UM GradCon - A Graduate Student Research Conference

The 17th Annual UM Graduate Conference (GradCon) will be held in the University Center Ballroom on Friday, April 20, 2018. The UM GradCon is interdisciplinary and welcomes presentations from all disciplines and departments. This year, GradCon has been organized by the UM Graduate and Professional Student Association and graciously sponsored by the Office of Research and Creative Scholarship. The conference is free and open to the public. All members of the UM campus community are encouraged to attend and participate.

GradCon Schedule Overview

<table>
<thead>
<tr>
<th>Time</th>
<th>Description</th>
<th>Location</th>
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<tbody>
<tr>
<td>8:00-9:00am</td>
<td>Registration, Day of Questions and Poster/Visual Display Set-up</td>
<td>UC Ballroom</td>
</tr>
<tr>
<td>9:00-1:00pm</td>
<td>15 minute Oral Presentations Social Sciences / Humanities &amp; STEM</td>
<td>UC North Ballroom, Presentation Pods 1 &amp; 2</td>
</tr>
<tr>
<td>12:45-1:30pm</td>
<td>Luncheon (lunch provided for all attendees)</td>
<td>UC Grand Foyer</td>
</tr>
<tr>
<td>1:00-3:25pm</td>
<td>Performing and Visual Arts Presentations &amp; 15 minute Oral Presentations – Continue</td>
<td>UC North Ballroom</td>
</tr>
<tr>
<td>3:30-4:30pm</td>
<td>5 minute “Chalk Talk” Oral Presentations (designed for quick overview of project)</td>
<td>UC North Ballroom, Presentation Pods 1 &amp; 2</td>
</tr>
<tr>
<td>4:30-6:30pm</td>
<td>&quot;Best of GradCon&quot; Awards (4:30-5:00pm) &amp; Poster Presentation Session (5:00-6:30pm) Hors d’oeuvre and a no-host cash bar will be available during this time (bring cash &amp; your ID).</td>
<td>UC South Ballroom</td>
</tr>
</tbody>
</table>
The below schedule lists GradCon presentations by: time, title and primary author.  
(Please see the following section for all abstracts, co-authors and faculty mentors).

15 Minute Oral Presentations
Social Sciences / Humanities & STEM (science, technology, engineering, mathematics)

<table>
<thead>
<tr>
<th>Presentation Pod #1 - UC North Ballroom</th>
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<tbody>
<tr>
<td>9:00 - 9:15am</td>
<td>Developing and implementing the Missoula Prescription Produce Program: A pilot study  - Harley Fredriksen</td>
</tr>
<tr>
<td>9:15 - 9:30am</td>
<td>Utilizing Food Trucks to Support Healthy Weight Initiatives in Yellowstone County  - Maia Dickerson</td>
</tr>
<tr>
<td>9:30 - 9:45am</td>
<td>Measuring the Return on Investment of Quality Improvement in Public Health  - Wendy Kowalski</td>
</tr>
<tr>
<td>9:45 - 10:00am</td>
<td>Aligning Montana’s Public Health System Priorities Through the Development of the Public Health System Improvement Task Force’s Improvement Plan  - Jessica Miller</td>
</tr>
<tr>
<td>10:00 - 10:15am</td>
<td>A Phenomenological Study of People Living with HIV in Montana  - Mary Parrish</td>
</tr>
<tr>
<td>10:15 - 10:30am</td>
<td>An Investigation of the Effects of Depressive-Rumination on Prospective Memory  - Mark Primosch</td>
</tr>
<tr>
<td>10:30 - 10:45am</td>
<td>Of Ruptures and Raptures: Locating Ideology with LiDAR Imagery  - William Schroeder</td>
</tr>
<tr>
<td>10:45 - 11:00am</td>
<td>Common Methods of Soft Tissue Removal on Skeletal Remains: A Comparative Analysis  - Emily Silverman</td>
</tr>
<tr>
<td>11:00 - 11:15am</td>
<td>Intentional Danger: Understanding Risk and Identity within Mountaineering  - Mira Cleveland</td>
</tr>
<tr>
<td>11:15-11:30am</td>
<td>Modeling of glutamate transporters and receptors  - Denis Shchepakin</td>
</tr>
<tr>
<td>11:30 - 11:45am</td>
<td>Zoning to Protect Farmland: A Case for Missoula County  - Kaitlin McCafferty</td>
</tr>
<tr>
<td>11:45am - 12:00pm</td>
<td>The Presentation of the Chasuble to San Ildefonso: an Exploration of its Origins  - Nikolyn Garner</td>
</tr>
<tr>
<td>12:00 - 12:15pm</td>
<td>Growing Youth Harvest and Youth Farm: Youth Participatory Action Research for Program Development of Garden City Harvest  - Hannah Oblock</td>
</tr>
<tr>
<td>12:15 - 12:30pm</td>
<td>The Climate Change Sublime: The Immense Awe of a Planetary Threat  - Sean Quartz</td>
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<tr>
<td>12:30 - 12:45pm</td>
<td>Health Needs Analysis of Hmong American Youth in Missoula, MT  - Krys Standley</td>
</tr>
<tr>
<td>12:45 - 1:00pm</td>
<td>Beyond the Mother of the Blues: Ma Rainey’s Queer Sexuality and Influence on African-American Culture  - Johnny Barber</td>
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<table>
<thead>
<tr>
<th>Presentation Pod #2 - UC North Ballroom</th>
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<tbody>
<tr>
<td>9:00 - 9:15am</td>
<td>Digital Media in Live Performance  - Kurtis Hassinger</td>
</tr>
<tr>
<td>9:15 - 9:30am</td>
<td>Using Immunization Information Systems to Increase Vaccinations Rates: Strategies for maintaining the sustainability of these systems.  - Bekki Wehner</td>
</tr>
<tr>
<td>9:30 - 9:45am</td>
<td>Women Under Fire: A Needs Assessment of Female Wildland Firefighters  - Bonnie Bishop</td>
</tr>
<tr>
<td>9:45 - 10:00am</td>
<td>TRUCE: a Hidden Markov Model for Annotation of Tandem Repeats  - Daniel Olson</td>
</tr>
<tr>
<td>10:00 - 10:15am</td>
<td>Effect of Uncompensable Heat from WLFF Helmet  - Tyler Stenersen</td>
</tr>
<tr>
<td>10:15 - 10:30am</td>
<td>Determining Skin Temperature Differences Between Three Cold Compression Modalities  - Madison McCarthy</td>
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</table>
### 15 Minute Oral Presentations – Continued
Social Sciences / Humanities & STEM (science, technology, engineering, mathematics)

#### Presentation Pod #2 - UC North Ballroom - Continued

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>10:30 - 10:45am</td>
<td>Examining the impact of adding gluteal strengthening exercises to the FIFA 11+ warm-up program on high school girls' basketball reported injuries.</td>
<td>Heather Bartz</td>
</tr>
<tr>
<td>10:45 - 11:00am</td>
<td>Addressing water contamination issues using SPCs and Indigenous knowledge.</td>
<td>Ranalda Tsosie</td>
</tr>
<tr>
<td>11:00 - 11:15am</td>
<td>Designing Configurable Computer Hardware for the Next Generation of High Performance Computing</td>
<td>Tim Anderson</td>
</tr>
<tr>
<td>11:15 - 11:30am</td>
<td>Probability-based confidence assessment of Transposable Element annotation helps explain confusing annotation results</td>
<td>Kaitlyn Carey</td>
</tr>
<tr>
<td>11:30 - 11:45am</td>
<td>Foreign Faculty Members' Lived Experiences at an International Branch Campus in China</td>
<td>Xin Bu</td>
</tr>
<tr>
<td>11:45am - 12:00pm</td>
<td>Sex Determination from a Geometric Morphometric Analysis of the Pubic Bone: A Pilot Study</td>
<td>Katherine Jackson</td>
</tr>
<tr>
<td>12:00 - 12:15pm</td>
<td>Examining Injury Data Reporting Practices in Wildland Firefighters</td>
<td>Erin Boggs</td>
</tr>
<tr>
<td>12:15 - 12:30pm</td>
<td>The role of mRNA deadenylation in translational repression required for stem cell maintenance</td>
<td>Xiaobo Wang</td>
</tr>
<tr>
<td>12:30 - 12:45pm</td>
<td>Identifying control strategies for measles in countries with seasonal birth rates using supplementary immunization activities</td>
<td>Dominika Dec</td>
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<tr>
<td>12:45 - 1:00pm</td>
<td>Turán number of star forest hypergraphs</td>
<td>Omid Khormali</td>
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### 15 Minute Visual & Performing Arts Presentations

#### The Center Area - UC North Ballroom

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
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</thead>
<tbody>
<tr>
<td>1:00 - 1:15pm</td>
<td>LIT - MFA Thesis Exhibition</td>
<td>Tyler Brumfield</td>
</tr>
<tr>
<td>1:15 - 1:30pm</td>
<td>Reflections of the Past: Hip-Hop and Black history</td>
<td>Tsiambwom Akuchu</td>
</tr>
<tr>
<td>1:30 - 1:45pm</td>
<td>Marble, Glass &amp; A Lawn Chair: A Sculptural Exploration of Culture Icons</td>
<td>Casey Schachner</td>
</tr>
<tr>
<td>1:45 - 2:00pm</td>
<td>Lag: An Artistic Investigation of Plant Systems</td>
<td>Anne Yoncha</td>
</tr>
<tr>
<td>2:00 - 2:15pm</td>
<td>Can Hares Keep up with Climate Change?</td>
<td>Brandon Davis</td>
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<tr>
<td>2:15 - 2:30pm</td>
<td>Art and Technology: A Post-Industrial Dialogue</td>
<td>Jesse Blumenthal</td>
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<tr>
<td>2:30 - 2:40pm</td>
<td>fortUtous: tunneling</td>
<td>Charlotte Nickel</td>
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### 15 Minute Oral Presentations
**Social Sciences / Humanities & STEM (science, technology, engineering, mathematics)**

#### Presentation Pod #1 - UC North Ballroom

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
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</thead>
<tbody>
<tr>
<td>2:40-2:55pm</td>
<td>The Stigma and the Damage Done</td>
<td>Bradley Applegate</td>
</tr>
<tr>
<td>2:55-3:10pm</td>
<td>Communication Accommodation in Technologically- Mediated Conflict Between Romantic Partners</td>
<td>Benjamin Wassink</td>
</tr>
<tr>
<td>3:10-3:25pm</td>
<td>To Know is to Grow: How Different Types of Contact with Transgender Individuals is Associated with Varying Levels of Anti-Transgender Prejudice</td>
<td>Oak Reed</td>
</tr>
</tbody>
</table>

#### Presentation Pod #2 - UC North Ballroom

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:10-3:25pm</td>
<td>Detecting Instance of Software Plagiarism from Online-Sourced Evidence</td>
<td>Adam Clemons</td>
</tr>
<tr>
<td>2:55-3:10pm</td>
<td>A Comparative Reconstruction of Proto-Eastern-Algonquian</td>
<td>Daniel Gaynes</td>
</tr>
<tr>
<td>2:40-2:55pm</td>
<td>Psychological Forces Behind the Theatrical Drama of Tennessee Williams</td>
<td>Peter Philips</td>
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</table>

### 5 Minute Oral Presentations
**Social Sciences / Humanities & STEM (science, technology, engineering, mathematics)**

#### Presentation Pod #1 - UC North Ballroom

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
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</thead>
<tbody>
<tr>
<td>3:30 - 3:35pm</td>
<td>Developing a Community Pathway to Improved Maternal Mental Health</td>
<td>Holly Jordt</td>
</tr>
<tr>
<td>3:38 - 3:42pm</td>
<td>Preventing cancer through local policy change: use of artificial UV tanning services among minors.</td>
<td>Stefanie Tassaro</td>
</tr>
<tr>
<td>3:45 - 3:50pm</td>
<td>Building Buy-In: Utilizing the Strategic Planning Process with a Local Advisory Council on Mental Health to Engage Stakeholders in Blaine County, Montana</td>
<td>Jana McPherson-Hauer</td>
</tr>
<tr>
<td>3:53 - 3:58pm</td>
<td>Community and Individual Responses to Flooding on Louisiana’s Last Inhabited Barrier Island</td>
<td>Lauren Miller</td>
</tr>
<tr>
<td>4:01 - 4:06pm</td>
<td>Cruising to be a gamer: Understanding Socialization relating to Board Gaming and The Dice Tower</td>
<td>Benjamin Wassink</td>
</tr>
<tr>
<td>4:09 - 4:14pm</td>
<td>Montana: The Last Best Place to Die by Suicide – An evaluation of Montana’s fragmented prevention efforts.</td>
<td>Kim Spurzem</td>
</tr>
<tr>
<td>4:17 - 4:22pm</td>
<td>“Inmates”: and Moral Reform: Law, Vice, and Culture in Missoula, 1890-1930</td>
<td>Kayla Fox</td>
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#### Presentation Pod #2 - UC North Ballroom

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<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>3:30 - 3:35pm</td>
<td>Explorations in 360/VR Filmmaking</td>
<td>David Mills-Low</td>
</tr>
<tr>
<td>3:38 - 3:42pm</td>
<td>&quot;reTHINK&quot;ing Roles: Using Organizational Input for Committee Recruitment</td>
<td>Hannah Groves</td>
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<tr>
<td>3:45 - 3:50pm</td>
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<tr>
<td>3:53 - 3:58pm</td>
<td>Development and implementation of a comprehensive groundwater nitrate tracking program in Gallatin County, Montana</td>
<td>Brittney Krahn</td>
</tr>
<tr>
<td>4:01 - 4:06pm</td>
<td>Cardiorespiratory Responses to the USFS Wildland Firefighter Arduous Pack Test</td>
<td>Christopher Alfiero</td>
</tr>
<tr>
<td>4:09 - 4:14pm</td>
<td>Exploring the Effect of Sterics and Geometry in Catalyst Design</td>
<td>Nicholas Wageling</td>
</tr>
<tr>
<td>4:17 - 4:22pm</td>
<td>Immune Organ Regeneration After Dioxin Exposure</td>
<td>Laura Berg</td>
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<tr>
<td>Poster #</td>
<td>UC South Ballroom</td>
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<tr>
<td>1</td>
<td>The effect of female priming on male Betta splendens - Susan Greene</td>
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<tr>
<td>2</td>
<td>Label avoidance: a measurement of stigma - Kali Strickland</td>
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<tr>
<td>3</td>
<td>Pig Trauma Models: A Civilian Perspective on AR-15 Skeletal Trauma - Lauren Kenny</td>
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<tr>
<td>4</td>
<td>Uncovering the Rules of Language: What the Case of the Word ‘Glimpse’ Can Teach Us - Jessica Holtz</td>
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<td>5</td>
<td>Withdrawn</td>
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<tr>
<td>6</td>
<td>The Portrayal of Unmarried and Married Women in Bhojpuri Folksongs - Srijee Mukherjee</td>
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<tr>
<td>7</td>
<td>Investigating least cost path from raw material sources to Bridge River site (EeR14) - Elizabeth Dolinar</td>
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<tr>
<td>8</td>
<td>&quot;Is this my Great Aunt?: An Analysis of Human Skeletal Remains to Construct a Biological Profile - Hayley Savage</td>
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<td>9</td>
<td>The use of forensic anthropology outside the medico-legal context: Creating a historic biological profile - Elena Hughes</td>
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<tr>
<td>10</td>
<td>The Battle of the Little Bighorn Gunshot Trauma Analysis: Suicide Prevalence Among the Soldiers of the 7th Cavalry - Genevieve Mielke</td>
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<td>11</td>
<td>No One left Behind: Forensic Anthropology in the Community - Keith Biddle</td>
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<tr>
<td>12</td>
<td>Addressing Health Needs in Rural Montana: Utilizing CHNA and CHA Data to Enhance Collaboration Between Critical Access Hospitals and Public Health Departments - Amy Royer</td>
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<td>13</td>
<td>Withdrawn</td>
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<tr>
<td>14</td>
<td>A Cost-Effectiveness Analysis of Treatment Options - Erica Forzley</td>
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<td>15</td>
<td>Adjunctive Triple Chronotherapy in the Acute Treatment of Depression and Suicidality - Nicholas Coombs</td>
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<tr>
<td>16</td>
<td>An Inclusive Community Health Assessment Process: Missoula City-County Health Department - Helen Russette</td>
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<tr>
<td>17</td>
<td>Improving Educator's Understanding of Rural Children's Mental Health - Heather Halko</td>
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<td>18</td>
<td>Metabolic Cost of Load Carriage: Evaluating Existing Models with Emperical Data - JT Strang</td>
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<tr>
<td>19</td>
<td>Effectiveness of low-level laser light therapy on ankle dorsiflexion following a cupping induced contusion - Conor Marlatt</td>
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<tr>
<td>20</td>
<td>Assessing Changes in Shoulder Rotation with Treatment of Dynamic stretching, Diathermy and Moist Heat Pack - Taylor Manning</td>
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<table>
<thead>
<tr>
<th>Poster #</th>
<th>UC South Ballroom</th>
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</thead>
<tbody>
<tr>
<td>21</td>
<td>Humoral Immune Response Modulation by Aryl hydrocarbon Receptor Activation (AhR) in CD11c+ Cells: Exploring Sex-specific and Ligand-dependent Effects on Antibody Responses in Mice. - Joanna Kreitinger</td>
</tr>
<tr>
<td>22</td>
<td>Comparing Measures of Ankle Dorsiflexion and Skin Temperature Between VORTEQ Technology and Hot/Cold Whirlpool Contrast Therapies - Olivia Feller</td>
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<td>23</td>
<td>Engineered Nano-materials Induce Membrane Permeability in Different Cell Models - Matthew Sydor</td>
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<tr>
<td>24</td>
<td>The legacy of smelter aerosols on soil physicochemical and plant community characteristics in a degraded watershed - Scott Robinson</td>
</tr>
<tr>
<td>25</td>
<td>Size and shape of multi-walled carbon nanotubes influence epigenetic changes and lung disease in a mouse model - Elizabeth Cole</td>
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<tr>
<td>26</td>
<td>Comparison of the acute respiratory response in male and female mice - Jessica Ray</td>
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<tr>
<td>27</td>
<td>Docosahexaenoic Acid Treatment on Particle-Exposed Macrophages - Paige Fletcher</td>
</tr>
<tr>
<td>28</td>
<td>Exercise Program to Prevent Shoulder Injury in Collegiate and Professional Pitchers - Rina Kasuga</td>
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<tr>
<td>29</td>
<td>Assessing the impacts of increasing wolf and grizzly bear populations on the habitat selection and foraging patterns of cougars: a multi-organizational collaborative project in the southern Greater Yellowstone Ecosystem - Jennifer Feltner</td>
</tr>
<tr>
<td>30</td>
<td>The Psychological and Physiological Effects of Performing the Primal Reflex Release Technique on Female, Division I Collegiate Athletes - Erika Vichcales</td>
</tr>
<tr>
<td>31</td>
<td>Testing for facultative switching between migratory strategies in a partially migratory, long-lived herbivore population - Hans Martin</td>
</tr>
<tr>
<td>32</td>
<td>Maxed out? Assessing forage quality and forage availability for a northern ungulate that may be approaching food-regulated carrying capacity - Libby Ehlers</td>
</tr>
<tr>
<td>33</td>
<td>Why do slow trees grow old? Exploring the physiological mechanisms that link slow growth and longevity in ponderosa pine - Libby Ehlers</td>
</tr>
<tr>
<td>34</td>
<td>A Novel, Noninvasive Approach For Assessing PAH and VOC Exposures for Application in Wildland Firefighters - Hanna Wright</td>
</tr>
<tr>
<td>35</td>
<td>Withdrawn</td>
</tr>
<tr>
<td>36</td>
<td>Determining the conformational states of peroxisome proliferator-activated receptor gamma (PPARγ) that favor coactivator or corepressor binding - Michelle Nemetchek</td>
</tr>
<tr>
<td>37</td>
<td>Regulation of neuron growth and development by the matricellular protein dCCN - Elizabeth Catudio Garrett</td>
</tr>
<tr>
<td>38</td>
<td>Biogeochemical impacts of wildfire in subalpine forests of the northern Rocky Mountains - Kyra Wolf</td>
</tr>
<tr>
<td>39</td>
<td>Journey to the Jungle: A UM Terrestrial Ecosystem Ecology Lab Trip to Costa Rica Through the Eyes of a Journalist - Maddie Vincent</td>
</tr>
<tr>
<td>40</td>
<td>Do children always trust confident individuals? Not when it comes to moral deliberations. - Shailee Woodard</td>
</tr>
</tbody>
</table>
A Comparative Reconstruction of Proto-Eastern-Algonquian

Author(s): Daniel Gaynes

Category: Social Sciences / Humanities

Abstract / Artist Statement: The Algonquian language family can be organized into three broad branches: Plains, Central, and Eastern. These subgroupings, however, are largely based on location and not genetic relations between the languages. According to a theory put forward by Goddard back in the 70s, the Eastern Algonquian languages form a separate “genetic subgroup” from the rest of the Algonquian languages. Support for this claim comes from how similar any given word is amongst Eastern languages when compared to any non-Eastern Algonquian language. If this theory is correct, then a proto-language be reconstructed from these eastern languages in much the same way that we can compare and contrast different species of an animal to see what they all theoretically evolved from. This proto-Eastern-Algonquian (pEA) is the theoretical link between pA and the Eastern Algonquian languages, and as such will be similar to both pA and all eastern languages in regard to phonology, morphology, and syntax. It can be seen how similar the Eastern languages are when looking at the following table, with the term for ‘axe’ in languages across the three branches. The Plains languages (white) look almost nothing alike. The Central (blue) look more alike than the Plains languages, but still not even close to similar. The Eastern languages (grey) look very similar and, given that these languages were spoken on a large part of the eastern coast, it is very unlikely that the languages in Maine developed a similar word for the same tool as the people in Delaware.

