech. The three different stories using the three different forms of communication were presented to listeners in random order. After hearing each of the stories, each listener rated the speaker using a Likert-type questionnaire. From the data, we determined which mode of communication was preferred.

The purpose of the study is to determine whether digitized voice allows people with ALS (PALS) to maintain quality communication compared to synthesized speech. The research suggests that many clients diagnosed with ALS wait until their speech is severely affected before considering the use of alternative communication and the option of recording their voice. We hope this study will provide evidence of the importance of maintaining natural communication throughout the course of the disease. This research is relevant in the field of ALS as most PALS eventually rely on AAC systems to communicate.

**Mentor:** Christine Merriman, Communicative Sciences and Disorders Department

Missoula Middle School Climates As Perceived by Respect Club Members

(64) **Heather Engblom, Anthony Shipman & Mercedes Becker**

**Purpose:** School-based violence and perceived discrimination have been linked to poorer health outcomes for youth (Bontempo & D'Augelli, 2002; Saewyc et al., 2006). Current research has documented the positive impacts of high school clubs that focus on inclusion and school safety, such as high school gay-straight-alliances (Heck, Flentje, & Cochran, 2011). The current study sought to examine heterosexual and gay, lesbian, or bisexual (LGB) students' perspectives of safety and acceptance at the middle school level within a local network of Respect Clubs in Missoula, that promote inclusion and acceptance.

**Methods:** Participants were recruited through normally designated Respect Club meetings. Participants were current or recent members of Respect Club, had provided parental consent, and were between 11 and 18 years old. Volunteers were asked to take an anonymous paper and pencil survey. The survey consisted of 26-items, including: demographic information, and questions targeting individual perceptions of belonging, acceptance, and safety at school. Approval for this study was expedited from the IRB before beginning. Descriptive analyses were run in SPSS to provide percentile breakdowns for each of these categories.

**Originality:** Although a growing body of research has examined the impacts of high school clubs that focus on inclusion and acceptance, significantly less research exists documenting the impacts of middle school clubs with similar goals. Additionally, very little research has addressed school climate for LGB middle school students more generally.

**Significance:** Findings from this project provide insight into the effectiveness of middle school based clubs that promote tolerance and acceptance. Highlighting the positive impacts of middle school based clubs may influence other schools to expand the presence of tolerance-based clubs outside of high schools. This project also allows middle school students who participated a chance to voice their opinions and experiences in Respect Club to a responsive audience through a safe, anonymous medium.

**Mentor:** Bryan Cochran, Psychology

Environmental Barriers and Pain Catastrophizing  
(65) **Cathy Berendts**

For people with impairments, both the environment and experience of pain can limit participation, which is important to one's quality of life. As a result, the perception of pain and impact of environmental barriers can be important factors in determining quality of life for these individuals. Little research has examined environmental barriers and pain catastrophizing. This correlational study examined the relationship between environmental barriers (e.g., weather, light, accessibility) and pain catastrophizing (i.e., one's thoughts about their pain intensity). Surveys were collected from 272 randomly selected individuals ages 18-64, who were residing in a small Western US city. These individuals experience pain in conjunction with some form of physical disability. In this study there were 107 male and 165 female participants with an average age of 50.7 years old. The Pain Catastrophizing Scale has been used to assess psychological suffering in response to pain. The Survey of Participation and Receptivity in Communities (SPARC) has been used to assess the frequency and magnitude of barriers experienced by people with various impairments. I hypothesized that frequency of environmental barriers would predict pain catastrophizing because people who are sensitive to pain may be sensitive to their environment. Such a generalized sensitivity across pain and barrier domains may help us understand important factors that affect an individual's participation in the community. The Statistical Package for the Social Sciences (SPSS 20.0) was used to complete multiple regression analyses. Elements of pain catastrophizing and the frequency and magnitude of barriers were compared. This investigation of environmental barriers and pain catastrophizing may advance our understanding of pain and participation that could be used for developing interventions for treating chronic pain and to improve the quality of life for people who have impairments.