Table 1 – Terms for the word ‘axe’ in some Algonquian languages

<table>
<thead>
<tr>
<th></th>
<th>Plains</th>
<th>Central</th>
<th>Eastern</th>
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</thead>
<tbody>
<tr>
<td><strong>pA</strong></td>
<td><em>tamahaakan</em></td>
<td>Mohegan</td>
<td>taka3k</td>
</tr>
<tr>
<td>Blackfoot</td>
<td>kaxakin</td>
<td>Abenaki</td>
<td>domohigan</td>
</tr>
<tr>
<td>Arapaho</td>
<td>hohi noox</td>
<td>Malecite</td>
<td>tamahekan</td>
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<tr>
<td>Gros Ventre</td>
<td>shonasa'i</td>
<td>Micmac</td>
<td>tumeekun</td>
</tr>
<tr>
<td>Cheyenne</td>
<td>hohkosh</td>
<td>Mahican</td>
<td>tamahekan</td>
</tr>
<tr>
<td>Ojibwe</td>
<td>waagaakwad</td>
<td>Algonquin</td>
<td>tamahaak</td>
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<tr>
<td>Fox</td>
<td>papakyehi</td>
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</table>

The following table shows the corresponding consonants in each branch. Table 2 – Sound correspondences for the above words for ‘axe’

<table>
<thead>
<tr>
<th>Consonant</th>
<th>Plains</th>
<th>Central</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>k,h,h,h</td>
<td>w,p</td>
<td>t,d,l,l,t,t</td>
</tr>
<tr>
<td>2</td>
<td>k,h,n,h</td>
<td>g,p</td>
<td>Ø,m,m,m,m,m</td>
</tr>
<tr>
<td>3</td>
<td>k,n,s,k</td>
<td>k,k</td>
<td>k,h,h,Ø,h,h</td>
</tr>
<tr>
<td>4</td>
<td>n,x,Ø,sh</td>
<td>w,y</td>
<td>k,g,k,k,k,k</td>
</tr>
<tr>
<td>5</td>
<td>d,h</td>
<td>Ø,n,n,n,n,Ø</td>
<td></td>
</tr>
</tbody>
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Some of the consonant correspondences in the Plains and Central branches, such as [k,h,h,h] and [w,p] are fine; but some, like [x,h,n,h] and [g,p] are not fine, given that there can almost certainly be no common ancestor to those entire groups of sounds. And then there are the Eastern languages, whose consonants correspond to each other almost every time. With this paper, I hope to reconstruct enough of proto-Eastern Algonquian to spark the minds of others into furthering the reconstruction of this language. Within this paper I will cover the phonemes and phonotactics, a large number of affixes, and a decent corpus of words to base further studies on. However, this paper is only written after the reconstruction of 100 random words based on data I acquired. For a fuller and more thorough analysis, more words will have to be reconstructed.

Mentor: Irene/Applebaum
A Cost-Effectiveness Analysis of Treatment Options

Author(s): Erica Forzley

Category: Social Sciences / Humanities

Abstract / Artist Statement: Youth face choices concerning media usage, gang involvement, violence, sex/pregnancy, and alcohol/drugs. Environmental stressors such as parental divorce/single family homes, domestic violence, parental drug/alcohol use/abuse, physical/sexual abuse, and neglect affect youth. These risk factors impact youth and can look like trauma, suicide ideation, addiction, poor performance in school and mental health disorder diagnoses. The breadth of the problem is that 70%-80% of children with clinical mental disorders may not receive the services they need. Also, 4 out of 26 million adolescents ages 12-19 have emotional problems severe enough to require treatment. Inner Roads, LLC, a Wilderness Therapy (WT) program in Missoula, MT treats at-risk youth in an outdoor residential setting. Multiple residential treatment options are available for at-risk youth. Payment options for residential therapy include out-of-pocket, loans, grants, and insurance companies. I will complete a preliminary cost-effectiveness analysis to inform parents, insurance companies and treatment programs. Literature indicates that indoor RTC and WT outcomes are equally effective, and, WT is more cost effective. The preliminary cost-effectiveness analysis will compare WT, indoor RTC, and Therapeutic Group Homes. The variables compared are treatment cost and effectiveness which is measured by the Youth Outcome Questionnaire (YOQ), a widely used indicator of youth well-being. At-risk youth who do not receive treatment might attend a Juvenile Detention Center and/or Youth Court. These will be compared using the variables of cost and recidivism. Data for the cost-effectiveness analysis will come from literature except for data on the cost of WT and Therapeutic Group Homes which will come from Youth Homes 2018 budget. The field of WT is working on being widely recognized as an effective and affordable treatment option. The cost-effectiveness analysis will contribute to information about treatment choices. This assessment could help families, insurance companies, and treatment -effectiveness analysis make decisions and could lead to improved adolescent and familial health.

Mentor: Kari Harris

A Novel, Noninvasive Approach For Assessing PAH and VOC Exposures for Application in Wildland Firefighters

Author(s): Hannah Wright; Curtis Noonan; Chris Palmer; Mary French; Chris Migliaccio; Tony Ward; Erin Semmens

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Wood smoke is composed of many harmful compounds, such as carcinogenic polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs), the exposures for which are often understudied in the people who work in close proximity to fire. This research proposes a novel technique for assessing exposures using silicone wristbands as passive receptors. Using analytical methods, we have developed a way to test for these carcinogenic chemicals using a noninvasive, everyday object.

Mentor: Chris Palmer, Erin Semmens
A Phenomenological Study of People Living with HIV in Montana

Author(s): Mary Parrish; Annie Sondag

Category: Social Sciences / Humanities

Abstract / Artist Statement: HIV is now characterized as a manageable, chronic condition; however, people living with HIV (PLWH) have a lower life expectancy, and are more susceptible to comorbidities, functional decline, and faster aging than the general United States (US) population. The Centers for Disease Control and Prevention reports that, in the US, more than one million people aged 13 and older live with HIV. Between 2010 and 2014, the annual number of new HIV diagnoses decreased by 9%, with 39,513 new cases reported in 2015. Although HIV is a manageable disease today, it is still a pressing public health concern with different considerations by sex and gender, racial and ethnic group, age, socioeconomic status, and/or geographic location. Several scientific studies indicate that PLWH in rural and urban areas experience disparate health concerns such as access to care, availability of treatment, quality of care, delayed diagnosis, and stigma.

Montana (MT), a state with distinct rural health concerns, has over one million residents dispersed across 56 counties. In 2015, the MT Department of Health and Human Services (DPHHS) reported 595 PLWH in MT. Most cases (68%) are from the six most populous state counties, including Missoula, Flathead, Gallatin, Cascade, Yellowstone, and Lewis and Clark. Similar to MT state demographics, most new HIV infections are among non-Hispanic, White males. Since 2000, 14-32 new cases are reported annually in the state. In 2015, men accounted for 17 new HIV cases, while there was only one new infection among MT women (MTDPHHS, 2016). Paralleling US trends, HIV is transmitted primarily among MSM, while female infection is largely due to high-risk heterosexual contact (MTDPHSS, 2016). A phenomenological study (in process) of PLWH explores the experience of living with HIV in MT through qualitative, in-depth interviews with HIV+ individuals living in the state, without regard to their place of diagnosis. PLWH that are out of care are of particular interest in this study, because limited information is available about their needs as they relate to the HIV healthcare continuum. Capturing the lived experience of PLWH in MT by listening to individual stories as they relate to factors like barriers to testing or treatment, or navigating the rural healthcare continuum, could enable the development of targeted health care practices improving health outcomes and quality of life for this demographic including long-term care and positive self-image. Information from this study will both foster understanding and create awareness about the lived experience of out of care PLWH in MT. Findings may help improve patient outcomes, inform population specific interventions, enhance quality of life, and give voice to an under-studied demographic living in a rural state. Results will be shared with MT DPHHS and the MT State HIV Planning Group to enhance provider knowledge and develop strategic healthcare interventions.

Mentor: Dr. Annie Sondag

Addressing Health Needs in Rural Montana: Utilizing CHNA and CHA Data to Enhance Collaboration Between Critical Access Hospitals and Public Health Departments

Author(s): Amy Royer

Category: Social Sciences / Humanities

Abstract / Artist Statement: Introduction - A Community Health Needs Assessment (CHNA) is mandated once every three years for all charitable 501(c)(3) hospitals. In addition to the CHNA, a detailed implementation plan must be developed which outlines how the facility plans to address health issues identified. Public health departments must undergo a similar process every five years if they wish to become or maintain their public health accreditation. This process is referred to as a CHA/CHIP or Community Health Assessment and
Community Health Improvement Plan. The processes conducted by Public Health Departments and non-profit hospitals are essentially the same; both involve an assessment of the community, a definition of the population served, collaboration with community partners, a selection of top priorities, and a detailed strategic plan to address the needs found in the assessment. However, despite the similarities of the two processes, very few Montana public health departments and hospitals are collaborating on this process. Collaboration between these two entities could provide various advantages such as shared costs for conducting the needs assessments, pooled resources, unified programs and messaging, and overall better coordination of community services.

Furthermore, because there is no requirement for public health departments to wait five years in-between assessments, they could switch to three-year intervals so they are on the same schedule with non-profit hospitals. To assist in better coordination between Public Health Departments and non-profit hospitals, the Montana Rural Health Initiative will examine existing CHNA reports from Montana Critical Access Hospitals and CHA reports from County Health Departments to demonstrate areas of overlap in each county. Implementation Plans and Community Health Improvement plans will also be examined demonstrate similar goals and strategies being conducted separately within each organization. Finally, solutions and resources will be proposed to assist PHDs and non-profit Critical Access Hospitals to collaborate more effectively in the future.

Methods – An excel database will be created detailing top priorities of health assessments and improvement/implementation plans conducted in the past three-five years. Priorities found in through each assessment process will be standardized into common themes, and areas of overlap in health improvement goals will be calculated for each county. The database will be published on the RHI website along with a comprehensive guide of wellness, behavioral and clinical resources to assist for collaboration on future assessments.

Results – It is expected that many or nearly all Critical Access Hospitals and Public Health Departments will have similar priorities outlined in their implementation plans and community health improvement reports. Percentage of overlap between both entities will demonstrate the need for enhanced collaboration to achieve improved community health and wellness.

Discussion – The top health issues in the state, such as cancer, alcohol and substance abuse and obesity, are largely preventable or can be greatly improved through behavioral, lifestyle and environmental changes. These findings are hopeful considering the plethora of evidence-based resources and strategies that support health promotion interventions. Individual facilities cannot tackle all the

Mentor: Kari Harris

Addressing water contamination issues using SPCs and Indigenous knowledge.

Author(s): Ranalda Tsosie

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: The legacy of mine waste contamination continues to affect many Indigenous communities throughout the U.S. Often resulting in numerous water sources that exceed established maximum contaminate levels for uranium, arsenic and other toxic metals. These contaminations are a direct result from the improper disposal of mine waste materials and abandoned mines. Some of these legacy-contaminations posed significant health and environmental impacts on the community members and livestock. To date, there are challenges for access to safe water despite many years of research and remediation efforts. Traditional solvent extraction methods are expensive, time consuming and pose additional problems with the generation of waste products. The aim of this study is to use solid phase extraction methods to remediate contaminated water sources. An example is Silica Polyamine Composites (SPC) that are engineered materials are rigid, thermally stable, have high porosity and can be easily modified with metal selective functional groups. SPCs have been primarily used in industrial settings, but this is the first application of SPCs to target well water remediation. Given the high valent nature of uranium and the effectiveness of adsorption of metals from wastewaters and mine leachates by SPCs, we hypothesized that functionalized SPCs will be effective at removing uranyl and
arsenic ions from contaminated water. In addition to addressing longstanding water contamination issues, a research framework that implements Diné philosophy and teachings has been developed to pair with the aims of the study and to assist the community with bringing about awareness of environmental exposures and risks.

**Mentor:** Edward Rosenberg

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**Adjunctive Triple Chronotherapy in the Acute Treatment of Depression and Suicidality**

**Author(s):** Nicholas Coombs

**Category:** Social Sciences / Humanities

**Abstract / Artist Statement:** Purpose: Unipolar depression has a serious negative impact on a person’s quality of life and is associated with increased risk of suicide. Although evidence-based treatments for the management of depression exist, social stigma, misperceptions of effectiveness in self-sustained management, and side effects to antidepressant medication all pose treatment barriers. My objective is to evaluate the mental and emotional effects of an alternative treatment option that works around these barriers, called Triple Chronotherapy (TCT), which simultaneously employs a therapeutic manipulation of sleep-wake cycles and bright light therapy. Methods: Individuals with moderate to severe unipolar depression who have resided in Montana their entire adult life will be included in this prospective cohort study. Prior to beginning the TCT intervention, participants will be evaluated by their levels of depression and positive circuit stimulation in brain activity. These measurements will persist through duration and follow up of treatment and be compared to levels at onset. Additionally, a sample of control participants within the same population receiving standard care will be compared to the intervention group at subsequent time periods. Originality: Preliminary research has concluded TCT to be a safe and feasible adjunctive treatment in managing depression and suicidality with no disconcerting side effects, contrary to most medication. In traditional practice, antidepressant medication may take months to produce a sustained effect, if any at all. TCT is administered over a five day period and shows promise to produce a rapid response in a fraction of that time. Exploring the neurological components linked to depression will aid in the universal understanding of treatment towards specific mental illnesses, an area that receives substantially less research attention than all other leading causes of mortality. Significance: Rates of suicide have steadily increased over the past twenty years in the United States. These increases are greatest in states with already higher rates, namely Montana, a state with one of the highest rates of suicide. Due to its elevated, vast, rural geographic setting and the inability to control for long, dark winters, Montana is susceptible to countless overlapping mental health issues. This research may provide an alternative approach to better address underlying health issues in these populations. As a whole, TCT may be instrumental in reducing many of the stigmatized characteristics around mental illness and revolutionize more effective treatments of depression for future generations.

**Mentor:** Jim Caringi

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**Aligning Montana’s Public Health System Priorities Through the Development of the Public Health System Improvement Task Force’s Improvement Plan**

**Author(s):** Jessica Miller

**Category:** Social Sciences / Humanities

**Abstract / Artist Statement:** The Public Health System Improvement Task Force (PHSITF) is made up of 14
individuals representing Montana public health agencies. The purpose of the PHSITF, as defined in their charter, is to advocate for statewide system improvement efforts and assess progress towards public health system goals (Public Health System Improvement Task Force Charter, 2016). The public health system is defined as the total makeup of public health agencies/groups as well as the individuals that promote public health. With so many agencies working in the system, it is important to align priorities to help with an environment that is lacking in resources (i.e., staff and funding). The current system goals that the PHSITF monitors progress on are outlined in the 2013-2018 Montana State Health Improvement Plan (SHIP). As the SHIP expires in 2018, the PHSITF will determine new system priorities (Big Sky. New Horizons. A Healthier Montana: A Plan to Improve the Health of Montanans, 2013). Some best-practices for successful alignment include having a common purpose and aligning timelines (Aligning State, Local, and Tribal Community Health Improvement Plans, n.d.). This project will address how the PHSITF aligned Montana’s public health system priorities into a new improvement plan. Methods To successfully align public health system priorities into an improvement plan for the PHSITF, available strategic plans for groups that serve a common purpose to the PHSITF were gathered. Some of the Montana groups that serve a common purpose to the PHSITF, include Montana local health departments, the Montana Public Health Association (MPHA), and the Association of Montana Public Health Officials (AMPHO) (Public Health System Improvement Task Force Charter, 2016). Common themes in each available strategic plan were identified based on practices outlined in NACCHO’s strategies for successful alignment (Aligning State, Local, and Tribal Community Health Improvement Plans, n.d.). These were then identified as priorities for the PHSITF to focus on in their new improvement plan. Results The public health system issues identified in the 14 available strategic plans were items, such as workforce and leadership development as well as data collection were revealed to be a priority in Montana. The public health system issues contained in these strategic plans mirrored the issues contained in the 2013 SHIP, revealing only minor system improvements in the last five years. As a result, these priorities were identified for focus in the PHSITF’s new improvement plan (Public Health System Improvement Task Force Charter, 2016). Discussion The lack of improvement in the public health system priorities is a result of a lack of desired outcomes, and a plan to continually track improvement in the 2013 SHIP. The PHSITF will build the public health system issues identified in the available strategic plans into a new improvement plan, containing outcome metrics and an implementation plan. Alignment practices outlined by NACCHO will be utilized to ensure support and collaboration to improve these issues. By communicating the PHSITF improvement plan to each group and aligning public health system priorities, the PHSITF can effectively pool resources and implement improvement activities.

Mentor: Kari Harris

An Inclusive Community Health Assessment Process: Missoula City-County Health Department

Author(s): Helen Russette; Robin Nielson-Cerquone

Category: Social Sciences / Humanities

Abstract / Artist Statement: Purpose: Community members from marginalized groups (e.g., poverty, Native American, disability, rural) have been historically absent in community decision-making efforts and often experience poor health outcomes. Their absence is an indicator as a failure to conduct an inclusionary approach in community decision-making. Inclusion of marginalized groups helps improve access and relevancy of community-wide activities and priorities. The community health needs assessment (CHA) conducted by local, state, or tribal health departments is one platform where members can discuss and identify issues in their community. The Missoula City-County Health Department (MCCHD) applied an inclusionary approach to their CHA, identifying several areas for improvement. Improvement efforts included: 1) prepare health disparity data
prior to CHA workgroup meetings; 2) apply an inclusive approach to CHA workgroup meetings; and 3) develop an inclusive and engaging process for data collection. Methods: Prior to CHA workgroup meetings, MCCHD staff organized secondary data collected from local and government agencies (e.g., U.S. Census, Montana Behavioral Risk Factor Surveillance System) into two reports to compare health outcomes by disability, Native American, and poverty status. Housing and job training staff were recruited to the CHA meetings to increase representation of agencies that serve low-income residents. Meetings were accessible, particularly for people with disabilities and those utilizing public transportation. Meetings occurred at different locations across the community, were located in an accessible building (e.g., zero-step entrance), near a bus stop, and occurred during regular work hours for no longer than three hours. Primary data was collected through key informant interviews with people from the following groups: Native American, disability, mental health or substance use disorder, low-income, aging, and rural. Paper surveys were completed primarily by those utilizing services from the food bank, homeless shelter, and housing authority and were distributed in adjacent rural communities. Originality: Health disparity reports raised expectations for community members to be informed by data. The team leading the CHA represented diversity within the community. Intentional accessibility of meetings is best practice for including marginalized populations. Primary data collection was intentional, targeting members that utilize services, identify with marginalized groups; furthermore, data collection was conducted in rural locations to ensure representation from rural members. Significance: Thirty-five agencies and service providers comprised the CHA workgroup and they made it possible to recruit marginalized respondents for interviews and surveys. Health disparity reports guided CHA meetings, enabling informed decision-making among partners in determining community issues and priorities of different populations likely to experience worse outcomes compared to their non-disabled, white, high-income, or urban counterparts. Meeting participation was encouraged by being located in accessible buildings, near a bus stop, and occurring 1-3 hours during general work hours. These efforts promoted attendance among people with disability (i.e., wheelchair-user) and those utilizing public transportation because they were able to enter the building and had accessible, free transportation. Select issues identified by respondents include low-income neighborhoods’ infrastructure issues (e.g., missing sidewalks), child care access, child abuse and neglect, dental care needs, racism and discrimination. Results will inform and shape priorities in the local community improvement plan.

Mentor: Meg Traci

An Investigation of the Effects of Depressive-Rumination on Prospective Memory

Author(s): Mark Primosch

Category: Social Sciences / Humanities

Abstract / Artist Statement: Prospective memory (PM)—remembering to carry out future intentions—is a fundamental aspect of human cognition. Research shows that depression is associated with PM impairment (Zhou et al., 2016). However, the research on depression-related PM impairment remains inconclusive. For instance, depression has been associated with both impaired and enhanced PM. Researchers (Albi?ski et al., 2012) have speculated that depressive-rumination—persistent negative self-reflective thoughts about one’s depressed mood (Nolen-Hoeksema, 1991)—is responsible for enhancing PM in people with sub-clinical depression. However, no study to date has systematically investigated the possible effects of depressive-rumination on PM. Moreover, depressive-rumination is known to impair executive functions underlying PM. Therefore, the current study sought to elucidate the effects of depressive-rumination on PM in people experiencing moderate and severe symptoms of depression. To determine whether depressive-rumination affects PM, 55 people with mild, 17 people with moderate, and 16 people with high symptoms of depression participated in the study. Participants completed reliable self-report questionnaires measuring their proclivity to
ruminate (trait rumination) and the presence of current ruminations (state rumination). Participants were randomly assigned to either (1) a rumination condition where they actively thought about their current mood or (2) a distraction condition where they thought about benign topics. Following this manipulation, participants completed a modified version of a clinically valid measure of PM, the Memory for Intentions Test (MIST). Contrary to my expectations, induced state rumination had no effect on PM regardless of depression severity. Interestingly, trait rumination was negatively correlated with overall PM performance in the low group compared to the moderate group, wherein the correlation between trait rumination and overall PM performance was positive. The latter correlation provides marginal support for the assertion made by Albiński et al., 2012, suggesting that a proclivity to rumination about one’s depressed mood is related to better PM. However, given that there was no effect of induced state rumination on PM performance, or a significant positive correlation between state rumination following the experimental manipulation and PM performance for those in the moderate and high groups, we cannot conclude that depressive-rumination facilitates or impairs PM. This study advances the science surrounding the relationship between depression, rumination, and PM. First, it tested an unexamined assertion about the enhancing effects of depressive-rumination on PM. Second, it revealed that trait rumination is positively correlated with PM performance in individuals reporting sub-clinical depression. This finding provides the only evidence to date about the relationship between depressive-rumination and PM. Additional high-powered experimental studies are needed to corroborate these results. In addition, future research will need to investigate the frequency, intensity, and content of participants’ ruminations while remembering future intentions. Understanding how depressive-rumination affects cognition has important clinical implications. Therapeutic interventions are created and selected based on their ability to effectively remediate mental illness and related sequela, such as impaired cognition. Therefore, additional research is needed to elucidate the effects of depressive-rumination on cognition, including PM, because the effects will influence how depressed patients are treated.