**Mentor:** Craig Ravesloot, Psychology

The Effects of Environmental Context on Correct and False Recognition Memory  
(66) **Kevin Kuper**

This study investigates how human memory, both correct recognition and false recognition memory can be influenced by environmental context. For the study, participants were randomly assigned to one of the two groups. Both groups received lists of semantically related words and were asked to remember them in a typical lab. Then, for the recognition memory test, one group of the participants moved into a new room, which looked very different from the first room (different context condition), while the other group stayed in the same room (same context condition). Performance was measured as the rate of 'yes' responses to the test words. For the targets, which were the words presented during the study session, recognition memory performance was greater for the same context condition than for the different context condition. For the critical lures, which were the words not presented during the study session but related to the semantic categories, recognition memory performance did not differ between the two conditions. The results provide evidence for the context-dependent memory of correct recognition and suggest that environment context has no or little effect on false recognition.

**Mentor:** Yoonhee Jang, Psychology

Moderating Stereotype Judgments Through a Priming Anecdote  
(67) **Michele Schahczenski**

This study investigates whether stereotyping can be changed through a short priming anecdote. Eighty four participants were randomly assigned to one of four groups and read one of the four anecdotes depending on story valence and the race of the main character: (1) positive (e.g. saving a life) and white; (2) positive and black; (3) negative (e.g. robbing a store) and white; and (4) negative and black. After reading the anecdote, the participants took the Weapon Identification Task (WIT). In the WIT a photograph of either a white or a black person's face was briefly presented, which was replaced by a target picture of either a tool or a gun. The participants were then asked to identify the target (e.g., tool or gun). ANOVAs were conducted for data analysis. We partially replicated the WIT effect: Black picture primes caused tools to be misidentified as guns, but there was no difference in misidentification between tools and guns for white picture primes. More interestingly, however, we found something new. When participants read a negative story, there was an interaction between the type of picture prime and target type: The WIT correct response time was shorter for the white-tool pairs than for the black-tool pairs whereas it was shorter for the black-gun pairs than for the white-gun pairs. However, when they read a positive story, the WIT correct response time was shorter for guns than for tools regardless of picture primes. The interaction among story valence, the type of picture prime, and target type suggests that stereotype judgments can be moderated by pre-experience of the situation of different races.

**Mentor:** Yoonhee Jang, Psychology

Analysis of Factors that Influence Visits to a Healthcare Professional  
(68) **Alexandra Schiwal**

The health care system in the United States has changed significantly in recent years. Under the Affordable Care Act, it will continue to change. One of the key factors for improving the healthcare system is an understanding of why people use healthcare services. I examined factors that are predictive of visits to healthcare professionals over time using a longitudinal health and community participation survey. The participants in this study were people in the community, aged 18 to 96, who experienced various impairments (e.g., sensory, physical, etc.). They received four longitudinal surveys at four month intervals. The surveys were paper and pencil surveys that inquired about barriers, participation, and impairments due to pain or other health conditions. To predict healthcare utilization, I analyzed health insurance coverage, income level, depression, total number of health conditions, education level, and environmental barriers. I conducted my analysis using a multiple regression to build models showing which factors are predictive of doctor visits. Preliminary results indicated that the number of health conditions at Time 1 accounted for 5% of the variance in doctor visits at Time 2. Depression accounted for an additional 1% of this variance in doctor visits. The results of this study will contribute to our understanding of individual characteristics associated participation in the healthcare system.

**Mentor:** Craig Raveslout, Rural Institute

Family Size and Socioeconomic Status in Humla District, Nepal  
(69) **Lucy Tompkins**