Mentor: Craig/McFarland

Art and Technology: A Post-Industrial Dialogue

Author(s): Jesse Blumenthal

Category: Visual Arts (sculpture, painting, etc.)

Abstract / Artist Statement: My work explores the post-industrial age by reflecting on the strains of the spaces between man and his environment. As an artist living in the west for the majority of my adult life, my recent work has explored industrial materials and consumer technology in interdisciplinary arrangements that reflect on the natural environment we are immersed within. The clash of the natural represented within the inherently processed and human material creates an ironic tension in the work. Recent work has been animated through repetition of intensive material process. Materials are selected for their aesthetic properties, but also their history and direct content. These art making processes become translations that mimic how people interact with each other, and their environment, in a post-industrial age. I often begin my identifying forms and subject matter of interest first through historical research. This object and/or process is then translated through computer aided design and manufacturing to arrive at the next stage of production. From here my digital outputs are manipulated and assembled through historically industrial processes. An example of how this thought process develops would be a simple horn shape from my recent installation in the University Center Gallery. My research began with historic “fake news” events (sparked by obvious contemporary influence). Because of my deep-rooted appreciation for the social value of community radio, amongst other reasons, I landed on the story of the 1938 broadcast of “War of the Worlds” by Orson Wells. This historic event could have played through several devices, but I found the 1938 Victor Gramophone horn to be a ubiquitous choice with high aesthetic value. After obtaining a replica from the depths of the internet I scanned the horn with an Xbox K’nect laser to produce a rough digital file I could manipulate and replicate using a 3d printer. From here the plastic
was cast in metal using traditional iron techniques and hand finished. “Hardware hacked” consumer electronics were then fitted to the technologically translated horn to produce an environmental response. At GradCon I intend to display several environmentally reactive sound pieces utilizing “hacked” consumer technology and horn forms made from a combination of digital and industrial processes. The room will become a part of the sound work. A slide presentation on the evolution of this process in my work, and the trajectory it will create for the subsequent conference performance I am seeking funding for travel expenses for, will be presented in conjunction with the original artwork created for GradCon. The speed and artificiality of our progress has neglected the natural. Our relationships with each other, and with the environment surrounding us, have been translated through one form or another of technology since the dawn of the industrial age. The resulting translations are a distortion of the original whose aesthetic carries the fingerprints of all the veils along the way. The energy of this tension not only creates the dynamics of the visuals but inspires my further artistic pursuits.

**Mentor:** Trey Hill

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**Assessing Changes in Shoulder Rotation with Treatment of Dynamic stretching, Diathermy and Moist Heat Pack**

**Author(s):** Taylor Manning; Seth Beal; Alexandra Davis; Chris Jones; Ian Davies

**Category:** STEM (science, technology, engineering, mathematics)

**Abstract / Artist Statement:**

**Introduction:** Dynamic stretching (DS) has become a universally accepted practice used to increase flexibility, reduce muscle injury, and improve performance. In addition, moist heat packs (MHP) and pulsed short wave diathermy (PSWD) are common therapeutic interventions used to augment a DS routine to increase tissue extensibility and range of motion (ROM). However, with the vast majority of research on these therapeutic interventions focusing on the lower extremity, it is unclear as to which of these interventions may be more beneficial at improving ROM of the upper extremity, specifically the glenohumeral joint (GHJ). Purpose: The purpose of this study was to compare the effectiveness of PSWD and MHP combined with DS, and DS alone at increasing the internal and external rotation of the GHJ. Hypothesis: We hypothesized that MHP in combination with DS would produce the greatest increase of shoulder range of motion. Patients or Participants: Nine participants (4 male, 5 female) were selected from the athletic training program; the average age was 21.9 ± 1.3yrs; height 69.1 ± 3.4 in; weight 173.4 ± 38.4lbs. Exclusion criteria was a history of surgery on the individuals dominate shoulder. Method: Each participant completed all three treatments (MHP + DS, PSWD + DS, DS alone) on three different days in a randomized order. GHJ ROM was measured before and after each trial to assess change by the same researcher. Dependent Variable: GHJ internal (IR) and external rotation (ER) were measured before and after treatment using PRO 360 digital protractor. Three measurements were obtained and an average recorded. Results: A 2 x3 (time x trial) repeated measure ANOVA revealed no statistical significance for GHJ IR (p=0.622) or for GHJ ER (p=0.499). Although not statistically significant, there was an improvement trend for GHJ IR, as well as total ROM (IR + ER) to improve with heating modalities in combination with DS. Conclusion: It is unclear at this time if the application of PSWD or MHP prior to completion of GHJ DS protocol adds any benefit. Further study is warranted with a larger sample size to determine if the trend in our results is accurate. Furthermore, the athletic training clinician should evaluate the feasibility of using these therapeutic interventions in clinical practice examining the cost benefit ratio of each intervention.

**Mentor:** Valerie Moody
Assessing the impacts of increasing wolf and grizzly bear populations on the habitat selection and foraging patterns of cougars: a multi-organizational collaborative project in the southern Greater Yellowstone Ecosystem

Author(s): Jennifer Feltner

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Across North America and Europe, efforts are underway to restore and conserve populations of top carnivores such as wolves and grizzly bears. These recovering large carnivore populations are reviving long absent competitive interactions amongst species of the same guild, resulting in behavioral shifts by subordinates that can have population and community-level consequences. Despite an impressive body of work on community dynamics following large carnivore recovery, few studies have explored intraguild competition in depth, and much work still needs to be done to understand the dynamics of competitive interactions between large carnivores and their importance to conservation. Following the reintroduction of wolves, and the recovery and expansion of grizzly bears, the Greater Yellowstone Ecosystem (GYE) reclaimed its place as one of the last nearly intact ecosystems in North America, containing a large suite of top carnivores and their ungulate prey. In the southern GYE (SGYE) north of Jackson, Wyoming, management and monitoring of large carnivores and ungulates is complex. Multiple federal and state agencies, as well as non-profit organizations collect data and conduct research on these species. Separate datasets on the population dynamics, movements and food habits of wolves, cougars, and grizzly bears, as well as their primary prey, elk, from 2001 to the present exist. However, none of these single species datasets have been merged or examined comprehensively to date. As such, the SGYE offers a challenging but unique opportunity to study the mechanisms by which recovering large carnivore populations (wolves and grizzly bears) impact subordinate carnivores (cougars) through competition. The aim of this study is to assess the impact of intraguild competition on cougars by investigating key factors driving cougar habitat selection and foraging patterns (i.e. where cougars kill prey), including prey availability, risk of dominant competitor encounter, human activities and other environmental factors. To examine changes in cougar habitat and kill site selection over time and potential drivers of these changes, I will estimate mixed-effects resource selection functions at three spatial scales following a use/availability design using location data from VHF and GPS collared cougars, wolves, grizzly bears and elk and kill site data from cougars. To carry out this project, I developed collaborations with the Interagency Grizzly Bear Study Team, the National Elk Refuge, the National Park Service, the Teton Cougar Project, U.S. Fish and Wildlife Service, and Wyoming Game and Fish Department. Collectively these organizations shared sixteen years of location data on the above-mentioned species for this study, comprising of millions of data points from hundreds of individual animals. This project will advance understanding of how intraguild competition shapes the behavior of cougars, highlighting potential fitness impacts to cougars and subsequent cougar behavioral shifts that could in turn cascade to impact cougar prey species. In an area where management of both carnivores and ungulates remains challenged by a lack of understanding in how shifting community dynamics impact individual species, this study will fill knowledge gaps and aide in the development of conservation and management strategies for both predator and prey species in the GYE.

Mentor: L. Scott Mills

Beyond the Mother of the Blues: Ma Rainey’s Queer Sexuality and Influence on African-American Culture

Author(s): Johnny Barber

Category: Social Sciences / Humanities
Abstract / Artist Statement: Popular in the 1920s and early-30s, blues singer Gertrude “Ma” Rainey sang about themes of homosexuality and was known to have relationships with both women and men. Rainey was direct and open about lesbianism in “Prove It On Me Blues,” which she wrote and recorded in 1928. Although Rainey obscured her queer identity in her private life more than blues singers like Bessie Smith or Gladys Bentley, it is important to analyze queer themes in her music. Rainey’s music illustrates how queer identities, especially African-American women’s, were not just relegated to the nightclub scene in New York, but infused blues entertainment in Chicago and elsewhere. The later LGBT+ rights movement, often described as beginning with the Stonewall Riots of 1969 in New York City, cannot be attributed to one lone event in one city. Social movements have an extensive root system spreading out in time, event type, and location. One of these roots of the larger LGBT+ rights movement in the United States was Ma Rainey’s blues. Rainey’s influence as a blues singer, or blues queen as she was known during her career, on African-American culture is still apparent. Rainey’s influence specifically on African-American women’s culture and African-American popular culture is demonstrated in the ways that Rainey presented herself on the stage and in the ways in which she is remembered and presented in African-American popular culture. Rainey kept her hair unkempt and curly, did not capitulate to prescribed thinness for women, and wore clothing—often flapper-style clothing with gaudy jewelry—associated with thin white women in the 1920s. Rainey combined all of this to show African-American women in her audience that they did not need to buy into the prescribed norms placed on them by a white-dominated society. Outside of often refusing white beauty norms and building African-American women’s culture and identity, Rainey heavily influenced African-American popular culture. Sterling Brown’s poem “Ma Rainey” published in 1932 and August Wilson’s play Ma Rainey’s Black Bottom, first performed in 1984, serve as examples of Ma Rainey’s influence within African-American popular culture. This project builds on the scholarship of Sandra Lieb in Mother of the Blues: A Study of Ma Rainey and Angela Y. Davis in Blues Legacies and Black Feminism: Gertrude “Ma” Rainey, Bessie Smith, and Billie Holiday. Lieb has written the only biography of Ma Rainey; however, her analysis mostly consists of the themes and style of Rainey’s music. Although Lieb mentions Rainey’s sexuality in places, she largely excludes analysis of Rainey’s queer identity and influence on African-American culture. Davis’s analysis of Rainey emphasizes early African-American feminist consciousness. My project goes beyond Lieb’s and Davis’s to analyze the ways Rainey’s queer musical themes can be seen as part of the backdrop for the LGBT+ rights movement.

Mentor: Anya Jabour

Biogeochemical impacts of wildfire in subalpine forests of the northern Rocky Mountains

Author(s): Kyra Wolf

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Quantifying the net impact of wildfires on carbon and nutrient budgets is challenging, particularly in subalpine forests, where long and variable fire-return intervals can create biogeochemical legacies that last for decades to millennia. While the ecosystem impacts of individual fire events have been well-studied in subalpine forest ecosystems, the impacts of multiple fire events over time are less certain, particularly in the context of varying fire activity and climate change. Paleoecological records, capturing variability in fire activity over centuries to millennia, are well-suited to investigate questions about the causes and consequences of fire-regime variability. In combination with ecosystem modeling, this approach can reveal ecosystem dynamics that are otherwise not apparent from studying modern landscapes alone. Here, we report on preliminary findings from the Big Burns Project, an interdisciplinary effort combining paleoecological records and ecosystem modeling to investigate coupled fire-climate-ecosystem dynamics over the past 2500 years in Rocky Mountain subalpine forest. We present records of fire history and ecological change spanning the past 200-300 years from four lakes in subalpine watersheds in the Bitterroot Mountains of Montana and
Idaho. These sites span a ~100-km north-south transect in the Lolo National Forest, with 25% of the study area impacted by regionally synchronous burning in the 1910 fires. We use charcoal, pollen, and biogeochemical proxies to reconstruct the frequency, severity, and spatiotemporal synchrony of past fire events, and assess biogeochemical impacts from watershed to regional scales. Our results are interpreted in the context of 20th century fire history and modern ecosystem properties at the study sites, including soil and foliar biogeochemistry. Our records help contextualize large regional fire events, like those in 1910 and more recently, and reveal the rates and patterns of post-fire ecosystem recovery.

**Mentor:** Philip Higuera

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**Building Buy-In: Utilizing the Strategic Planning Process with a Local Advisory Council on Mental Health to Engage Stakeholders in Blaine County, Montana**

**Author(s):** Jana McPherson-Hauer

**Category:** Social Sciences / Humanities

**Abstract / Artist Statement:** The two most recent Community Health Assessments (CHA) for Blaine County reflected Mental Health as significant health issue as well as a priority area for intervention. The more recent CHA was completed in 2017 and reports that compared to 11% of Montanans, 15% of Blaine County residents report frequent mental distress. Additionally, according to the County Health Rankings Blaine County has the fourth highest number of “poor mental health days” in the state. Forty-six percent of the respondents to the 2017 CHA report that mental health issues are not recognized and treated in Blaine County. Further, about 20% of Blaine County respondents stated that they or a family member needed mental health services in the last 6 months, but only 38% of those who needed services received services. In 2014 an existing mental health strike community group transitioned to a Local Advisory Council, a structure recognized by the Montana Central Service Area. This transition potentiated the development of a mission statement and bylaws for the group. The mission statement strongly describes the “what” and the “why” of the group, but was developed without input from the current group stakeholders. There was an initial action plan without measurable objectives, and there have been informal projects within the LAC, but no formal strategic plan has been developed. Attendance by stakeholders varies widely from meeting to meeting, and this largely affects the effectiveness of work accomplished and knowledge shared. The variation is likely due in part to the dynamic nature of other responsibilities of the representatives. Additionally, the author hypothesized that a lack of participation in the planning process, and the resulting lack of understanding of specific stakeholder roles, contributes to decreased buy-in or participation of agencies or organizations. Therefore, in attempt to improve the quality of the partnership, we hypothesize involving stakeholders in the strategic planning process will increase their level of participation (as evidenced by meetings attended) and the stakeholders’ perception of engagement. The Local Advisory Council held a strategic planning event, as a quality improvement and evaluation step, and assessed stakeholder engagement in the group and understanding of LAC’s goals by conducting pre- and post-strategic planning survey. The questions on the survey ask for the agency representative to rate their level of engagement in the group and their understanding of the group’s objectives. The author will present the process and information about how agency representation at strategic planning increased levels of meeting attendance, engagement and action plan understanding.

**Mentor:** Kari Harris
Can Hares Keep up with Climate Change?

Author(s): Brandon Davis; Alex Kumar; Lindsey Barnard; James Goerz; Molly Feltner

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Medium: Six minute video providing background on the seasonal coat color molt and climate change. Following the video we will perform an interpretive dance to further explain the timing of the hare molt and influence that snow has on hare camouflage and survival. Dimensions: We would like a stage for our interpretive dance. Description of work: Tentative outline of our presentation: - Six minute overview video - First scene – Two brown hares on snowless background - Second scene – Lynx dances by and does not see camouflaged hares. - Third scene – Sun appears and one of the brown hare molts white. - Fourth scene – The lynx returns and still does not recognize the brown hare but finally notices the camouflage mismatched white hare. A chase dance ensues. - Fifth scene - Just as the lynx is about to catch the hare the snowfall finally arrives, camouflaging the hare, saving it from the lynx. Cast Molting Hare: Brandon Davis Brown hare: Alex Kumar Lynx: Lindsey Barnard Sun/photoperiod: James Goerz Coat color Video: Jennifer Feltner and Molly Feltner

Mentor: Scott Mills

Common Methods of Soft Tissue Removal on Skeletal Remains: A Comparative Analysis

Author(s): Emily Silverman

Category: Social Sciences / Humanities

Abstract / Artist Statement: The removal of soft tissue is a process familiar to members of a wide array of scientific fields and contexts, for skeletal remains that are human and non-human. Due to the highly variable goals and intentions behind flesh removal, the methods used are likewise numerous and inconsistent. In forensic investigations and crime labs across the country there lacks a standardization for this process, sometimes even leading to multiple different methods being used within one facility depending on resources available at the time or the specific researcher's own preference. This lack of standardization pairs with a distinct lack of literature on the potential benefits and risks associated with each method, as well as even basic information and instruction on the proper amount of additives, temperatures, or time estimations. Unlike perhaps in taxidermy or a museum, in a forensic context human remains may be the only evidence available, which makes any damage or loss of material particularly detrimental, and this lack of knowledge on the effects of common methods not only negligent, but dangerous. In this research, I obtained pig limbs as a human substitute to study the effects of five distinct but commonly used flesh removal methods. Each pig limb was weighed and measured before being randomly selected for one of the five methods with each method being done in three separate trials, making for a total of fifteen tests performed. The methods selected for study were: cleaning by Dermestes lardarius, otherwise known as dermestid beetles; plain water boil; and boil in three separate additives. The chemical additives; bleach, enzyme-based detergent, and ammonia hydroxide, were selected based on cost, commonality of use, and difference in chemical makeup. Between the five different methods tested a number of things were reported and recorded, focusing primarily on time efficiency, cost, damage, and the effects the method has on DNA extraction from the remaining bone sample. As each of the methods may lead to DNA degradation at different rates and variables, two extractions from the same bone from each trial will be run to test for DNA yield as well as original starting template utilizing qPCR. Samples will also be amplified for nuclear and mtDNA markers to test the viability of remaining DNA using pig-specific targeted oligos, which will exclusively amplify Sus scrofa DNA. With these tests I hope to be able to provide a useable set of data showing the time expectation, potential damage, efficiency, and effectiveness of each of the methods being
tested. This research is intended to highlight the need for more consideration when selecting a soft tissue removal method, but also the need for an awareness of what each method's risks and benefits are on the remains. When the sensitivity and critical importance of skeletal remains within a forensic context is taken into consideration, the lack of any specific protocols or even a clear understanding of the expectations and repercussions of the methods being utilized is a crucial oversight that demands rectification.

Mentor: Meradeth Snow

Communication Accommodation in Technologically-Mediated Conflict Between Romantic Partners

Author(s): Benjamin Wassink; Callie Parrish; Mira Cleveland

Category: Social Sciences / Humanities

Abstract / Artist Statement: This study explores communication accommodation via technologically-mediated (e.g., text message) conversations of romantic couples. Although research has previously examined how partners engage in accommodation through face-to-face communication, less is known concerning how accommodation functions over text message, particularly when couples engage in conflict. Participants (N = 28) completed an online survey, where they provided two text conversations with their partner: one on a “good” day in their relationship, and one on a “bad” day. Using Linguistic Inquiry and Word Count (LIWC, 2015), we measured participants’ language matching in each conversation. Additionally, participants completed scales indicating perceived self- and partner-accommodation levels and conversation satisfaction. Results suggest that perceived partner accommodation relates to satisfaction during texting conflict more than it does to satisfaction with positive conversations. Lange style matching did not relate to conversation satisfaction or perceived accommodation. The current study offers theoretical and practical implications for Communication Accommodation Theory and technologically-mediated exchanges.

Mentor: Alan Sillars

Community and Individual Responses to Flooding on Louisiana’s Last Inhabited Barrier Island

Author(s): Lauren Miller

Category: Social Sciences / Humanities

Abstract / Artist Statement: This case study attempted to better understand local attitudes of public flood interventions and their individual responses to flood risks on a remote barrier island—Grand Isle, Louisiana. People have lived Grand Isle for over a century and the island has been an efficient community for tourism, seafood, and petroleum in the past. However, today’s residents are confronting social and environmental challenges that early settlers of the island did not experience. For example, oilfield employment on the island has dwindled and seafood workers are facing challenges within the surrounding natural environment. Both industries are now having to compete within the globalized marketplace for employment and income. In addition, Grand Isle residents have experienced two of the worst environmental disasters in United States history. Their lives were forever changed after the seven mile long barrier island took the brunt of Hurricane Katrina in 2005 as well as the Deepwater Horizon oil spill in the Gulf of Mexico in 2010. Many young residents
are now moving off of the island to find employment or educational opportunities elsewhere. Still and all, the tourism industry sustains the town’s economy with opportunities for visitors to bird watch, attend fishing tournaments, enjoy local seafood, visit the beach, and meet local residents. In person interviews with fourteen full-time residents discussed public flood interventions and individual responses to flood risk on the island. Community responses to flooding involves numerous projects over the past half century designed to protect developments from hurricanes, high tides, coastal and shoreline erosion and frequent flooding. Levee systems, rock jetties, and drainage pumps have been constructed on and around the island to oppose these environmental hazards. According to the residents I interviewed, these systems may sometimes cause more harm than good. This depends on a number of factors: direction and strength of the storm, amount of rainfall, level of tidal surge, and technical damages to the levee or pump stations. With regards to individual responses to flooding, interviewees discussed unique behaviors of flood preparation. For example, some residents have elevated their homes while others did not for reasons like: unaffordable insurance rates, age of the house, and a preference to keep original living quarters downstairs. Overall, the public flood interventions and personal experiences to several hazards has allowed Grand Islanders to continue their residency on this vulnerable landscape.

Experienced vulnerability continues to be a theoretical concept of focus for sociologists, geographers, and environmental scientists. When considering the social and environmental impacts of vulnerability on a population like Grand Isle, I expect my findings to relate to other communities confronting challenges to flooding. My research findings may also contribute to coastal risk planning and management that incorporates social and cultural knowledge of local residents. This is important for learning what has been done, assessing what has been helpful, and changing what has not worked to make a significant difference in decreasing community exposure to flooding.

Mentor: Kathy Kuipers

Comparing Measures of Ankle Dorsiflexion and Skin Temperature Between VORTEQ Technology and Hot/Cold Whirlpool Contrast Therapies

Author(s): Olivia Feller; Elly Wright

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Introduction: Contrast therapy is a modality often used to aid in the transition from cryotherapy to thermotherapy, as it involves both techniques to promote vasoconstriction and vasodilation. The traditional method for contrast therapy includes the use of hot and cold whirlpools. Although this method is most commonly practiced, new technologies are being explored. VORTEQ technology is a new contrast therapy modality that has little to no research pertaining to its effectiveness. Purpose: To compare the use of hot and cold whirlpools to new VORTEQ technology. Hypothesis: Our hypothesis was that both contrast treatments would present with similar outcomes. Patients or Participants: This study included 11 participants from the University of Montana Athletic Training Department (3 females, 8 males) aged 22.8 ± 1.7 years, weight 180.2 ± 19.7 lbs, and height 69.8 ± 3.64 inches. Subjects were selected based on having no prior history of ankle injuries within the past 6 months. Methods: Participants were instructed not to perform lower body exercise 24 hours prior to the trials. Each participant took part in both the whirlpools and VORTEQ trials, with at least 24 hours between treatments. Ankle dorsiflexion and skin temperature were recorded pre and post treatment method. Ankle dorsiflexion was measured using a Goniometer. Skin temperature was recorded using the RYOBI Tek4? Lithium–ion 4V Professional Infrared Thermometer. Descriptive statistics, including mean and standard deviation, were calculated for dorsiflexion and skin temperature. Each trial was analyzed with a 2-way repeated measures ANOVA by SPSS statistical analysis tool version 22. Statistical significance was set at P = 0.05. Dependent Variables: Dorsiflexion and skin temperature were recorded pre and post each treatment option. Results: Range of motion increased pre to post treatment for each modality. Changes in skin temperature were
seen for both the VORTEQ and whirlpool trials. Differences in skin temperature pre to post treatment were larger for the whirlpool groups. Conclusion: From the data collected, it was shown that hot and cold whirlpools produced greater ankle dorsiflexion measures than VORTEQ, however the results were not statistically significant. This rejects our hypothesis and supports the more traditional methods of contrast therapy. Despite the results, further research is necessary to further analyze the effectiveness of both therapy methods. This is especially important to assess the worth of the new VORTEQ technology.

Mentor: Valerie Moody

Comparison of the acute respiratory response in male and female mice

Author(s): Jessica Ray; Raymond Hamilton

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Epidemiology has shown that males and females differ in susceptibility to illnesses resulting from inhalation of environmental particulates and pathogens. Women are more susceptible to asthma, and chronic respiratory symptoms when exposed to tobacco smoke and traffic pollution, while men have an increased incidence and severity of respiratory tract infections. However, the exact biological factors responsible for these disparities are unknown. As the primary immune cell within the lungs, macrophages are capable of adapting a variety of phenotypes in order to initiate the correct immune response to inhaled xenobiotics. Recent literature has shown that sex can influence macrophage phenotype in response to inhaled particulates, affecting the resulting pathology. Naturally occurring crystalline silica (SiO2) and engineered nanomaterials, such as multi-walled carbon nanotubes (MWCNTs), are a concern in the etiology of lung disease, but the relatively few studies evaluating sex-differences are inconclusive. This study aims to expand on this information by evaluating differences in the cellular response to inhalation of these particles in female and male C57BL/6 wild-type mice. Results show an exaggeration in response to SiO2 by male mice, and to MWCNTs by female mice.

Mentor: Andrij Holian

Cruising to be a gamer: Understanding Socialization relating to Board Gaming and The Dice Tower

Author(s): Benjamin Wassink

Category: Social Sciences / Humanities

Abstract / Artist Statement: The Dice Tower started as a board game podcast with three hosts, but has grown to produce thousands of YouTube videos that review board games, provide board game news, and even host events such as board gaming cruises and conventions. The Dice Tower now consists of six professional board gamers and has the largest online following with 60,000 podcast listeners and over 140,000 YouTube subscribers (The Dice Tower, 2017a). This study seeks to understand how board gamers learn to become board gamers through the use of Kramer’s Multilevel Communication Model of Voluntary Socialization (MCMVS). Previous socialization models examined workplace socialization with clear membership boundaries. Kramer (2011) created MCMVS to illustrate the complex socialization process into volunteer organizations. A unique feature of volunteer organizations is ambiguous membership boundaries where neither the organization nor the
volunteers can properly identify who is and who is not a member. This study applied MCMVS to a population with more ambiguous membership boundaries, specifically board game leisure. In addition, this study examined the role of the Dice Tower and similar organizations in socializing board gamers. 18 participants were recruited during a board gaming cruise hosted by the Dice Tower. Participants engaged in semi-structured interviews to understand a board gamer’s journey to attend a five day board gaming cruise. The interviews were transcribed, iteratively examined and coded for themes outside of MCMVS application. Results indicated MCMVS successfully captures socialization to board gaming. However, MCMVS does not fit socialization to organizations like the Dice Tower without modification. MCMVS displays the socialization process that changes outsiders to insiders of an organization, but board gamers do not become members of the Dice Tower. Board gamers voluntarily associate (Putnam, 2001) with organizations such as the Dice Tower. The Dice Tower and similar organizations serve as a socialization resource for recruitment, networking board gamers, and guiding board game purchases. In turn, the Dice Tower functions as a Socialization Gateway Organization (SGOs). SGOs facilitates socialization of individuals to become an activity such as ESPN socializes sports fans and temp agencies socialize prospective employees. The Dice Tower teaches board gamers the qualifications of an ideal board gamer and creates a sense of community within the board gaming leisure. This study extended socialization literature by modifying MCMVS to apply to leisure and explain the role of organizations such as the Dice Tower in socialization to leisure.

Mentor: Joel Iverson

Designing Configurable Computer Hardware for the Next Generation of High Performance Computing

Author(s): Tim Anderson

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Designing Configurable Computer Hardware for Analysis of Big Genomics Data

While computing systems have become more powerful over time, their general architecture has remained fairly consistent for decades. In order to be able to effectively solve a wide range of problems, computers run a series of instructions in sequence, loading and storing data in complex layers of hardware memory. This generic architecture is effective at enabling computer programmers to solve an infinite variety of problems, but this flexibility comes at a cost of performance, both in terms of speed and energy usage. They are, in this sense, the proverbial “jack of all trades, master of none”. A new generation of application-specific hardware aims to revolutionize computing, particularly in the context of massive scale “big data” analysis. Instead of running software, these computation circuits are configured to take data inputs, and create data products as efficiently as possible. Instead of running code instruction-by-instruction, these custom hardware computers perform every stage of an algorithm simultaneously, efficiently passing data between modules exactly when needed to avoid the expensive overhead of data movement and management of instructions. The cutting edge of this paradigm is in the area of field programmable gate arrays (FPGAs). FPGAs can be programmed to solve specific problems in highly optimal ways, and easily reprogrammed when needed. This flexibility has been at the forefront of computer research, highlighted by Intel’s recent $17 billion purchase of FPGA manufacturer Altera. Here, I present my work to use FPGA technology to implement a time- and energy-efficient replacement for a complex algorithm used for recognizing similarities between genetic sequences. The resulting system will be the first of its kind open-source hardware acceleration of a simplified variant of sequence alignment with profile hidden Markov models. The algorithm will be integrated into the HMMER software suite, which is used in multiple genomic data centers worldwide, and accounts annually for millions of dollars worth of computational time in those centers.

Mentor: Travis Wheeler
Detecting Instance of Software Plagiarism from Online-Sourced Evidence

Author(s): Adam Clemons

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Plagiarizing software source code is an issue that becomes more rampant as the resources to do so become more prominent. Recently, plagiarism commonality has been evidenced by the detection of 10% from Harvard’s “Introduction to Computer Science I” (Spring 2017), and similar numbers for Columbia’s “Advanced Programming” (2016-2018). We have developed a new tool and web service, DISPOSE, which assists in automated plagiarism detection while addressing modern concerns. The principle method used for modern software plagiarism detection is the “winnowing” algorithm created for and integrated into Stanford’s popular tool, MOSS. Through this algorithm, the program receives a list of files to compare, labels particular text fragments as “fingerprints” for each file, and then highlights the document pairs containing long, consecutive fingerprint matches. As a platform, MOSS lacks many features that are desirable for today’s atmosphere that have been addressed by DISPOSE: MOSS does not seek potentially plagiarized online sources. Common problems assigned in Computer Science courses are “a simple Google search away”, which are often discoverable on forums (e.g. StackOverflow) or another student’s “repository” (e.g. Github). DISPOSE uses the Github API on queries provided by the instructor to compare student submissions not only to each other, but also to online files received. MOSS has limited capability to keep a submission history. Current students may receive solutions from the course's previous students. MOSS’s history tracking is limited to the instructor's bookkeeping; there is no native method to differentiate files from the past and present. DISPOSE allows specification for which files are from the past and assigns labels that separates them in the scoring process. MOSS is closed source, and may only be run as a web service. A software’s utility largely depends on how many developers can improve the code base for features, speed, and complexity. DISPOSE will be available open-source and offline capable to extend its usefulness as desired. MOSS’s algorithm can be tricked with common techniques. In computer source code, text blocks can be rearranged and labels can be modified, yet retain the same logical execution. We have furthered developed DISPOSE to compare the programs' “abstract syntax tree” design rather than their actual text. This overcomes the weakness of modifying text to obscure the program’s underlying structure. Software plagiarism detection is important to retaining student and institution integrity. Computer science courses are designed to promote problem-solving and applied thinking in the field, aspects that plagiarism circumvents. With the more robust feature-set, it is hoped that DISPOSE will be more usable and welcoming to computer science professors across academia.

Mentor: Travis Wheeler

Determining Skin Temperature Differences Between Three Cold Compression Modalities

Author(s): Madison McCarthy

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Background: Cold and compression are common therapeutic interventions used in the treatment of acute musculoskeletal injuries. Cryotherapy uses extreme cold to decrease cell metabolism and pain following injury. Compression works to decrease overall blood flow and control edema. The benefit of combining cold and compression is to increase the rate and depth of the temperature drop, while utilizing the effects of both modalities. Purpose: The objective of this study was to determine if a crushed ice pack was as effective as newer cold compression technology to decrease skin temperature. A crushed ice pack was compared to the PowerPlay and Game Ready, two competing cold compression devices. We hypothesized that
each of the modalities would reach therapeutic temperatures, and the Game Ready would be the most effective at cooling skin temperatures due to the circulation of ice and water. Participants: Ten (7 female, 3 male) healthy, recreationally active students (Age: 22 ± 1.3yrs; Height: 66 ± 4.2 in; Weight: 167 ± 34.3lbs) participated in the study. A repeated measures design was utilized; each participant completed each of the three trials, ice pack, PowerPlay, and Game Ready in a randomized order. Skin temperatures over the sinus tarsi were recorded before and after each trial by the Ryobi infrared laser thermometer. Skin temperature differences were examined before and after a 20-minute treatment of each modality. Results: There was a statistical significance between trials and skin temperature (p =0.000). Specifically, post hoc testing revealed ice pack cooled skin temperature significantly more than PowerPlay (p=0.001), as well as Game Ready more than PowerPlay (p=0.21). Ice pack and Game Ready cooled skin temperature similarly (p= .506). Conclusion: We found that each of the modalities reached therapeutic temperatures necessary to slow cell metabolism and provide analgesic effects. However, our results indicate that an ice pack and ace bandage and Game Ready were more effective at producing cooler skin temperatures when compared to the PowerPlay.

Mentor: Valerie Moody

Determining the conformational states of peroxisome proliferator-activated receptor gamma (PPAR?) that favor coactivator or corepressor binding

Author(s): Michelle Nemetchek

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Nuclear receptors are transcription factors that, when bound to agonists, cause transcription of regulatory genes. Peroxisome Proliferator-activated receptor gamma (PPAR?) is a nuclear receptor that is an important target of many FDA-approved diabetes type II drugs. When agonist bound, PPAR? recruits the coactivator Mediator complex subunit 1 (MED1), which is part of the mediator complex and triggers transcription of PPAR?-regulated genes. These genes control adipogenesis and lipid storage, and can enhance insulin sensitivity. When bound to inverse agonists, PPAR? complexes with Nuclear Receptor Corepressor I (NCoR1) and is blocked from transcriptional activation. Herein, we show how PPAR? ligands and coregulators select for specific conformational ensembles in the ligand binding domain (LBD) of PPAR?. By using Time-Resolved Förster Resonance Energy Transfer (TR-FRET), PPAR? drugs and synthetic ligands are shown to produce a range of recruitment of MED1 and NCoR1 peptides which contain the essential nuclear receptor binding motif. Fluorine-19 (19F) Nuclear Magnetic Resonance is also employed to correlate coregulator recruitment to certain specific conformational ensembles. Through covalent labeling of PPAR with a 3- bromo -1,1,1- trifluoroacetone on the AF2 surface using an introduced cysteine (Helix 12, K502C), where coregulators have been demonstrated to interact, we see a variety of highly distinct conformational groups in the fluorine NMR spectrum which correlate significantly to coregulator recruitment. PPAR? agonists favor a conformational ensemble highly similar to MED1 bound or “active” apo PPAR? LBD, whereas inverse agonists do the same in relation to NCoR1. The efficacy of coregulator recruitment correlates linearly with observed 19F NMR probe shifts suggesting that these NMR shifts can be employed as an estimate of efficacy towards coregulator recruitment in this and possibly other nuclear receptors. These data suggest that both drug and coregulator binding can cause PPAR? to inhabit specific conformational ensembles, linking structure of the LBD to the functional outcome of transcription.

Mentor: Travis/Hughes
Developing a Community Pathway to Improved Maternal Mental Health

Author(s): Holly Jordt

Category: Social Sciences / Humanities

Abstract / Artist Statement: PUBH 591 – Community Partnerships GradCon Abstract Developing a Community Pathway to Improved Maternal Mental Health: Holly Jordt, BSN It is estimated that up to 20% of women are affected by perinatal mood and anxiety disorders (PMADs). If left untreated, the impact of PMADs is extensive. Complications include medical complications, for mother and child, due to poor adherence to medical care. Individuals may experience significant financial consequences due to inability to work, negative impact on job performance, or poor work attendance. Women may isolate themselves limiting their social supports. Other complications may include child abuse or neglect, tobacco and substance use, suicide and infanticide. PMAD’s are associated with increased risks of maternal and infant morbidity and mortality and are recognized as a significant patient safety issue. Maternal mental health is considered a major public health challenge by the World Health Organization. The goal of this project is to develop a community pathway for better identification of PMADs and to provide interventions and follow up that lead to improved family outcomes. The Flathead City-County Health Department, in collaboration with Kalispell Regional Medical Center, North Valley Hospital, Healthy Mothers Healthy Babies, and other local providers and community members has created the Flathead Maternal Mental Health Coalition. The aim is to identify women with perinatal mood and anxiety symptoms, refer them to support services for an intervention, and to follow up with them to evaluate the success of the intervention or need for further interventions. The Maternal Mental Health Coalition intends to routinize screening and increase screening rates of all women during the perinatal period. We expect to demonstrate that by providing an intervention to women with scores above the threshold, women will experience improved mental health with a lower follow up score. Through community assessment and literature review, the Flathead Maternal Mental Health Coalition intends to develop a community pathway to address PMADs. This presentation will inform you of the considerations for the development of the care pathway, appropriate in for community, and the evaluation process. It will describe ways in which the community will benefit. The care pathway will offer an efficient and effective care provision for all providers to follow. The pathway will focus on not only engaging clients in care but activating them toward healthy behavior changes through trauma informed care, motivational interviewing, and family involvement approaches leading to health literacy, skills creation, and competence. The community will have a clearly mapped plan on how to coordinate care across disciplines while utilizing families’ natural supports. The pathway is expected to reduce variation in care provision, enhance communication, and decrease the cost associated with late identification and treatment or unaddressed PMAD’s. The model will incorporate evidence-based practice and treatment guidelines and utilize a continuous quality improvement framework.

Mentor: Kari Harris

Developing and implementing the Missoula Prescription Produce Program: A pilot study

Author(s): Harley Fredriksen

Category: Social Sciences / Humanities

Abstract / Artist Statement: Purpose: Food insecurity (lacking access to proper amount of nutritious food) has become a focus for health care organizations. Those who are food insecure for extended periods of time have a higher incidence of chronic disease (heart disease, diabetes, hypertension, etc.), and food insecurity in patients with chronic disease have poorer disease management. Preventive health approaches that directly alleviate food
insecurity can reduce health care costs and improve disease management. The Missoula Prescription Produce program started in 2015 as a partnership between Garden City Harvest (a local food-security non-profit) and the Providence Endocrinology Center. This program allows physicians, physician assistants, and dieticians to prescribe fresh produce to their patients. The purpose of this presentation is to describe the Missoula Prescription Produce Program (PPP) and how it may improve health outcomes in low-income patients referred to the program by their health care provider. Methods: Patients received $20 each month in the form of vouchers to spend at PPP market stands, and in exchange, enrolled in the 18-week program. The PPP addressed food access issues for patients by subsidizing the cost of produce that these patients could obtain through the program. Patients met at market stands on Monday and Thursday evenings (4:30-6:30PM) from June 6th-October 5th, 2017. Two PPP staff were present at each farm stand. Patients provided contact information and were measured for biometric variables (height, weight, blood pressure, and waist circumference) and filled out a demographic survey. We evaluated program effectiveness by collecting participant participation and retention information. We also interviewed some of the participants at the end of the program to learn about their experiences. The interview data were coded and analyzed for common themes. Forty patients enrolled in the PPP. Of these, 20 patients completed the baseline measures. This group was 80% Caucasian, 73% female, and had an average BMI of 34.7. Results from the interviews showed the PPP did not eliminate barriers to accessing fresh produce entirely, but did reduce barriers such as cost and limited access to produce during the operating season. Participants also reported trying new produce as a result of the program, and described positive interactions with their health care providers as a result of the program. Originality: This pilot study provides proof of concept for this form of preventive health intervention. Research shows that spending on food security programs provides roughly equivalent returns on health care cost reductions. Programs like these that aim to integrate with the health care system and tailor their interventions with nutrition and disease-management education may see increased benefits. This presentation will discuss the limitations and complications that future programs should be aware of. Significance: This program broadens the network of “prescription produce” programs and builds on the literature and context for future programs. Approaching population-based health through upstream, preventive approaches is a cost-effective approach with manifold benefits; judicious care and increased sensitivity to food system issues and the related public health problems being just a few.

Mentor: Blakely Brown

Development and implementation of a comprehensive groundwater nitrate tracking program in Gallatin County, Montana

Author(s): Brittney Krahn

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Worldwide, nitrogen has been increasing in groundwater and surface water bodies and is now considered one of the most difficult and pervasive pollutants. High levels of nitrate (nitrate + nitrite, herein after referred to as nitrate) can cause eutrophication of surface water and can cause both immediate and chronic health risks including methemoglobinemia in infants, spontaneous abortion, some birth defects, and bladder, thyroid, and colon cancer. Nitrate has been increasing steadily, which has been associated with a 77% increase in the population of Gallatin County, Montana. This population boom has resulted in a significant increase in the number of individual and small community (non-public) wells. According to the Montana Bureau of Mines and Geology, there are 17,660 wells in Gallatin County. Of these, 76.5% reported domestic use while only 0.03% reported use as a public water supply. Non-public domestic wells are not required to have water quality tested for any parameters before being in service. Some water quality data of these wells is obtained by the Gallatin City-County Health Department (GCCHD) and the Montana Department of Environmental Quality through regulatory means when a property is proposing to subdivide or to
install/upgrade a septic system but this data is not being tracked for use in any mapping format. Other wells submit sampling data through test kits provided by the Montana Well Educated program, which is facilitated by the Gallatin Local Water Quality District (GLWQD) and Montana State University Extension-Water Quality. The partnership between GCCHD and GLWQD proposes to develop and implement a comprehensive nitrate tracking program. This program will spatially track all water samples received by either agency in a shared GIS (Geographic Information System) database. This will identify areas that have elevated and/or increasing levels of background nitrates which will allow both agencies to implement further sampling schemes on a small scale. Further, it will provide a framework for water quality data to be tracked for other constituents such as arsenic on a near real-time basis. This presentation will detail the development and implementation strategy between the Gallatin City-County Health Department and the Gallatin Local Water Quality District. Once implemented, the gathered data will be used for public education and impact reduction strategies if required.