In a remote district of Nepal in the Himalayas, known as Humla District, increased access to health care and contraception in the past decade have given village families more options for family planning. In other research on health seeking, socioeconomic status indicators such as household education level, months of food security, and occupation have been associated with contraceptive behaviors. Based on theories related to demographic and health transitions, we hypothesized that families with higher socioeconomic statuses were more likely to have lower fertility. Multiple regressions of a handful of indicators of socioeconomic status derived from ethnographic and survey data collected between 2003 and 2013 in Humla District revealed that decision making about health and family size is fairly complex, and is related to a handful of factors. Based on this knowledge of the region, where livelihoods depend on labor for agricultural pursuits but fertile land is not widely available for expansion, decisions to limit family size have wide-ranging repercussions. We discuss variations in barriers to health seeking in multiple villages of Humla District, and their implications for the future of family planning and health development in Humla District. This project was conducted using research acquired through surveys of villagers. Questions regarding their ideas of wealth, their ability to reach clinics when sick, socioeconomic status indicators, and family size were used to reach conclusions about this topic. This approach is unique because it asks villagers themselves what they value and consider to be signs of wealth, prosperity, and success, and uses that information to deduce what it is that they need in order to thrive in their communities. It examines how and why families with more socioeconomic status would desire a smaller family size, and why that may be beneficial in these villages.

**Mentor:** Kimber McKay, Medical Anthropology

Revisions to the Coding of Maternal Mind Mindedness  
(71) **Kelsey Halvorson**

Attachment theory, a result of the collaboration of John Bowlby and Mary Ainsworth, is an essential concept in developmental psychology, wherein there are four types of infant attachment (secure, insecure-resistant, insecure-avoidant, and insecure-disorganized) that have been found to relate to relationships later in life (Bretherton, 1992). In the past, maternal sensitivity, or the consistency with which a caregiver responds to infant needs, was thought to be the strongest predictor of secure attachment (Meins, Fernyhough, Fradley, & Tuckey, 2001). However, researcher Elizabeth Meins recently reframed the concept of maternal sensitivity, revealing another predictor, Maternal-Mind Mindedness (MMM). MMM is a concept based upon a mother's interpretation of her infant's behavior and whether she "treat[s] her infant as an individual with a mind rather than merely as a creature with needs that must be satisfied" (Meins et. al, 2001, p. 638). The most predictive measure of MMM are mind related comments, or comments that frame an infant's behavior in a way that emphasizes the child's mind (Meins et. al, 2001). The coding system for maternal mind-mindedness consists of seven comment categories and a measure of the appropriateness of comments. Later researchers added a measure of comment valence, or whether the comment was positive, negative, or neutral (Demers, Bernier, Tarabulsky, & Provost, 2010). While using this coding for research, several difficulties with the current system were identified. Through discussion amongst coders and analysis of problem areas in coded transcripts, several revisions to increase clarity and decrease confusion have been suggested. The purpose of this presentation is to stimulate discussion regarding possible revisions to the current system. Proposed revisions are (1) a stricter definition of maternal utterance, and (2) combinations of categories for clarity. These revisions will ensure the measurement of MMM will be consistent across studies.

**Mentor:** Lois Muir, Psychology

Sports-Related Concussion Management in Montana Youth: Rural vs. Non-Rural Settings  
(72) **Tiffany Martin**

**Objective:** Approximately 1.6 to 3.8 million sports-related concussions occur each year in the United States, and there was a four-fold increase in the number of sports-related concussions in high school athletes from 2000 to 2011. This study assessed the knowledge of coaches from rural (population < 10,000) and non-rural (population > 10,000) counties in Montana with regard to sports-related concussion management and return-to-play guidelines. It was hypothesized that there would be a higher amount of deficits in sports-related concussion management practices for youth sports in rural counties.

**Participants and Methods:** Individuals involved in overseeing youth sports (including coaches, assistant coaches, and athletic directors) were surveyed regarding sports-related concussion management and return-to-play guidelines. Of these participants, 48.1% were from rural counties and 51.9% were from non-rural counties. These data were collected prior to the first sports season in which the Dylan Steigers Protection of Youth Athletes Act became effective in Montana.

**Results:** Differences were apparent between rural and non-rural counties in all aspects of concussion management addressed in this survey. Significantly more respondents from non-rural counties indicated that their organizations have individuals trained in the evaluation and management of concussions. Additionally, significantly more respondents from non-rural counties reported that they have an individual specialized in recognition and treatment of concussions present during sporting events.

**Conclusions:** These findings highlight a significant discrepancy between concussion management practices in rural and non-rural counties in Montana. Montana was one of the last states in the nation to implement a law regarding concussion management in youth sports, and it is imperative that all counties within our state receive the education and resources necessary to protect youth athletes from the devastating consequences of poor concussion management. With these baseline findings, the overall effectiveness of concussion legislation to protect youth athletes in Montana can be monitored.

**Mentor:** Stuart Hall, Psychology

Women's Health Seeking Behavior in Rural Uganda  
(73) **Sophia Bay**

My project analyzes the usage of traditional healers and biomedical healthcare by pregnant women in the rural region of the Nakaseke District, Uganda. This is of concern to medical anthropologists because childbirth decision-making is a result of social change, a topic that is rapidly becoming more important in international development research. With data that Kimber Haddix McKay and Catherine Sanders have collected in 2011 and 2013, I utilized inferential and descriptive statistical analyses to determine my predicted hypotheses that age and education level are the most influential factors during prenatal care and delivery, that women who have a more traditional view of gender roles will be more likely to give birth close to home, and that traditional healers are more accessible than biomedical facilities. With the same data sets, I then determined the impact of socioeconomic status on these decision-making processes using multiple regressions. This research is important to the understanding of how social change is affecting decisions about childbirth in rural Uganda.

**Mentor:** Kimber Haddix McKay, Anthropology



Chitin: an alternative nitrogen source for algae growth and the treatment of pulp and paper mill wastewater  
(74) **Ryan Parks**

Every day, a pulp and paper mill produces ~ 10 million tons of phosphorus-enriched wastewater. This wastewater, when discharged, causes eutrophication in natural waters, making it imperative that this waste stream be treated. At the technological forefront of wastewater treatment is the utilization of algae. Algae remove phosphorus from wastewater, growing and creating valuable biomass that can be used to create valuable bioproducts (e.g. biofuels). However, this wastewater is nitrogen deficient, so it must be supplemented with nitrogen. Currently ammonium nitrate is used, but manufacturing this nitrogen source is expensive and has a large carbon footprint. However, with the discovery that algae can grow using chitin as their sole nitrogen source, we have found a potential alternative to synthetic nitrogen. Chitin, found in the shells of crustaceans, is one of the most abundant natural polymers on earth, with ~750 million pounds entering the landfill annually as a waste product of the shellfish industry. We aim to repurpose this waste chitin as a nitrogen source for photosynthetic microorganisms.

Preliminary results presented at last year's UMCUR demonstrated phosphorus removal from pulp and paper (P&P) wastewater on both chitin and ammonium. Further analysis has yielded data supporting efficient phosphorus removal. Growth curves for a diverse number of algal strains grown on chitin in P&P wastewater have also been compiled, yielding rates comparable if not better than those associated with ammonium nitrate. Additional analyses have also been conducted comparing the amounts of dissolved carbon and nitrogen left over in the wastewater after treatment. Combining this data with a techno-economic analysis, we can compare the costs and benefits of chitin versus the conventional ammonium nitrate. Bench scale results suggest this technology could be a viable alternative if taken to commercial scale

**Mentor:** Carrine E. Blank, Geosciences

# UMCUR Artist Statements: Paint & Print Exhibition

(in alphabetical order by title of selected work)

Concrete Jungle

**Hannah Callahan**

I strive to make art that pointedly addresses a generation's relationship to its times. Today, fragile natural landscapes all over the globe are being obliterated by clear cutting practices. Will a day come when all living plants are in pots and all the land will be covered with concrete? But isn't it true, when concrete crumbles it's plants you find growing among the remains? As much as environmental education is on the rise within America there is no stopping our large population's demands, causing us to exploit our natural resources now, more than ever. I wanted to convey my concerns regarding the unchecked development happening today with specific regard to the oppression concerning plants. Maybe it's silly to concern oneself with the oppression of such insignificant organisms but my photographs' odd composition is reflective of this quirky thought. I created this image using HDR techniques to bring out the subtle details within the plants and emphasize a futuristic look. With the help of Photoshop I was able to place these two awkward plants uncomfortably on a blanket of stark white with a crack of concrete in the space above. The final image is static, yet it carries a fragile tension, reflecting the vulnerability of plants given our current habits.