**Mentor: Kari Harris**

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**Digital Media in Live Performance**

**Author(s): Kurtis Hassinger**

**Category:** Performing Arts (dancing, playing instrument, reading)

**Abstract / Artist Statement:** Digital Media in Live Performance Kurtis Hassinger Traditionally, theatre has consisted of performers on a stage telling a story to an audience to understand and reflect the world in which we live. However, the twentieth and twenty-first centuries have introduced digital innovations that have radically changed the world we live in. My area of study in the University of Montana’s College of Visual and Performing Arts focuses on these innovations and asks: how are storytelling, performers, and audiences influenced when digital media is incorporated with live performance? Working with this question, I’m currently taking part in the design process for the University of Montana theatre department’s Spring 2018 studio production: Everyman, by Carol Ann Duffy, which follows a man to his final judgement from God. Under the guidance of the show’s director, Dr. Bernadette Sweeney, and the show’s lead designer, Professor Michael Murphy, I’m working in the creative software program, Isadora, tracking the actors’ movements with an Xbox 360 Kinect sensor. The physical sensor reads the movements of the performer and sends them into Isadora which projects these movements simultaneously in the form of pictures, video, and computer-generated graphics on screen. This process allows the performers to control the visual effects that share the performance space with them. They can, in short, manipulate the imagery in their environment through this method which helps the audience to connect with the world, story, and characters in a unique way. The process of making theatre through this blending of live performance and digital motion tracking media reflects the current computational environment of our world and speaks to our possible future performance path in the arts. The research in this area attempts to interrogate—through a combination of theatre performance theory and media arts practice—digital media and how it is redefining art and our society. My research and work for both the theatre and media arts graduate programs requires me to learn developing performance theories as well as learn to work with creative computer software and apply it to live performance. I’m using this research not only for a thesis in U.M.’s theatre department, but also with the purpose of applying these skills in the fields of media arts and theatre professionally. The knowledge gained will benefit the performance relationship of theatre and media arts at the University of Montana as well as give general student audiences and actors the opportunity to view and interact with the digital media and motion tracking software involved in a performance setting. This work also applies to art and society as a whole. The most effective way to convey my project is through an installation that allows its audience to view and interact with the digital imagery through moving in front of the motion tracking sensor themselves. The set-up only requires a projector, Kinect sensor, small projection screen or white backdrop, and a laptop which would encompass about 20 square feet of space. Thank you for your
Do children always trust confident individuals? Not when it comes to moral deliberations.

Author(s): Shailee Woodard

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Children and adults alike often interpret confident individuals as more credible sources when learning new information. However, confidence is not always interpreted as a sign of credibility. For example, children of about 5 years of age prefer a hesitant-accurate individual over a confident-inaccurate one (Brosseau-Liard, Cassels, & Birch, 2014). Previous research has shown that confident individuals are generally perceived as credible when the issue at hand is factual in nature. For example, one may trust a confident individual over a hesitant individual when they are providing differing information about salmon spawning patterns. However, it is an open question whether the preference for confidence generalizes to non-factual claims, such as moral decisions. That is, one may be skeptical of a confident individual when they make claims about who is most deserving of societal aid, as their confidence may reflect a cursory level of thoughtfulness. To address this gap in the literature, this study examined children’s credibility judgments of informants who differed in their level of confidence in two domains of knowledge (factual and moral).

Method. Children 3-8 years (N = 96 planned with 77 participants thus far) listened to both a confident and a hesitant speaker make claims about either factual information (e.g., the dragonfly has a fendle inside) or moral decisions (e.g., the otter should get the last piece of fish). Novel (that is, made up) facts with words from a published novel word bank were utilized so as to control for children’s prior knowledge. Each child listened to a total of eight claims (factual or moral): four with a confident speaker and four with a hesitant speaker (in alternating order). After each claim, children rated the speaker’s confidence, likeability, smartness, and agreement with the speaker on a 4-point scale (0=not at all, 3=a lot).

Results. Importantly, children clearly discerned between the speakers’ level of confidence as shown by significantly higher confidence ratings for the confident versus hesitant speaker (p Discussion. This research sheds light on the remarkable level of sophistication with which children are able to evaluate informants and the credibility of information they are providing. That is, children’s use of confidence as a credibility cue is conditional, depending upon the domain of knowledge. Specifically, as these findings demonstrate, children not only attend to the tones (confident or hesitant) of individuals but also simultaneously weigh the type of information (factual or moral). This remarkable capacity at such a young age allows children to discern who is a trustworthy source of information across contexts, which has important implications for children’s learning and the transmission of knowledge.

Mentor: Rachel Severson

Docosahexaenoic Acid Treatment on Particle-Exposed Macrophages

Author(s): Paige Fletcher; Ray Hamilton; James Pestka

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Rationale: Inflammation is a vital contributing factor to pulmonary diseases which can be triggered by exposure to airborne toxicants such as silica and nanomaterials. There has been an
increasing trend in the use of nanomaterials in various consumer products, which will increase the risk of pulmonary diseases. However, there are no effective treatments for chronic inflammation. One potential treatment that has been shown to have anti-inflammatory effects is the dietary supplement docosahexaenoic acid (DHA); an omega-3 polyunsaturated fatty acid commonly found in fish oil. Macrophages are important regulators in an immune response to inhaled foreign materials in order to maintain homeostasis. Macrophage functions are dependent upon various signaling factors which generate different macrophage phenotypes (pro-inflammatory classically activated M1 and anti-inflammatory alternatively activated M2). The signaling factors determine which macrophage phenotype is dominant to regulate the overall response to foreign particles. This study investigated DHA as a treatment for particle-induced inflammation and examined the impact of DHA on macrophage phenotype. Methods: Two macrophage models were used to examine DHA on particle-induced inflammation: THP-1 human monocytic cells differentiated into macrophages with Vitamin D3 and murine alveolar macrophages (AM). Either DHA, arachidonic acid (AA), or vehicle control were incubated with the macrophages while being exposed to various particles (silica and multi-walled carbon nanotubes). NLRP3 inflammasome activation (measured as IL-1? release) and cell viability were assessed after exposure. DHA’s impact on macrophage phenotype was examined by polarizing THP-1 derived macrophages into M1 and M2a phenotypes. Supplements and particles were then exposed to the separate phenotypes. IL-1? release and cell viability were assessed after exposure. Results: There was less IL-1? release and cell death when macrophages were treated with DHA in both cell models. In addition, AA treatment showed more IL-1? release compared to DHA treatments in both cell models. Preliminary results suggest that DHA treatment is inducing the M2 macrophage phenotype. Conclusions: DHA has an anti-inflammatory effect on macrophages after particle exposure. Less IL-1? release correlates with less inflammation; therefore, we propose that DHA is inducing the M2 macrophage phenotype.

Mentor: Andrij Holian

Effect of Uncompensable Heat from WLFF Helmet

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

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Heat related illness (HRI) is of major concern within heat related occupations. The addition of personal protective equipment (PPE) exacerbates the issue of HRI due to uncompensable heat stress. The inability to offload heat due to PPE, from shirts, pants, and boots, has been investigated in the past and shown to effect performance along with increased risk of HRI. While previous research has focused on different types of PPE, there is little research involving the WLFF helmet. PURPOSE: To investigate factors of heat stress with and without a standard issue WLFF helmet. METHODS: Eleven male subjects (age = 25.18±4.9 yrs) were recruited with a VO2 >40 ml/kg/min and ?65 ml/kg/min (VO2max = 54.16±5.5 ml/kg/min). Subjects were required to finish a 90-minute exercise protocol in a heat chamber (35?C and 30% RH), with Nomex shirt, pants, cotton t-shirt, and either with or without a helmet. A randomized crossover design was implemented; with a minimum two week washout period. Skin blood flow to the head and neck (SBFh; SBFn), head heat (HH), CT, skin temperature on chest and neck (STc; STn), HR, PSI, RPE, perceived head heat (PHH) and sweat rate were recorded during trials. A 2x3 ANOVA was used to analyze SBF, and 2x4 ANOVA was used to analyze HH, CT, ST, HR, PSI, RPE, and PHH. One-way ANOVA was used to analyze sweat rate. RESULTS: Nine of the 11 subjects were able to finish the 90 minute exercise trial. The HH, SBFh, and PHH (36.41±0.76?C with helmet v. 35.22±0.98?C w/out helmet; 211.93±86.84 w/helmet v. 185.51±73.34 w/out helmet; 10.07±3.25 w/helmet v. 8.52±2.65 w/out helmet; respectively) were all significant (p < 0.05) with a main effect between trials. HR, PSI, CT, and STc demonstrated main effects of time (p < 0.05), but were not different between trials. Sweat rate was not significant among trials (2.09±0.44 L/h w/helmet vs. 1.85±0.44
ConCLUSION: These data (HH, SBFh, and PHH) suggest that the current WLFF helmet design causes excess heat accumulation and resultant redirection of blood flow to the head. While some physiological factors (CT, HR, ST, PSI, and sweat rate) did not reach significance between trials; trends existed for PSI and RPE. The design of the WLFF helmet lacks ventilation, which from these data, may result in metabolic alterations, and perceived discomfort. Funded by the USFS (14-CR-11138200-009)  

Mentor: Charles Dumke

Cardiorespiratory Responses to the USFS Wildland Firefighter Arduous Pack Test

Author(s): Christopher Alfiero

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: US wildland firefighters administer over 30,000 physical tests per year to qualify candidates for the occupational demands of fire suppression. The primary assessment is the arduous pack test (APT) a 4.83 km hike that must be completed in 45 min while wearing a 20.45 kg pack. Delivery of individual feedback to guide the physical training of candidates is hampered by two factors; first, passing the pack test is widely considered the minimum performance level necessary needed for this occupation, and second, the binary nature of the assessment presents candidates with a task representing an unknown and self-selected exercise intensity. PURPOSE: To determine the cardiorespiratory response elicited by the APT within a subject population whose aerobic capacity and body masses vary. METHODS: 61 young (age = 22.8 ± 3.2 yrs) adults (36 males, Mb = 79.5 ± 8.8 kg; 25 females, Mb = 67.5 ± 13.5 kg; study range: 55.4 - 119.6 kg) performed the APT and subsequently underwent a hiking inclined-treadmill test to VO2peak while wearing a skin mounted heart rate (HR) monitor and 20.45-kg pack. RESULTS: 50 of the 63 subjects achieved the 45-min cutoff with a finishing time of 41.8 ± 2.1 min, the non-passers had a mean time of 47.7 ± 2.7 min. Non-passers were 77% female and 23% male. The VO2peak values of the passing and non-passing groups were 49.4 ± 7.2 and 42.6 ± 9.6 mlO2 kg-1 min-1, respectively; the study range was 62.1 to 30.8 mlO2 kg-1 min-1. HR, whether expressed as a fraction of the subject’s maximum rate (passers = 81.2 ± 17.1 and non-passers = 79.9 ± 12.7% of HRmax), or as the fraction of the HR reserve (passers = 68.0 ± 7.9 and non-passers = 67.7 ± 15.3% of HR reserve) were not different between the groups. Regression of VO2peak on completion time yielded a negative relationship (R2 = 0.45). In contrast, the HR responses and completion time were consistent among the participants (R2 < 0.01 for both % of HRmax and % of HR reserve). CONCLUSION: To successfully complete the APT candidates must achieve a HR reserve of 68% or less while maintaining a walking speed of 1.8 m s-1. These data suggest that monitoring HR during load carriage may be used to identify candidates with adequate and inadequate pre-fire season readiness.

Mentor: Brent/Ruby

Effectiveness of low-level laser light therapy on ankle dorsiflexion following a cupping induced contusion

Author(s): Conor Marlatt; Matt Buckner; Nate Schieffert; Makenna Turk; Jessica Keller

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Introduction: Low-Level Laser Therapy (LLLT) was first introduced in the 1960’s with the initial purpose initiate cell regrowth and healing. LLLT then expanded its use for edema and
inflammation reduction, promotion of wound healing, and treatment of neurological disorders. However, there is clear gap in literature regarding the physiological effects of LLLT which impacts its efficacy compared to other healing modalities. Purpose: The purpose of this study was to evaluate the effect of LLLT on ankle joint range of motion and the healing process of contusions on human subjects induced by cupping. Hypothesis: Our hypothesis was that LLLT would promote superficial healing by reducing cupping induced bruising.
Participants: Four graduate students, 2 females and 2 males, participated in this study. Methods: Data was collected over four days. The first day included obtaining a brief health history, demographics, and a cupping treatment to induce superficial bruising. Two cups were applied on the posterior aspect of the lower leg (calf region) at their predetermined locations. The participants were informed of their study restrictions the contraindications of LLLT and cupping treatments. On days two through four, participants underwent the LLLT treatment. The right leg was the treatment leg while the left leg was a placebo treatment. Before and after each treatment, participants underwent measurements for both the bruising diameter and weight bearing dorsiflexion test. The equipment used was a Chattanooga Vectra Neo Model 6000 for the LLLT treatment and a KangZhu Vacuum Cupping Set for the cupping treatment. Data was analyzed by using SPSS software to run a 2x3 repeated measures ANOVA. Dependent Variables: The variables measured during this protocol were bruising diameter on the posterior lower leg as well as ankle dorsiflexion. Results: Bruise diameter of both proximal calf and distal calf showed improvement from the baseline measurements (6.55 cm, 6.2 cm) to last day of treatment (3.25 cm, 2.75 cm), respectively, however were not statistically significant (p = 0.638; p =0.428) . Dorsiflexion range of motion showed to have slight improvement among the TG in comparison to the CG by 0.5 cm on average (p=.727). Conclusion: This study was an attempt to add to the previous literature and assist in solidifying the efficacy of laser therapy. Although healing improved in this study by reduction of the bruising, range of motion was not significantly impacted. The use of laser therapy may be beneficial promoting healing and additional study is warranted examining its effects.

Mentor: Valerie Moody

Engineered Nano-materials Induce Membrane Permeability in Different Cell Models

Author(s): Matthew Sydor; Donald Anderson; Harmen Steele; J.B. Alexander Ross; Andrij Holian

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Because of the increased use of engineered nano-materials (ENM), it is important to develop a better understanding of ENM bioactivity and their potential for causing inflammation and disease. Some ENM have been reported to be bioactive and to trigger a pro-inflammatory response when inhaled. Alveolar macrophages have been demonstrated to be responsible for this inflammatory response due to their release of the cytokine, IL-1?. A key step preceding and linked to IL-1? release is phagolysosomal membrane permeability (LMP). Some ENM have been implicated in inducing LMP in alveolar macrophages, which in turn results in release of cathepsin B from the phagolysosome. While, LMP has been implicated in this inflammatory pathway, the mechanisms of ENM-induced LMP remain unclear. It has been reported that ENM can have interactions with lipid membranes, therefore it is hypothesized that LMP is generated by a disruption of lipid packing in the membrane, caused by the ENM interacting with membrane lipids. The cell models used in this work were bone marrow derived macrophages (BMDM) and human red blood cells (RBC). BMDM from C57BL/6 mice were selected as a model for alveolar macrophages. These cells were treated with 25-50µg/ml of crystalline silica (SiO2), a material reported to cause inflammation, and titanium dioxide (TiO2) for 16 hours and cytosolic cathepsin activity was recorded, as a measure of LMP. Both SiO2 and TiO2 produced significantly increased cathepsin activity with SiO2 greater than TiO2. RBC was used as a simplified surrogate for internal cellular membranes, such as the phagolysosome. RBCs were exposed to SiO2 and TiO2 ENM for four hours at doses ranging from 25-200µg/ml. Subsequently, the RBC membranes were assayed for
permeability and changes to lipid packing by a hemolysis assay and fluorescence lifetime imaging microscopy (FLIM), respectively. A significant increase in hemolysis was produced in response to SiO2 and TiO2. FLIM results indicated increases in lipid packing around the fluorescence probe Di-4ANNEPDHQ, as a result of, SiO2 and TiO2 exposure. These results suggest SiO2 and TiO2 generate LMP by inhibiting natural lipid mobility that can potentially induce membrane permeability.

**Mentor:** Andrij Holian

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**Every Man: Reflections of the Past: Hip-Hop and Black History**

**Author(s):** Tsiambwom Akuchu

**Category:** Performing Arts (dancing, playing instrument, reading)

**Abstract / Artist Statement:** Tricia Rose describes hip-hop culture as a “cultural form attempting to negotiate the experiences of marginalization within the cultural imperatives of African-American and Caribbean history, identity, and community”. Within that negotiation, it also works to record history. This work looks one of the core elements of hip-hop, the dance form, and examines how black history has come to shape the hip-hop dance styles today as well as how performance and ritual traditions from African slaves have left their imprint within hip-hop dance vernacular. Through embodied and academic research that culminated in the creation of a dance piece titled “Every-Man (Alright)”, black history is looked at through the lens of dance and performance, examining the United States’ history and relationship with the black body, and how black movement, performance and celebration embodies social, political, and cultural influences across time.

**Mentor:** Nicole Bradley Browning

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**Examining Injury Data Reporting Practices in Wildland Firefighters**

**Author(s):** Erin Boggs

**Category:** STEM (science, technology, engineering, mathematics)

**Abstract / Artist Statement:** Wildland Firefighter (WLFF) crews lack an injury surveillance program to collect information on non-traumatic and traumatic injuries. Tactical athletes including: police, military, and structural firefighters all have a variety of systems in place for injury data collection. The lack of injury data prevents WLFF crews from identifying high-risk environments, implementing injury prevention programs, and improving the overall quality of care on the job. Over the last several decades the recent rise in wildfire incidence and wildfire suppression costs have created a need for healthy and physically fit individuals in the field. The high costs of firefighter salaries and medical care can be mitigated with the use of an athletic trainer along with better knowledge of on the job injuries. For the purpose of this project, we have developed a suggested injury surveillance program that can be used within wildland firefighting, as well as developed an injury surveillance document that can be utilized in the field for data collection. In order to complete this task we analyzed the current injury surveillance systems in all three tactical domains (Structural, Firefighters, and Police) as well as the documents used to collect the injury data. We also looked at the success and failure of each system to determine what worked best for each domain. Additionally, this project researched the importance of having an athletic trainer in the field to promote health and safety among wildland firefighters. We investigated the roles athletic trainers played in each domain and how those roles can be modified.
Examining the impact of adding gluteal strengthening exercises to the FIFA 11+ warm-up program on high school girls’ basketball reported injuries.

Author(s): Heather Bartz

Category: STEM (science, technology, engineering, mathematics)

**Abstract / Artist Statement:** FIFA 11+ is a multi-modal injury prevention program (IPP) that has been shown to decrease injury rates in soccer athletes of both genders and male professional basketball athletes. There is also plenty of literature that supports the use of gluteal musculature strengthening to assist in the prevention of lower extremity (LE) injuries. FIFA 11+ has not been studied specifically examining the prevention of LE injuries in adolescent girl basketball athletes and there are no known LE IPP’s that include gluteal strengthening exercises. Purpose: The purpose of this project was to see if the addition of gluteal strengthening exercises in place of certain exercises in the FIFA 11+ IPP resulted in fewer LE injuries and improved sport performance measures in high school girls’ basketball players. Hypothesis: It was hypothesized that the addition of gluteal strengthening exercises to the FIFA 11+ IPP would result in fewer LE injuries and improved vertical jump performance. Valgus knee movement during drop-jump testing was hypothesized to decrease between pre-and post-season measurements. Participants: Thirteen high school girls (ages 15-18) were selected for this study. Methods: A modified FIFA 11+ IPP was used as a warm-up program before each regular-season practice. The program consisted of running drills, strengthening exercises, and plyometric drills. Data analysis compared the total number of injuries sustained during the 2016-17 season to the 2017-18 season, the number of chronic and acute LE injuries suffered in each season, and the number of injuries to specific body parts in each season with chi-square analysis. Pre-and post-season vertical jump averages were compared using a paired t-test. Valgus knee movement during a drop-jump test was recorded and analyzed with a composite scoring system, then compared using a paired t-test. Results: In the 2017-18 girls’ basketball season, 9 total injuries were reported compared to 12 total reported LE injuries in the 2016-17 season (p = 0.51). The total number of injuries for each season were broken down into chronic (p=0.65) and acute (0.42) categories to be compared further. Injuries were also categorized by body part injured and compared between 2016-17 and 2017-18. The most significant change in reduction of injury was in hip/thigh injuries from 4 in 2016-17 to zero in 2017-18 (p = 0.04). Vertical jump team averages improved from 16.5 inches to 17.9 inches when measured pre-and post-season (p = 0.00), which is significant. The drop jump test composite scores improved from 1.38 to 2 pre- to post-season (p = 0.57), but this change was not significant. Conclusion: There was no difference comparing total LE injuries reported between the 2016-17 and 2017-18 girls’ basketball seasons. These results make it difficult to confidently report the effectiveness of the modified FIFA 11+ warm-up program on reducing LE injury in athletes that participate in sports other than soccer. However, a significant vertical jump improvement in this study does support the literature that the FIFA 11+ program is effective in improving sport-specific skills, such as vertical jump, in non-soccer athletes.

Mentor: Valerie Moody
Exercise Program to Prevent Shoulder Injury in Collegiate and Professional Pitchers

Author(s): Rina Kasuga

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Upper extremity injuries are very common in baseball players at both the collegiate and professional level. Pitchers are especially susceptible to shoulder injuries because of the repetitive nature of pitching. Approximately 60% of all injuries in collegiate baseball are due to throwing, and pitchers suffer over 70% of throwing-related injuries. In Major League Baseball (MLB), about 50% of players on the disabled list were pitchers, and the injury rate for pitchers is 34% higher than position players. The majority of injuries in MLB players occur in the first half of the season, and the highest rate of injury occurs in the first month of the regular season. Therefore, there is a significant need for effective injury prevention programs that occur during the pre-season and early part of the regular season, in order to effectively reduce injuries in collegiate and professional baseball players. Although a lot of research has been devoted to the study of risk factors and treatment of baseball-related injuries in youth and adolescent players, there have been very few studies on exercise-based injury prevention programs for baseball pitchers at the collegiate or professional level. Common injury prevention strategies for youth and adolescent players such as restrictions on pitching count, do not produce the same benefit in collegiate and professional pitchers. This is a major gap in the literature and suggests the need for other strategies to prevent injuries in this population. Therefore, the purpose of this project is to create an evidence-based exercise prescription that clinicians can use to alter factors that may be related to a higher risk of shoulder injury in professional and collegiate baseball pitchers. In order to create an evidence-based program to prevent shoulder injuries in baseball pitchers, three steps were taken: (1) risk factors for shoulder injury were defined via a review of prospective studies, (2) interventions that target and change each risk factor were identified in the literature, and (3) an injury-prevention exercise program was designed using effective interventions. The evidence-based review of the risk factors for shoulder injuries revealed that range of motion (ROM) deficits in the throwing shoulder, preseason rotator cuff weakness, and poor lumbopelvic control (degree of anterior-posterior pelvic tilt) are major factors that increase injury risk in collegiate and professional baseball pitchers. The cross-body stretch is effective at improving ROM deficits including posterior shoulder tightness and glenohumeral internal rotation deficit. Rotator cuff muscles are strengthened by exercises which efficiently activate dynamic stabilization and neuromuscular control around shoulder girdle. The pelvic tilt is corrected by exercise that target the multifidi, transverse abdominus, and erector spinae. This injury-prevention exercise program can be used by clinicians in the pre-season and early season to potentially reduce the risk of injury in collegiate and professional baseball players. This can also serve as a model for injury-prevention research in this population.

Mentor: Melanie McGrath

Explorations in 360/VR Filmmaking

Author(s): David Mills-Low

Category: Visual Arts (sculpture, painting, etc.)

Abstract / Artist Statement: I spent the last 20 years working as a professional actor, director, playwright, and sound designer in the Rocky Mountain Northwest. As an MFA candidate in the Media Arts Department, School of Fine Arts, I am studying digital media and 360 filmmaking as it relates to Virtual Reality (VR). I have always been fascinated by human beings and the way we relate to and interact with one another in performative spaces. VR allows me to explore this in virtual realms. This spring I am in the process of shooting
and compiling a VR film, all shot in 360 Camera. This is a storytelling exploration that plays with truth and fiction, how the two intersect, and whether you can distinguish the one from the other. Below I have linked a sample of some of my early tests. The bulk of my filming is happening in the next couple weeks. Theatre is an exploration of spatial relationships and emotional relationships between characters. The optimum viewing environment is that of the live audience, sitting in a theater. In many ways, 360 video and VR environments are akin to this experience. In film, a closeup is a tool used to affect the perspective of the audience. But inside a VR headset, a closeup means that the subject is exactly that, close up to the camera. The effect is that of standing next to one another. It is a position of intimacy, vulnerability of the subject and the viewer. There is an immediacy that exists in this VR world because it so closely mirrors our own experience. You can use it to literally step into the shoes of another person. This is part of why VR filmmaker Chris Milk describes the medium as “… the ultimate empathy machine.” Currently my work is recorded. The next step in my explorations, as I accumulate the grammar of this new filmic platform, is to implement VR techniques in live settings, turning performance events into live streamed, interactive events. My goal is to one day present plays in VR, similar to the way that The National Theatre livestreams some of their performances. Instead of traveling to a theatre however, the audience merely slips their phone into a viewing device (as simple as Google Cardboard for instance) and is instantly transported, from their living room or classroom, into an immersive viewing experience. Link to video sample of 360 experiments:  https://youtu.be/ONZt2Pcwig

Mentor: Bernadette/Sweeney

Exploring the Effect of Sterics and Geometry in Catalyst Design

Author(s): Nicholas Wageling, University of Montana

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: In organic chemistry, catalysis (accelerating a chemical reaction) has largely been dominated by inorganic acids. While effective, these additives are also usually toxic, reactive, and environmentally unfriendly. Unfortunately, catalysts are necessary for many aspects of our life: they generate fertilizer for farming, aid in petroleum refinement, and allow pharmaceutical companies to produce safer drugs. Organocatalysts provide an alternative way to accelerate reactions. By appending hydrogen bond donors to a carbon based molecular scaffold, organocatalysts can have activity similar to traditional catalysts, while mitigating the negative side effects. Consequently, the field of organocatalysis has been steadily growing for the last twenty years. Chemists can impart preferable traits in their organocatalysts by modifying the scaffold around the “active site” of the molecule. That research has provided us with many organocatalysts that work well. However, some of the fundamentals are still incompletely understood. A more thorough investigation of the basic mechanisms through which these molecules act will lead to more efficient and better designed organocatalysts. The research presented here explores the effect of steric hindrance and substrate binding geometry on the activity of a simplified organocatalyst. As stated above, this research explores two facets of catalyst design: steric hindrance of the active site, and the relative orientation of the substrate and catalyst. The idea of “steric hindrance” is based on the Pauli exclusion principle. Put simply, matter cannot occupy space that is already occupied by other matter. If the active site of an organocatalyst is sterically hindered, then substrates (molecules that are “activated” by a catalyst for a reaction) cannot interact with the organocatalyst, effectively rendering it useless. However, designing organocatalysts sometimes requires that certain structures be present on the scaffold. These structures may be necessary for various reasons: catalyst activation, increasing solubility, or they may be vestigial components from the synthesis. Here, we circumvent those necessities by synthesizing a simplistic version of an organocatalyst. While less active than state-of-the-art organocatalysts, the steric bulk around the active site can be easily controlled. By synthesizing a collection of simple catalysts with incrementally increasing steric bulk, we can discover at what size steric hindrance deactivates these types of...
catalysts. Alternatively, if the substrate can still access the active site, but is pushed into an unexpected orientation, how will that affect the rate of the reaction? While these molecules cannot be viewed using conventional means (i.e. a microscope), they will be studied using 1H NMR spectroscopy, and x-ray diffractometry. 1H NMR spectroscopy produces a distinct signal for each hydrogen atom on the molecule. Changes in the signals can be informative of how the catalyst is behaving in solution. X-ray diffractometry scatters x-rays off a single crystal composed of the molecule in question, and gives the absolute position of the atoms in that molecule. This technique can be used to explore simple substrate orientation relative to the catalyst in the solid state. Combining the information gathered from these two techniques will help us understand how molecules bind, and how we can design better organocatalysts in the future.

**Mentor:** Orion Berryman

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**Exploring the role of innate lymphoid cells in vaccine efficacy**

**Author(s):** Valery Roman-Cruz

**Category:** STEM (science, technology, engineering, mathematics)

**Abstract / Artist Statement:** The discovery and the development of vaccines has become one of society’s greatest public health achievements. However, many diseases, such as tuberculosis, have a tremendous burden globally with no effective vaccine. Vaccines and vaccine adjuvants help to provide protection against diseases by inducing a robust immune response. The immune system is divided into the adaptive and the innate system. The innate system is the first line of defense when the body encounters a pathogen or other insult. The adaptive immune system is responsible for retaining memory of the pathogens or insults encountered and mounting a robust response against them. Recently, a set of innate immune system cells with memory characteristics, called innate lymphoid cells (ILCs), has been discovered (Nature 517, 293-301 Jan 2015). My primary research project involves understanding the role ILCs play in the efficacy and safety of vaccines and if adjuvants (immunostimulatory molecules added to vaccines). Targeting the innate immune system via adjuvants that stimulate ILCs could provide the opportunity to finally create safe and effective vaccines for such diseases as tuberculosis. My hypothesis is that adjuvants alter the phenotype of ILCs resulting in improved short-term and long-term immunity following vaccination.

**Mentor:** Jay/Evans

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**Foreign Faculty Members’ Lived Experiences at an International Branch Campus in China**

**Author(s):** Xin Bu

**Category:** Social Sciences / Humanities

**Abstract / Artist Statement:** Transnational education is a new phenomenon emerging as internationalization of higher education grows. Transnational education between the U.S. and China is playing a crucial role in promoting the two countries’ cooperation in higher education. International Branch Campus (IBC) is identified as a form of transnational education. As of January 2017, 12 IBCs have been established by American universities in partnership with Chinese universities. Related literature identified an IBC as an entity which pertains to a university whose home campus is in one country but operates in its name through a joint venture in another country. Students will be awarded a degree upon successful completion of the course program, which was taken at an IBC. In this study, IBCs which will be selected pertain to American Universities but operate in
China. Foreign faculty is critical in ensuring the program quality at IBCs in China. However, existing literature found that the retention of foreign faculty in China is a problem. This qualitative phenomenological study is designed to describe the perceptions of foreign faculty members from American home universities at IBCs in China. This study will explore their lived experiences educating students, their collaboration with other faculty colleagues, the roles of leaders at IBCs, and their cross-cultural experiences. The design of this study will be guided by a phenomenological strategy of to explore foreign faculty members’ lived experiences at IBCs in China. The central research question to guide this study will be: What are the lived experiences of foreign faculty members at IBCs in China? The central question will be supported by four sub-questions: 1. How do foreign faculty members describe their experiences educating students at IBCs in China? 2. How do foreign faculty members work collaboratively with other faculty colleagues at IBCs in China? 3. How do foreign faculty members describe the role of the leaders at IBCs in China? 4. How do foreign faculty members ascribe meaning to their cross-cultural experiences at IBCs in China? A purposeful sampling approach will be used to select 15 participants. The sampling strategies that will be used are maximum variation and snowball sampling. The researcher will ask 14 demographic and 22 open-ended, semi-structured interview questions to collect data. Skype interviews will be conducted with participants who meet the selection criteria on a one-to-one basis. Each individual interview will last approximately sixty to ninety minutes. NVivo will be employed to assist in organizing and analyzing data upon the completion of transcription. This study will select six steps from Van Kaam (1969) to guide its data analysis as stated by Polkinghorne (1989, pp. 52-53): 1. The classification of the data into categories. 2. The reduction and linguistic transformation of the selection into more precisely descriptive terms. 3. The elimination of those reduced statements developed in Step 2 that are probably not inherent in the experience of feeling understood. 4. The first hypothetical identification. 5. Application. 6. Valid identification. Following the six steps, the researcher will write a composite description that will represent the essence of the phenomenon. This description will be presented in a narrative statement. A visual model will be used as well. This study is not only relevant to the discipline of educational leadership, cross-cultural leadership specifically, but also to international higher education. This study will contribute to a better understanding of foreign faculty members’ lived experiences for concerned parties at both home universities in the U.S. and IBCs in China. The results of this study will also assist administrators, decision-makers, Chinese partners, and American home universities in better understanding foreign faculty members’ lived experiences at IBCs in China, and thus better support them and improve the IBC system.

Mentor: Patty Kero

fortUitous: tunneling

Author(s): Charlotte Nickel

Category: Visual Arts (sculpture, painting, etc.)

Abstract / Artist Statement: Medium: Cardboard boxes, printed photographs, projector (2) videos, paper, textiles, and mixed media. Dimensions of work or intended presentation set-up: 15.5 x 3 (2), 7.5 x 7.5, 7.8 x 3, 13.4 x 3 (dimensions are in feet) Description of work and all producers and/or contributors: This mixed media tunnel fort is meant to be crawled through giving the element of a different world; developing a sense of meaning through memories, imagination, and exploration. Artist Statement: I invite you to take part in this performance piece to engage in bits and pieces of a childhood. The different dimensions of peering in, walking through, and crawling are meant to draw you into a multi-layered memory experience, a tactile sensory fort that juxtaposes play with memory, childhood, and emotions. What are memories and what do we remember? Is a photograph a document of time or a posed picturesque version of a moment—a construction or a concept? Is a fort a world within a world, or a world in its own? What is collaborated and what is calibrated in our mind's eye through our own tunnels?

Mentor: Michael Murphy
Growing Youth Harvest and Youth Farm: Youth Participatory Action Research for Program Development of Garden City Harvest

Author(s): Hannah Oblock; Jazmyn Saunders; Zayne Mogus

Category: Social Sciences / Humanities

Abstract / Artist Statement: The lives of young people in today's society are controlled by the decision making of adults and young people's ability to make choices is constricted by their dependence on adults in power. Many youth are stereotyped by their age as unruly, impulsive, irrational, apathetic, and lazy. Facing inadequate access to empowering opportunities in their communities, youth are typically excluded from community development initiatives and not valued as contributing citizens in their communities. One organization that is working to provide youth with more empowering opportunities for engagement is Garden City Harvest (GCH), a local non-profit in Missoula, Montana, which coordinates community farming projects and facilitates sustainable agriculture education. Their job training programs, Youth Harvest (YH) and Youth Farm (YF), hire adolescents of 15-18 years of age to work on their urban farms to learn about sustainable agriculture, vocational skills, and social-emotional well-being. As the organization continues to expand, especially with the addition of a new facility, GCH administration and staff are interested in learning how the programs impact the youth employees and how future programming can provide more empowering and meaningful opportunities for youth. To assist GCH in conducting an evaluation of its youth programs, I facilitated two focus groups of past youth employees of YH and YF. The first group identified the strengths and areas of improvement of the programs, and the second group developed recommendations of opportunities for programmatic growth. From interviews with staff from nine similar youth programs around the country, I gathered contextual information of best practices and ideas for program development that could be adopted by GCH to bolster their programs. Using a participatory research approach, I recruited three youth from the focus groups to assist in data analysis. This research approach was meant to provide youth with opportunities to participate in decision making processes at an organizational level in order to produce findings that are relevant to the very young people impacted by the programs. We qualitatively analyzed the focus group data and developed specific recommendations for program growth, particularly how GCH could provide employment opportunities for youth in the winter season. The three youth co-researchers and I presented the recommendations to GCH staff members and advocated for youth representatives to be involved in further conversations about program development. The conclusion of this project will result in a professional paper consisting of a detailed summary of the research findings and recommendations that will be made available to GCH staff for the future development of YH and YF. The report will help expand opportunities for youth in Missoula to be more active and engaged in the development of their local community.

Mentor: Neva Hassanein

Health Needs Analysis of Hmong American Youth in Missoula, MT

Author(s): Krys Standley; Erica Forzley

Category: Social Sciences / Humanities

Abstract / Artist Statement: Health Needs Analysis of Hmong American Youth in Missoula, MT Both investigators on this project were interested in adolescent populations. Understanding that difficulties exist with gaining access to adolescents through the public-school systems and through independent recruitment, we identified the Missoula-area Hmong community as a cohesive cultural group that might allow for access to youth. The current inquiry seeks to understand needs as perceived by the target population themselves and in
consideration of extant research. Ethnic minority Hmong resettled in the United States in the 1980s as refugees from Laos after supporting the U.S. in the Vietnam War (Moua & Vang, 2015). Today, Hmong American adolescents are second- or third-generation immigrants (their parents and/or grandparents immigrated to the U.S.) (Moua & Vang, 2015). Across the U.S., Hmong American youth face challenges such as acculturation, adjustment, education, language loss, conflict with parents, and cultural identity issues (Moua & Vang, 2015; Thao, Leite, & Atella, 2010). At present, approximately 200 Hmong live in Missoula County, including approximately 50 teenagers. The present inquiry seeks to analyze this population’s needs through conducting social, health, and educational assessments. The assessment process was modeled after the PRECEDE-PROCEED program planning model (Greene & Kreuter, 2005), a bottom-up approach that addresses community health needs from the perspective of the targeted population. Our planning process involved qualitative inquiry with community gatekeepers and dyadic interviews with Hmong American youth living in Missoula County, Montana, as well as a literature search. These inquiries indicated that family dynamics, cultural dynamics, academic pressure, and racism/discrimination are social challenges among Hmong American youth in the Missoula area. The quality of life assessment also indicated community strengths, including a close-knit community as a source of support, annual community events such as the farmers market, Hmong New Year celebration, and the Montana Hmong Youth Leadership Program’s summer educational programming. The results of the health assessment indicated anxiety as the most significant, but changeable, health problem among Missoula’s Hmong American youth. Pressure to conform to traditional Hmong culture while negotiating American culture was a major contributing factor to anxiety in this population. The aim of this project was to develop strategies to address factors that contribute to health problems, with the understanding that improved health leads to improved overall quality of life (Greene & Kreuter, 2005).


Mentor: Laura Dybdal

Humoral Immune Response Modulation by Aryl hydrocarbon Receptor Activation (AhR) in CD11c+ Cells: Exploring Sex-specific and Ligand-dependent Effects on Antibody Responses in Mice.

Author(s): Joanna Kreitinger, University of Montana

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Modulation of antibody responses is often a summation of effects on B cells, helper T cells, and dendritic cells (DCs). All three of these immune cells express AhR, a ligand-activated transcription factor with endogenous and exogenous ligands known to modulate immune responses. Importantly, antibody responses are keenly sensitive to AhR activation by TCDD, its prototypical ligand and common environmental pollutant. However, the specific contribution of AhR activation in DCs has not yet been defined, particularly in the context of sex-specific and ligand-dependent effects. We aimed to determine the effects of AhR activation in DCs by endogenous and exogenous ligands on OVA-specific antibody responses in
mice. Specifically, we hypothesized that AhR activation in DCs alone suppresses antigen-specific serum antibody production, selectively affecting different isotypes. To test this hypothesis, we used mice conditionally deficient of AhR in CD11c+ DCs (AHRCD11c). Control (AhRd) and AHRCD11c mice were treated with vehicle, ITE or TCDD via oral gavage, and subsequently immunized i.p. with whole OVA/adjuvant to induce a systemic, antigen-specific humoral response. One week later, AhRd mice showed significantly reduced OVA-specific IgM and IgG2a titers while IgA was significantly increased; effects that were ameliorated in AHRCD11c mice. Interestingly, TCDD-induced IgA increases were both AhR- and sex-dependent with female mice showing increased IgA production. Collectively, these results demonstrate that DCs contribute to, but are not wholly responsible for, AhR-mediated effects on antigen-specific serum antibody generation. Research supported by ES013784 (DMS) and AAI Careers in Immunology Fellowship (JMK).

Mentor: David Shepherd

Identifying control strategies for measles in countries with seasonal birth rates using supplementary immunization activities

Author(s): Dominika Dec

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Infectious diseases such as polio, diptheria, and measles have not disappeared completely with the advent of vaccination strategies directed at eradication. Countries that do not have scheduled vaccination methods, do not have easy access to medical facilities, or face political turmoil (i.e. Boko Haram occupation or civil war), still experience the resurgence of these highly infectious diseases. The measles vaccine has been present for over 50 years but the difference in administration of the vaccine between nations leads to the need for developing control strategies to diminish and control measles related infections with the help of supplemental immunization activities. This project concentrates on several Sub-Saharan countries with a birth rate that varies over the period of a year. Using an SIR model parameterized with a sinusoidal birth rate and measles data we are able to find the ideal timing and proportion of vaccinated individuals that would effectively eradicate or at least minimize the average reproduction number.

Mentor: Emily Stone

“Inmates”: and Moral Reform: Law, Vice, and Culture in Missoula, 1890-1930

Author(s): Kayla Fox

Category: Social Sciences / Humanities

Abstract / Artist Statement: An 1890 ordinance in Missoula, Montana referred to women who worked at houses of ill repute as “inmates” and, as with prison inmates, restricted what prostitutes could wear, to whom they could speak and when, and what public places they could enter (and how – prostitutes were restricted from entering saloons through the front door).[1] Interestingly, arrest records in the early twentieth-century – prior to 1906 – indicate that male pimps were arrested as often as female prostitutes. However, beginning in 1906, arrest records show a large uptick in arrests for women in brothels, suggesting a change in legal and social priorities. During these early years of the twentieth century, Missoula, like most of the country, also was participating in broader reform efforts against smoking, opium, and alcohol; at the same time, many female activists were
seeking autonomy through the right to vote. For example, Maggie Smith Hathaway, a prominent legislator in Montana, was not only a suffragist and a member of the Women’s Christian Temperance Union but also led an anti-smoking campaign. This paper seeks to use Missoula, Montana as a case study to see the intersection of female-led reform efforts and vice law adoption and enforcement in the early twentieth century—particularly against prostitution—to explore the complex interplay of law, vice, and culture in modern America. It examines both women seeking autonomy through reform and prostitutes whose autonomy was restricted because of these reform efforts. Although many historians have addressed these subjects, their studies have often been geographically broad in focus. Other scholarship focuses either on reformers or on prostitutes rather than the way that both groups affected—and were affected by—vice laws. This paper will explore shifts in the application of vice laws over time as well as the practical effects and potential motivations for these shifts. More specifically, this project will examine the extent to which such legal shifts were related to female-led moral reform efforts. Did legal changes reflect reformers’ goals or were they the result of other factors? To what extent were changes in prostitution arrests tied to other moral, social, or economic concerns? Does a local case study confirm or complicate national studies of prostitution? This paper also seeks to examine some of the implications of attitudes about sexuality embedded in laws and their application, public discourse, and other concerns (moral, medical, or otherwise) over prostitution and the impact of these ideas on approaches towards the sex trade. To conduct this study, I rely on local sources, including newspapers, city ordinances, arrest and prison records, court records, and personal papers and organizational documents related to reform efforts. These will be placed into the context of larger state and national discourse through digitally available sources such as pamphlets, as well as secondary sources that address the topics of prostitution, moral and political reform efforts, and sexuality. [1] Ordinances, 1889-2008, City of Missoula (Mont.) Records, 1883-2009, Series V, Vol. 118-121, Mike and Maureen Mansfield Library.