eleutheromania

**David M. Sampson**

“eleutheromania” (n.) the intense and irresistible desire for freedom. As human beings we all have, to some extent, the desire for freedom. People do not like to be restrained, restricted or imprisoned. It is our instinct to have the freedom to develop and evolve. The inspiration for my piece “eleutheromania” comes from the recent travesty of an individual hanging a noose from the James Meredith statue at the University of Mississippi. James Meredith believed in the struggle for equality in a legitimate and dignified fashion. He was the first black man to be accepted into a segregated college on his merits alone. He paved the way for the racial integration of public schools and civil rights. “eleutheromania” is an attempt to pay homage to this figure, and any figure like him, who will stand up for their beliefs, no matter the odds, and break the bonds that attempt to limit them. The act of hanging this figure, even though just a statue, is a setback. It's a reminder of how far we have come as a culture, and how far we have yet to go.

Here,

**Parker J. Beckley**

From as far back as I can remember it seems I have been making art of one form or another. From more traditional methods such as intaglio printmaking or oil painting, to sculptures made of waste and trash; my use of materials and technique shift to match the intent of each work. I often collaborate with my friends and their mediums of choice; film, music, graphic design and a variety of other projects less easily categorized. Time and the temporal nature of all things seem to be a constant underlying theme in my work. On a personal level, there are layers in my work with my own meanings, but more so I always enjoy conversations with friends and strangers alike about what they see and get from my art. To me, art making is simply the process of learning, growth, development and trying to make some sense of our time here.

Norms  
Eva Stone

Color is a tool, which can be used to direct a viewer's attention in an image. Color acts as a connection to gender in this piece. The figures in this picture are monochromatic. The only color is found in the two speech bubbles and the electrical outlet and plug growing out of the two figures. These colors are pink and blue, and they indicate gender difference. The blue plug feels connected to the blue speech bubble, and the pink outlet feels connected to the pink speech bubble. The isolation of these two gendered colors sets the tone for a gendered image.

The text within the speech bubbles speaks to our society's differing attitude toward sexuality among males and females. Comfort with one's own body is an important part of feeling sexually empowered. The speech bubbles imply that society generally embraces male sexuality. A natural and normal part of male adolescence is masturbation. In contradiction to this, female genitalia are generally hidden away or are perhaps thought of in a negative way. Sometimes young females are made to feel ashamed of their sexual urges. This causes females to feel sexually ashamed or uncomfortable. The repression of female sexuality is a form of gender inequality, and one that is worthy of notice.

Reflecting on Sinopah  
Celeste Bickford

In *Sacred Mountains of the World*, author Edwin Bernbaum states, "when an artist chooses to paint a mountain in an awe-inspiring manner, he automatically calls forth such images from the repository of his own tradition and juxtaposes them with the image of the peak (p.226)." As an artist depicting mountains, I often call upon my scientific background in mountain geography in the interest of accuracy, and out of respect for the processes that make a mountain look uniquely the way it does. As Bernbaum states, this is a process of drawing upon "images from the repository of [my] own tradition", that tradition being my scientific background. I argue that this process of artistically depicting mountains, through the lens of mountain science, is an act of respect and reverence. This process also reflects my dedication to the scientific tradition as a way of knowing, understanding, and loving mountains.

This piece is an intaglio etching of the mountain Sinopah, which sits on the western shore of Two Medicine Lake in Glacier National Park. I chose to depict the mountain using intaglio etching because it is an intensely analytical process that requires knowledge of chemical processes involving copper and ferric acid. This analytical process, however, is used as a form of expression. This piece is a vertical mirror image of Sinopah. The vertical mirror image is a departure from the realism present in the rest of the print. I did this to juxtapose the originally 'scientifically accurate' representation of the mountain, with the resulting 'inaccurate' representation to highlight the interplay between accuracy and expression. I seek to draw a parallel between the process of intaglio and the process of science, to show that science, though analytical and technical, is a way through which we express ourselves and our relationships to our world.