Mentor: Anya Jabour

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**Immune Organ Regeneration After Dioxin Exposure**

**Author(s):** Laura Berg  

**Category:** STEM (science, technology, engineering, mathematics)

**Abstract / Artist Statement:** Exposure to environmental pollutants such as wildfire smoke, diesel exhaust, and pesticides damage a human immune organ called the thymus. Thymic damage results in dysregulation of the immune system in the form of immune suppression and autoimmune disease. The thymus is capable of regeneration, and we are trying to figure out how this regeneration happens. We know that a specific chemical signal, IL-23, is released after the damage. The release of IL-23 is essential for cells associated with tissue repair to be activated and for the thymus to regenerate. A paper has been published that suggests IL-23 is released by a starfish-shaped cell called a dendritic cell. However, another cell type in the thymus, a macrophage, is capable of releasing IL-23 in other tissues. Because the macrophage could be responsible for releasing IL-23 in the thymus, I suggest that both dendritic cells and macrophages are responsible. No one has previously examined the involvement of macrophages in the thymic regeneration. Knowing which cells are responsible for IL-23, we can inform future medical research to improve immune regulation and overall health.

**Mentor:** Celine Beamer
Improving Educator's Understanding of Rural Children's Mental Health

Author(s): Lindsey Nichols; Kindle Lewis; Kaitlyn Ahlers; Heather Halko, University of Montana; Anisa Goforth

Category: Social Sciences / Humanities

Abstract / Artist Statement: Increased focus on the psychological needs of children in schools has pushed educators to enhance implementation of programs to address learning and behavioral needs. In rural states like Montana, a significant number of children struggle with mental health concerns, including one of the highest suicide rates in the country (MDPHHS, 2016). Educators are a first point of contact in schools, so they must be able to effectively recognize, interact with, and refer children with mental health needs. To our knowledge, there are no training programs related to mental health targeted for educators in rural communities. Therefore, we collaborated with educators to develop Educators Navigating and Generating Approaches for Genuine Empowerment (ENGAGE), a program designed to advance knowledge of mental health services available in rural schools. We also connected with educators to better understand what contextual factors might promote or impede implementation of the ENGAGE program within a rural school setting. Educators (teachers, school mental health professionals, etc.; N = 26) provided feedback regarding the development of a specialized training for PK-12 educators. They were given an outline of the training and provided comments to the curriculum content through two phases of online review. A focus group (n = 8) was also conducted to collect data that will be used to further adapt the training content and to inform program implementation efforts. Qualitative responses were analyzed for overarching themes. Educators who complete the online surveys most commonly requested that ENGAGE provide knowledge and opportunities for educators to advance their skills in responding to posttraumatic stress, suicide, and generalized mental health and behavioral difficulties within the school setting. They also requested specialized training in how to access mental health supports for children living in rural areas. Educators who participated in the focus group identified several aspects of the ENGAGE training that could promote successful implementation of the program within rural schools: 1) inclusion of training content that is highly needed and prioritized by educators, 2) the capacity for ENAGE to enhance networks and communication with the school system, and 3) high compatibility between the ENGAGE training content and needs of the school system at large. Results of this study will contribute to understanding mental health facilitation in schools, particularly in rural areas. This is critically important, as approximately 60% of rural Americans live in areas with restricted access to psychological care (DPHHS, 2012), and school settings can reduce barriers to receiving mental health services (Dishion & Kavanagh, 2000). Further, given research findings that teachers often feel underprepared to support students’ mental health needs (Reinke et al., 2011), an educator-informed training has the potential to increase the number of highly trained educators in rural areas prepared to support students’ mental health and academic success.

Mentor: Lindsey Nichols

Intentional Danger: Understanding Risk and Identity within Mountaineering

Author(s): Mira Cleveland

Category: Social Sciences / Humanities

Abstract / Artist Statement: This study seeks to examine how identity is navigated within ‘risky’ situations, and ultimately how this may contribute to crisis situations. From understanding and accepting the inherent dangers of driving a car, to the potential of falling off of a step ladder when reaching for a dish on the top shelf, risk is an accepted part of life. However, there are risks fundamental to extreme adventure sports that reach
beyond the everyday accepted risks. In the case of mountaineering above 26,000 feet, climbers accept the risk of lost money in the event of a summit failure, frostbite when unexpected time is spent in less than ideal conditions, and in worst cases: death, when missions go awry, seracs crumble, ropes break, and climbers slip. This study seeks to examine how identity is navigated within ‘risky’ situations, and ultimately how this may contribute to crisis situations. Through examining existing literature, conducting a case study of two deadly mountaineering disasters, and reviewing interviews with mountaineers surrounding why they climb, greater sense can be made of the unique relationship between identity, risk, and mountaineering. Data for this study was collected through analyzing several mountaineering disaster accounts (specifically the 1996 Everest disaster and the 2008 K2 disaster), as well as reviewing interview responses recorded within the book Beyond Risk (O’Connell, 1995). The case studies were conducted via analyzing Jon Krakauer’s 1996 book (Into Thin Air), and the documentary The Summit (Ryan, 2012). Notes were taken from all three sources, and dialogue surrounding identity and risk was recorded, as well as similarities between the two disasters. I watched the documentary several times and took notes on various responses and statements of identity from climbers. Into Thin Air (1996) is an account by journalist Jon Krakauer of the 1996 Everest disaster in which eight climbers perished in a blizzard, and documents the breakdown in team function that eventually was a contributing factor in the deaths of eight climbers. Additionally, The Summit (Ryan, 2012) is a documentary covering the 2008 K2 disaster, in which eleven climbers died during one summit bid, becoming the deadliest mountaineering disaster at the time. Finally, Beyond Risk: Conversations with Climbers (O’Connell, 1995) contains transcribed interviews between seventeen famous mountaineers (including Edmund Hillary, the first white person to summit Everest) with interview questions surrounding how they justify and mitigate risk, why they climb, and why mountaineering is meaningful to them. Finally, this study makes several recommendations: First, it may be beneficial to modify the ways in which climbing expeditions are carried out. For guided climbs, standards should be set and agreed upon before climbs begin, and penalties should exist for climbs that work past set turnaround times. Additionally, it may prove beneficial to ensure that climbers with less experience who are preparing to summit an “eight-thousander” are fully educated in the risks associated with summiting a prestigious peak, as well as how to take “safe” risks versus “foolish” risks.

Mentor: Greg Larson

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**Investigating least cost path from raw material sources to Bridge River site (EeR14)**

**Author(s):** Elizabeth Dolinar; Emma Vance

**Category:** Social Sciences / Humanities

**Abstract / Artist Statement:** Excavations at Housepit 54, Bridge River site, British Columbia produced a large collection of lithic debitage and tools made of a wide variety of different materials. Dacite, chert, and slate are particularly common and have been sourced to a few different locations around the region. This research seeks to test transportation cost from these sources to the Bridge River site using the least cost path function in Geographic Information Systems (GIS) software. By looking at the quantity of the commonly sourced materials at Bridge River and comparing it to the cost of transport from its source it is expected that the most frequent material will come from the most easily accessible location. If the expected pattern does not emerge, it is hypothesized that the people chose lithic sources based on political, cultural, spiritual, or symbolic preference and not solely on geographic accessibility.

Mentor: Anna Prentiss
"Is this my Great Aunt?": An Analysis of Human Skeletal Remains to Construct a Biological Profile

Author(s): Hayley Savage; Samantha Ramey

Category: Social Sciences / Humanities

Abstract / Artist Statement: Forensic anthropology is the sub-discipline that applies the principles and methods of physical anthropology to medico-legal cases. Forensic anthropologists have a multiplicity of skills that are used in various ways, but amongst those is the ability to construct a biological profile from a set, or sets of, unknown, skeletonized remains. Biological profiles of adult human skeletal remains consist of sex, age-at-death, ancestry, stature, trauma, and pathology. The information gained through these analyses are used in two ways: to provide immediate supporting evidence for identification, and to provide a means of narrowing potential lists of individuals. There are various methods to complete this process, but the most common include analyzing the morphoscopic traits of the skeleton, particularly the cranium and pelvis, and using various measurements of the long bones (humerus, femur, etc.). This research will focus on the process of creating a biological profile for an unknown historic skeleton brought to the University of Montana Forensic Anthropology Laboratory (UMFAL). This individual represents one of three historic skeletons found in unmarked graves in Beaverhead County, MT. The goal of this research was to aid in the identification of these remains using multiple methods to create a complete biological profile for the individual. Our analysis found that the remains are most consistent with a female individual aged 35-45 years at death, with a height between 4 ft 9 ins and 5 ft 5 ins, most likely of European ancestry with some Asian admixture, and no perimortem trauma. This individual likely died in the early to mid-1900’s based on artifacts associated with the remains. Biological profiles are the backbone of Forensic Anthropology and this research is unique in that it combines the profile based on the skeletal analysis with historic artifact analysis all with the goal of identification.

Mentor: Kirsten Green

Journey to the Jungle: A UM Terrestrial Ecosystem Ecology Lab Trip to Costa Rica Through the Eyes of a Journalist

Author(s): Maddie Vincent

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Shovel. Shuttle. Sift. For a week, ecologists Megan Nasto and Fiona Soper repeated these three steps with soil on Costa Rica’s Osa Peninsula. They shoveled from specific areas of the rainforest, shuttled in backpacks and buckets to a nearby greenhouse and sifted over 2,000 pounds of soil on a tarp. The women sat in front a large brown mound for hours, picking out rocks and roots and dead spiders. It felt monotonous, meticulous. Then, they found the nods. Nasto and Soper lit up when they found the little, round root growths. They were nitrogen fixing nodules, they explained, a way for plants to convert unavailable nitrogen into a usable form. Soper and Nasto are two of the women in UM’s Terrestrial Ecosystem Ecology lab. They study nutrient cycling in tropical forests with a view on how it may affect global environmental change. The other lab member, master’s student Alanna Shaw, is currently setting up a study in Panama that will look at phosphorus and its role in plant viability. I was lucky enough to spend about six months with these women, learning about their research and getting to know them as real, living scientists. My name is Maddie Vincent and I am an Environmental Science and Natural Resource Journalism graduate student. Last winter, I flew down to Costa Rica with Nasto and Soper. I learned about and assisted in finishing one project on greenhouse gas emissions from the tropical soil on Costa Rica’s Osa Peninsula, and starting another on nitrogen cycling in these same rainforests. Their work is important to them, but confounding to outsiders. Some might just see it as...
playing with dirt. I heard from the women about how difficult it is to engage people with uncharismatic subjects, but by being with them and seeing their work first hand, I learned how engaging it really is. I also spent some time with Shaw in the lab and in the field as she collected and sampled soil from Missoula and around the world, and came to similar conclusions. My experiences with Nasto, Soper and Shaw’s lab was an opportunity for two fields that rarely interact outside of interview dates to learn from each other and get to know each other, really. For GradCon, I am proposing a poster presentation that’s a photo story of my time with Nasto, Soper and Shaw. I will talk about my experiences with them, what I learned from them, what I learned about the challenges of communicating science, and how it all influenced my master’s thesis work, themed around science communication. I feel this relationship is important to highlight because it is a unique example of broader impacts, which funded scientists have to think about and prove as a part of their research. My goal for this poster presentation is to educate and share the significant amount of information I learned in a short period of time, and how its impacted my journalistic work moving forward.

**Mentor:** Cory Cleveland

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**LIT - MFA Thesis Exhibition**

**Author(s):** Tyler Brumfield

**Category:** Visual Arts (sculpture, painting, etc.)

**Abstract / Artist Statement:** Title: LIT Medium: Plexiglass + Vinyl + LED Lights Dimensions of Work: Variable, Largest eight feet tall by one foot wide Description of Installation: I will exhibit three pieces from my MFA thesis exhibition. They all require electricity to be illuminated. I will bring one that is eight feet tall by one foot wide by one foot deep, and two other wall pieces that are 4 feet tall by three feet wide by one foot deep. Artist Statment: Illuminated signage is a ubiquitous tool of advertising. One cannot drive more than a few miles on the interstate or walk down the street for more than a block without seeing it. Signs are beacons: bright, bold and boisterous. They grab our attention with light, color, shape, and placement in space, and then communicate with text and/or recognizable brand. Advertisement and visual art share a common goal: they attract the viewer to elicit a response. Advertisement seeks instantaneous recognition and understanding to turn viewers into consumers. Artists, specifically Formalists, seek to provoke a powerful aesthetic response in the viewer. This body of work relies on the reality that we have all been trained to look at signage and grasp it immediately. I am interested in the viewer’s immediate response, but I also desire a more meaningful experience. The questions that intrigue me are: what happens to signage when its communicative and directional functions are nullified? What is the resulting experience for the viewer? By appropriating the successful, eye-catching strategies of commercial signage but abandoning its communicative ambitions, I free the viewer to see and experience something familiar in an entirely new way. Without text, recognizable imagery, or clear direction, illuminated signage can only be understood as glowing geometric shapes in space. They are read formally with regard to their color, shape, arrangement, and placement in space. What were once images can now be regarded as merely objects that occupy our physical space, free of communicative distraction and directional obligation.

**Mentor:** Trey Hill
Label avoidance: a measurement of stigma

Author(s): Kali Strickland

Category: Social Sciences / Humanities

Abstract / Artist Statement: Stigma serves as a barrier to mental health treatment seeking. Label avoidance is described as a consequence of the commonly studied public stigma, in which an individual who holds negative beliefs about a specific mental health concern avoids treatment he or she is diagnosed with the same disorder. This avoidance circumvents the consequences that would result from holding those negative beliefs about oneself. Label avoidance is typically conceptualized as behavioral avoidance, and the cognitive awareness components of label avoidance has not been studied. To address this, we included a self-report measure of label avoidance in a larger study examining depression treatment stigma. The current study analyzes this measure’s internal reliability, as well as its relationship to other measures of stigma and related variables. Label avoidance is not only present in depression but can exist for other disorders or groups. For example, labels such as disability status, SES, medical diagnoses could all be subject to label avoidance. The more we can understand about this concept the more can be done to mitigate its effect across disciplines. We tested the internal consistency of the label avoidance measure and provide a preliminary analysis of the measure’s concurrent validity. To analyze our measure of label avoidance, the Attribution Questionnaire (AQ) and Social Distance measure served as comparative measures of public stigma. Other measures and variables analyzed included the PHQ-8, which measured current depressive symptomology, and the Level of Contact Report, which measured exposure to depression, gender, and age. A sample of 149 undergraduate research participants was included in this analysis. A series of reliability analysis, Pearson r correlations, t-tests, and ANOVAs were used to examine the variables. The label avoidance measure had an internal consistency reliability coefficient of \( \rho = .65 \). There were no significant relationships between the label avoidance measure and gender, age, and some AQ scales. Significant correlations were found for the AQ blame scale, or how much responsibility people assign to people for their depression \( (r = -.274, p = .001) \), the AQ avoidance scale, how much the participant would avoid the individual with depression \( (r = -.179, p = .033) \), Social Distance measure \( (r = .286, p \)  

Mentor: Duncan Campbell

Lag: An Artistic Investigation of Plant Systems

Author(s): Anne Yoncha

Category: Visual Arts (sculpture, painting, etc.)

Abstract / Artist Statement: In our rapidly technologizing world, we are nudged to interact with devices rather than engaging with the mechanics behind them. Plants, in particular, sustain us directly, though the processes through which they do so have become increasingly detached from the average person’s daily experience. My work explores the often-hidden mechanics of plant physiology, such as the tension that brings water up a ponderosa pine stem against the force of gravity, or the coevolution of the Mucuna flower’s sound-reflective shape with its echo-locating bat pollinator. I aim to create work that transforms these microscopic or invisible processes into analogues viewers can experience in a tangible and visceral way. Perhaps engaging with these interpretations of plants as entities in dynamic relationships with their surroundings will contribute to our capacity to view the world around us as less silent, and more eloquent. This body of work sprang from a collaboration with UM plant physiology PhD candidate Gerard Sapes. After talking about his research, we were both struck by the thought that, though art and science can initially seem like dissimilar thought processes, the lab and the studio are actually quite similar. Both spaces provide ways to test hypotheses, providing as much
illumination from failure as success. The installation “Lag” references the lag phase of seed germination, in which the plant undergoes many important transformations allowing it to put forth a plumule and radicle (sprout and root), but none of these are apparent to the naked eye. In this piece, Mucuna pruriens seeds have been planted in balls of raw clay and allowed to progress 7-10 days in their germination process, at which point the dense and nutrient-weak nature of the clay thwarts further growth. Seven of these balls of clay extend into the floor space of the gallery, and are attached via wool thread to a series of seven panels. The panels, hand-dyed cotton with locally-sourced plant matter, are layered with pen and ink drawings of the same Mucuna plant in various phases of growth, sandwiched behind the canvas and only partially visible. As the viewer progresses through the space, movement becomes increasingly impeded by the seed balls, and the textile surface of the panels is gradually pushed and pulled by intrusions of the same wool thread, mimicking the pressure of a plant against its earthen surroundings. Knowledge of plants’ functioning and adaptations under adverse conditions is especially timely now as we are beginning to see increasing impacts of climate change. Installation art can provide a unique and powerful way to visualize the strength and fragility of the natural systems—helping viewers connect at a tangible, visceral, and perhaps emotional level with data, increasing its potential impact. I hope this artistic research can contribute to a conversation about how human life is not so dissimilar from plant life, since similar patterns sustain all living things—a conversation which can perhaps change the way we perceive and interact with the natural world.

Mentor: Valerie Hedquist

Marble, Glass & A Lawn Chair: A Sculptural Exploration of Culture Icons

Author(s): Casey Schachner

Category: Visual Arts (sculpture, painting, etc.)

Abstract / Artist Statement: To be a stone carver in 2018 says a lot about a person. Most definitely, this person is determined, but perhaps stubborn is a better word choice. You have to be a bit ironwilled to be a stone carver. Living in such a fast-paced culture where technology is changing rapidly, it is ironic to go into a profession that is so difficult, expensive, slow moving, and seemingly irrelevant. For me, stone carving could not be more relevant to a society that is moving so quickly. I find it imperative to slow down with a material as a contemporary female sculptor and ruminate through my ideas. The history of stone sculpture is intimidating. We do not live in the Renaissance but we are quick to associate stone carving with this austere period of cultural rebirth. In order to humble the material, I take the stone down from the pedestal and attempt to use it in unorthodox ways. Recently I’ve created a body of work exploring the historical medium of marble in a contemporary context. This work examines how social hierarchies of material can be transgressed. My marble sculptures surprise the viewer by allowing them to touch the stone, an activity usually prohibited in a gallery setting. By permitting potential action, the sculptures are disrupting traditions of stone carving. Broadening the physical accessibility to artwork stems from my curiosity about how materials convey meanings tied to class and status. My most recent work, The Lawn Chair, explores the absurdity of contrasts: fragile, transparent glass and rigid, polished marble paired with the old, rusted aluminum chair frame from my childhood home in Florida. The chair itself refers to the tourism industry - it represents a woven luxury of the everyday. Tourism is Florida’s leading industry, attracting millions of out-of-state visitors annually, employing thousands of locals, and generating large percentages of the state’s revenue. I am a product of this environment. In the realm of the tourism industry, luxury goods, social status, and societal recognition are in constant flux between the visitor and the local population. While creating this sculpture, I realized the demands of negotiating what Pierre Bourdieu calls “cultural capital.” Focusing on the lawn chair as an objectified symbol of social value, I explore the absurdity of rank by creating a replaceable piece of lowbrow leisure furniture with the elevated materials of marble and glass. I am interested in examining the ubiquitous symbols of the tourism industry and
evaluate how cultural capital is assigned in places of permanent "locals" and impermanent "visitors". These utilitarian objects become part of the landscape and begin to examine the notion of place. Ironically, by building them out of carved marble and cast glass, I am rendering these objects functionless. The permanence, elegance, and history within the materials themselves is somewhat serious yet coming across a lawn chair made of stone and glass evokes a sense of surprise and humor. Much of my work strives for a balance between formal play and and an interest in history and culture which is both sincere and ironic.

**Mentor:** Valerie Hedquist

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**Maxed out? Assessing forage quality and forage availability for a northern ungulate that may be approaching food-regulated carrying capacity.**

**Author(s):** Libby Ehlers

**Category:** STEM (science, technology, engineering, mathematics)

**Abstract / Artist Statement:** The Fortymile Caribou Herd (FMCH; Rangifer tarandus granti) ranges across east-central Alaska and into the Yukon Territory, Canada and serves as an important cultural, economic and ecological resource. The FMCH has increased in population from about 52,000 in 2010 to at least 71,400 in 2017 and there are concerns the FMCH may be approaching carrying capacity. The availability of forage throughout the year may be changing as a result of density-dependent factors such as overgrazing, overbrowsing and/or trampling. Historically, the proportion of lichen in caribou summer diet declines as higher quality forage species are preferred; however, preliminary analyses suggest the proportion of lichen in the summer diet of FMCH is relatively high. Based upon 14 composite fecal samples that were collected and analyzed between 2011 and 2015, I conducted a prospective statistical power analysis to determine our ability to detect annual changes in the proportion of lichen in the summer diet of caribou. Results from the power analysis suggest the need to collect 21 composite samples and there is low power to detect changes in the proportion of lichen in the summer diet. This spring, 18 video camera GPS collars will be deployed on females in the FMCH; data resulting from video footage will expand our understanding of forage availability and selection. Furthermore, results from this research will lay the foundation for linking bottom-up drivers to population level dynamics for a herd that may be approaching food-regulated carrying capacity.

**Mentor:** Mark Hebblewhite

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**Measuring the Return on Investment of Quality Improvement in Public Health**

**Author(s):** Wendy Kowalski

**Category:** Social Sciences / Humanities

**Abstract / Artist Statement:** At a time when federal resources are scarce, government agencies are expected to do more with less. As stewards of public funds, agencies must implement programs and deliver services as effectively and efficiently as possible. In the public health field, quality improvement (QI) is an increasingly recognized approach to maximizing the effectiveness of services while minimizing costs (McLees, Nawaz, Thomas, & Young, 2015). But, how do you quantify the value of QI work? Return on investment (ROI) is a simple calculation that tells you the bottom line return of an investment over time. In public health, ROI is way to measure and communicate public health effectiveness in a manner that is understandable for policymakers, funders, administrators and the general public. ROI calculations are done in order to quantify the value of a
program or intervention. Demonstrating ROI is also a characteristic of a public health agency that has fully embedded QI into the way they conduct business across all levels, departments, and programs (National Association of County & City Health Officials (NACCHO), Fall 2012). The purpose of this project is to determine how to estimate ROI in public health and to establish a tool for the Public Health and Safety Division (PHSD) to calculate ROI. The PHSD’s Quality Work Group will be able to use this information to support the Division in their effort to establish a culture of QI. A systematic review of public health literature and databases will be conducted to identify ROI examples, QI projects, and tools that quantify value. It is expected that the results will show a way to estimate cost savings. It is also expected that there will be advantages and disadvantages found when applying ROI to public health interventions and QI projects. When looking at measuring the return on investment (ROI) with public health interventions, there are a few key factors to consider. The time lag between costs and benefits could be a significant challenge. It may take years for a public health investment to produce benefits. It can also be difficult to associate a specific intervention to a change in behavior or outcome. Measuring the direct and indirect costs of prevention can also be problematic. Selecting an appropriate performance measurement – such as: cases detected, time in process, and quality-adjusted life years gained – will be important in order to calculate the value of ROI in public health. Establishing a tool to determine ROI at the Public Health and Safety Division will help the Division continue their journey towards a culture of quality improvement. References McLees, A. W., Nawaz, S., Thomas, C., & Young, A. (2015). Defining and Assessing Quality Improvement Outcomes: A Framework for Public Health. Government, Law, and Public Health Practice, S167-S173. National Association of County & City Health Officials (NACCHO). (Fall 2012). Roadmap to a Culture of Quality Improvement.

Mentor: Kari Harris

Metabolic Cost of Load Carriage: Evaluating Existing Models with Empirical Data

Author(s): Strang JT, Alfiero CJ, Dumke CL FACSM, Ruby BC

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Despite extensive and ongoing scientific study into the metabolic requirements of load carriage, an understanding quantifying the effect of speed, load, sex and body mass has yet to come forth and the extent to which established models predict these requirements is largely untested. Specifically, because existing experimental efforts have typically focused on relatively modest walking speeds using loads representing a fixed portion of the subject’s mass, extending the available predictions to applications where individuals complete a common task carrying an identical absolute load provides estimates of unknown accuracy. Here, we measured the energy use in a large subject group walking at speeds surrounding the 1.8 m s-1 necessary to successfully complete the 4.83 km USFS wildland firefighter arduous pack (20.5kg) test, and compared these results to estimates available from the prevailing models. METHODS: We measured VO2 from 61 young (age = 22.8±3.2 yrs) adults (36 males, Mb = 79.5±8.8 kg; 25 females, Mb = 67.5±13.5 kg; study range: 55.4-119.6 kg) as they performed four, 5min trials, with a 20.5kg pack, on a level treadmill at 1.7, 1.8, 1.9 m s-1, and their individual average speed from a previously administered pack test. We used the methods of Pandolf et al. 1977 and Ludlow & Weyand 2017 to generate VO2 estimates for the 217 individual trials we administered. RESULTS: Measured values of VO2 increased from 22.4±3.2 and 24.6±4.1 ml kg-1 min-1 at 1.7 m s-1, to 31.6±5.3 and 31.0±4.5 ml kg-1 min-1 at the fastest speed administered for males and females respectively. In contrast, the accuracy of the predictive models decreased with speed and yielded prediction errors of -12.4 and -22.9% at 1.7 m s-1 for the Pandolf and Ludlow & Weyand methods respectively, these errors were -18.0 and -32.2% at the fastest speeds administered. When evaluated at the speed subjects used in the field trial the prediction models underestimated energy expenditure by 5.6±4.7 and 9.8±4.8 ml kg-1 min-1 respectively. CONCLUSION: We conclude that existing predictive models do not retain their internal
accuracy, and substantially underestimate measured values when applied to a group of male and female subjects undertaking relatively fast walking speeds with a heavy load.

Mentor: Matt Bundle

Modeling of glutamate transporters and receptors

Author(s): Denis Shchepakin

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: About 11% of the world’s diseases are neurological, with about one billion people worldwide affected according to the World Health Organization. The development of new treatments and drugs requires a thorough understanding of central nervous system (CNS) functions for design of new drugs with minimal side effects. However, due to the complexity of the nervous system, elucidating many basic parameters and functional properties turns out to be challenging. In this work we present the application of a particular mathematical approach, called the Boundary Function Method, to determine unknown neurophysiological parameters. Neurons are the cells responsible for the basic functions of the nervous system. They communicate with each other and with different parts of the body via signaling molecules called neurotransmitters that are released to act at receptors. Glutamate is the predominant excitatory neurotransmitter in the mammalian human CNS. However, the prolonged exposure of receptors to glutamate leads to excitotoxicity and neuron death. Excitatory amino acid transporters (EAATs) play an important role by transporting glutamate in astrocytes from the extracellular space after neuronal signaling and limiting its toxic effects. To date five different subtypes of EAATs have been found in mammals, namely EAAT1 - 5. In human forebrain the major transporter on neurons is EAAT3 and the major transporter on astrocytes is EAAT2. Epilepsy, Alzheimer’s disease, stroke, and other diseases are associated with changes in glutamate transporter functions and expression. However, some basic properties of EAATs are still not known. For example, the turnover rate of EAATs, i.e., the average time it takes to transport a glutamate molecule, differs in the literature by several orders of magnitude. This uncertainty is due to a discrepancy between the complexity of the existing models and the limited available experimental data. The naïve statistical approach to analyzing this problem previously used by various researchers was not suited for the analysis of such problems. The lack of mathematical apparatus often results in unreliable estimates of model parameter values which results in the mentioned above discrepancies. The use of more advanced methods of analysis has allowed us to derive a new model of the process of interest and to resolve the issue of reliably estimating the transporters turnover rate. One of the major subtypes of glutamate receptors on neurons is the N-methyl-D-aspartate receptor (NMDAR). NMDARs play critical roles in neural plasticity, development, learning, and memory. Disrupted function is associated with disorders including epilepsy, depression, schizophrenia, ischemic brain injury, and others. For common heterotetrameric NMDARs to signal, they must bind glutamate at each of two NR2 subunits and coagonist (D-serine or glycine) at each of two NR1-type subunits. In response to prolonged agonist pulses, NMDARs desensitize, a process in which the response amplitude decays over time. This desensitization is observed to increase in the presence of limiting coagonist. This phenomenon could potentially be explained by different mechanisms. One possibility is that coagonist already bound to the NMDAR could experience a reduction in affinity following glutamate binding (“glycine-dependent desensitization”). Alternatively, the effect of coagonist concentration on desensitization may not depend on agonist-coagonist site interactions. Here we use the Boundary Function Method to derive new mathematical models to describe the process as well as to design a set of experiments necessary to answer the question on the nature of desensitization.

Mentor: Leonid Kalachev, Michael Kavanaugh
Montana: The Last Best Place to Die by Suicide – An evaluation of Montana’s fragmented prevention efforts.

Author(s): Kim Spurzem

Category: Social Sciences / Humanities

Abstract / Artist Statement: Montana has been a leader in the nation in deaths by suicide for over 40 years, making it one of Montana’s largest public health priorities. In fact, suicide is the second leading cause of death for children under the age of 18 in the state of Montana. As of 2017, 10% of all 9th-12th-grade students in Montana self-report to attempting suicide in the past year (16% for Native youth and 20% for youth with disabilities). Montanans risk factors for suicide continue as they age and most deaths by suicide in Montana are white (91%), men (79%), middle-aged (53%), and utilize lethal means such as firearms (63%). Montana also has the highest per capita death rate of veterans in the nation at 68 per 100,000 (national average is 17). To address the complex nature of suicide in Montana this project took an innovative approach of combining the historical and cultural wisdom of Montana with existing secondary data sources, electronic message data from a national suicide prevention source, and a community-wide assessment. This project initially sought to find a correlation between suicidal ideation and variables such as experiences with depression, family conflict, relational challenges, anxiety, substance abuse, and many other risk factors. To increase my understanding of suicide, risk factors, and prevention programming, I completed a literature review of over 300 articles assessing for evidence of effectiveness and feasibility within Montana. However, mid-project it became apparent that one of the largest barriers to addressing suicide in the state of Montana is the fragmentations of systems (public health departments, schools, mental health service providers, community groups, and individuals and families). To address this, I completed a county program assessment in which I contacted at least one prevention coordinator (i.e. school-based, public health, or medical provider) from each county, reservation, and Urban Indian Center. Following this, I cataloged innovative, evidence-based, and culturally relevant programs to be published later this year on the web. Research on suicidal ideation and intention is over 100 years old. Despite having a breadth of research on the subject there are significant gaps when looking to address suicidality in Montana. To understand the unique nature of suicide in Montana and barriers for addressing it one must understand the history and culture as valid data sources. Montana’s culture of isolation, self-resilience, emotional stoicism, and demand for privacy create unique barriers for addressing the silent nature of suicidal thoughts and behaviors. In addition, the history of colonization and systemic genocide of Native people and the devaluing of women, children, and other marginalized groups cannot be forgotten. Each of these factors was included as part of the analysis for each element of this project. To date, the findings of this research have been presented to key stakeholders and state leaders such as the Governor’s office and the Department of Public Health and Human Services. This project will be used to develop resources

Mentor: Ryan Tolleson Knee

No One Left Behind: Forensic Anthropology in The Community

Author(s): Keith Biddle; Britney Radford

Category: Social Sciences / Humanities

Abstract / Artist Statement: Forensic Anthropology and Bioarchaeology are subdisciplines of the field of Physical Anthropology. Forensic Anthropology deals with the study of human remains in the medico-legal context, while Bioarchaeology focuses on human remains and their excavation within the archaeological record. This historic burial case came to the University of Montana through the initiated request of a citizen in an effort
to identify his relatives’ remains by correlating our findings with family records before being re-located to another cemetery. The remains were originally exhumed by Beaverhead County and transported to the Montana State Crime Lab in Missoula before being transferred to the University of Montana Forensic Anthropology Lab (UMFAL) for analysis. They were temporarily curated at UM during the analysis and have subsequently been sent back to the citizen, along with our findings, for reburial. Standard Forensic Anthropology and Bioarchaeological methods were used in this analysis. In order to determine the sex of the individual, aspects of the cranium, pelvis, and upper arm bones were examined and findings were verified using well documented and peer-reviewed regression formulae and statistical analyses including the use of FORDISC 3.1. Living stature was estimated by taking measurements of the long bones with an osteometric board and calculated using known and accepted mathematical formulas. Age-at-death was found by assessments of the ektocranial sutures, dental patterns, and known changes that occur to certain features of the pelvis. Ancestral estimations were made using morphoscopic analysis of the cranium as well as by taking craniometric measurements and then employing statistical analysis with FORDISC 3.1. Trauma and pathology analyses were also performed and the findings corroborated with Dr. Aldo Fusaro of the Montana State Crime Lab in Missoula. The artifacts that were transported with the human remains were catalogued and Archaeology faculty from UM were consulted in an effort to help ensure the accuracy of findings. This case is a great example of combining different methods and techniques from multiple fields of Anthropology in order to identify a set of human remains.

Mentor: Kirsten Green

Of Ruptures and Raptures: Locating Ideology with LiDAR Imagery

Author(s): William Schroeder, University of Montana--Anthropology Dept.

Category: Social Sciences / Humanities

Abstract / Artist Statement: Problem: Historical Archaeologist, Mark P. Leone, has been searching for the object of Mormon ideological desire in the archaeological record within capitalism for over 40 years. He has located certain artifacts and pieces of technology that provisionally satisfy criteria he outlined in 1973 and 1978, but none is the object. The ultimate Mormon ideological desire in the 19th and early 20th centuries was the recreation of Zion, the abode of Jesus Christ and the righteous Chosen Ones prior to His 2nd Coming. Can we identify and locate the object of Mormon ideological desire in the archaeological record within capitalism? Purpose: The purpose of my dissertation in Cultural Heritage and Applied Anthropology will be to re-examine Mark P. Leone’s argument and method for identifying the object of Mormon ideological desire in the archaeological record within capitalism keeping in mind a definition, rubric, and insights of what an object of ideology is from Slavoj Žižek. Hypothetically, the object of Mormon ideological desire in the archaeological record within capitalism can be identified if certain assumptions and premises of Lewis Binford, Mark P. Leone, Slavoj Žižek, Thomas A. Tweed, and Richard V. Francaviglia are accepted. Methods: By re-examining the life-work of Dr. Mark P. Leone who investigated the intersectionality of technology, ideology, and ritual within Mormonism in the 19th and early 20th centuries, one arrives in the 21st century with new methods and a better insight to the potential identity of the object. Landscape Archaeology landscape analysis of LiDAR imagery will ideally lead to the identification and location of the object. A textual deconstruction of the local legend of “Miracle” Spring will also assist in the identification of the object. I will apply landscape analysis to 2014 LiDAR imagery and archival maps of the northern Lower Gros Ventre River floodplain terrace and the Ditch Creek alluvial fan within the Grand Teton National Park in and around Grovont, Wyoming, a.k.a. the Mormon Row Historic District, in search for a pattern that meets certain criteria and articulates the research agenda: to identify and locate the object of Mormon ideological desire in the archaeological record within capitalism. Originality and Significance: I have applied landscape analysis to the northern Lower Gros Ventre River floodplain terrace and the Ditch Creek alluvial fan within the Grand Teton National Park in and around
the Mormon Row Historic District while deconstructing a local legend of “Miracle” Spring in an attempt to identify the object. This was experimental and had never been attempted before. The result was the identification and location of a Mormon Irrigation Pattern (MIP) that meets the criteria of a rubric outlined by Žižek. Re-creation of Zion could only have been possible through irrigation practices, therefore ‘New Zion’ was and is reified in and by an MIP that masked and hid a void, a deficiency, is an unattractive leftover from the past of which we are aware, and functioned as a circulating object in the daily lives of the Mormon settlers of Jackson Hole, Wyoming while permitting the community to participate marginally in capitalism.

Mentor: Richard Sattler

Pig Trauma Models: A Civilian Perspective on AR-15 Skeletal Trauma

Author(s): Lauren Kenney

Category: Social Sciences / Humanities

Abstract / Artist Statement: In the last decade, our country has seen an unprecedented wave of terror punctuated by increasing events of gun-related violence. Consequently, the use of firearms against civilians or upon targets containing civilians has inevitably had a direct impact on the health of those affected, and in many cases these events have concluded with mass number fatalities. The driving force for this research falls to the lack of available literature regarding the skeletal trauma associated with high-velocity firearms outside of the realm of the military. Trauma from high-velocity firearms encountered in the civilian setting differ from what is seen in military combatants in terms of the epidemiology, mechanism of wounding, and pathophysiologic trajectory. The effects of these types of weapons on civilians, which result from their specific design and the context in which they are utilized, cannot be neglected any further. This research attempts to investigate the skeletal tissue trauma inflicted by a high-velocity firearm, specifically the AR-15, in a civilian context. For the experiment, two post-mortem pigs were positioned upright and safely fired upon using an AR-15 with Remington .223 55 grain full-metal jacket ammunition from varying distances of 25 yards and 50 yards, respectively. The targeted areas of impact included the right and left extremities, right and left innominate of the pelvis, as well as portions of the thorax and abdominal regions. After exposure to high-velocity AR-15 gunfire, the severity of the trauma to bone was analyzed taking into consideration the significant amount of bone obliteration. Examination and analysis was completed on the trauma present, including the location, dimensions, and fracture type (if available). Small bone fragments were weighed together using a digital scale and were considered as a whole. Larger fragments were measured using digital calipers and were counted. Bullet fragments were also counted, if present. The results demonstrate that when subjected to high-velocity AR-15 fire, the severity of the trauma to the skeletal tissues is so significant that reconstruction due to complete fragmentation of the targeted areas is nearly impossible. When the variable of distance is applied to such a high-velocity weapon, the severity of the trauma to the skeletal tissues was so significant that no determination or correlation of the distance was be able to be interpreted from the trauma. Bullet fragments were present only in the examination of the pig exposed to the 25 yard AR-15 fire. However, due to the small sample size, the presence or absence of bullet fragmentation could not be correlated to distance. While the sample size for this research is small, it is with hope that its importance is demonstrated due to the fact that there is inevitably much to be gained from the understanding of the patterns and type of high-velocity firearm trauma, especially when they are used against civilians. The recognition of the differences could be applicable to the study of trauma in an anthropological context, which in turn could be beneficial to future humanitarian efforts and research involving civilians in mass atrocity events around the world.

Mentor: Randall Skelton
Preventing cancer through local policy change: use of artificial UV tanning services among minors.

Author(s): Stefanie Tassaro

Category: Social Sciences / Humanities

Abstract / Artist Statement: In 2014, the U.S. Food & Drug Administration began requiring warning labels be placed on sunlamp products stating that they should not be used by anyone younger than 18 years of age due to their associated risk of exposure to ultraviolet (UV) radiation, which can cause skin cancer, burns, premature aging, and eye damage1. Although the percentage of Montana youth that are using indoor tanning devices has been decreasing over the last few years2 (13.4% in 2013 compared to 11.8% in 2015 and 7.4% in 2017), minors are still at increased risk of developing skin cancer as a result of artificial UV tanning. The Tri-County Cancer Coalition, which includes Gallatin, Park, and Sweet Grass counties, has decided to pursue local policy change that would prohibit the use of tanning beds for minors by means of advocating for a local ordinance for the city of Bozeman. In 2016, the Tri-County Cancer Coalition conducted a brief survey of establishments in Madison, Park, and Gallatin counties that offer UV tanning services. This survey asked tanning salons if they were aware of the 2014 FDA warning label requirement and if they had a policy in place that prevented minors from using their tanning beds. All nine establishments that responded to the survey reported knowing about the FDA labeling requirements and most (78%) had a policy regarding minors. However, only 5 out of 10 salons in Bozeman completed the survey, and there is evidence that new salons have opened in Bozeman since 2016. The Tri-County Cancer Coalition will conduct a follow-up survey that focuses specifically on the Bozeman area and will collect additional data on the percentage of minors using tanning services and the types of policies that establishments have in place. The purpose of this presentation will be to share the findings of this survey, specifically the number of salons in Bozeman that offer UV tanning services, level of awareness of the FDA warning label requirement, the percentage of minors utilizing UV tanning services, and the types of policies that salons have for clients ages 18 and under. This presentation will also discuss how the results of this survey will be used to develop an action plan and next steps for the Tri-County Cancer Coalition in pursuit of a local ordinance that will prevent minors from using tanning beds at all tanning establishments within the city of Bozeman. Exposure to UV radiation from tanning beds poses serious health risks, especially for minors, and can cause skin cancer, burns, premature aging, and eye damage. The Tri-County Cancer Coalition hopes that this work will help set a precedence for other Montana communities looking to establish a local ordinance banning minors from using artificial UV tanning services. References Tanning. FDA.gov. https://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/Tanning/default.htm. Updated June 1, 2017. Accessed March 3, 2018. Youth Risk Behavior Survey. OPI.mt.gov. https://opi.mt.gov/Leadership/Data-Reporting/Youth-Risk-Behavior-Survey. Accessed March 3, 2018.

Mentor: Kari Harris

Probability-based confidence assessment of Transposable Element annotation helps explain confusing annotation results

Author(s): Kaitlin Carey; Gilia Patterson

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: A better understanding of the distribution of transposable elements (TEs) in the genome is needed in order to improve whole genome annotation and genetic studies. TEs are sequences of DNA
that replicate within the host genome. More than 55% of the human genome is TE derived, and large fraction of the remaining unclassified DNA likely shares a similar origin. However, identification is made difficult by large scale accumulation of mutations. TEs are organized into families, each family corresponds to a collection of replicates created by an ancestral sequence. Over evolutionary time, families can experience bursts of replication activity. The parental sequences for these bursts contain mutations that distinguish them, and their replicates, from other replicates – this allows instances to be annotated as belonging to different subfamilies. Current methods of annotating TE content depend on a library of known TE families, where each family/subfamily is represented by a single consensus sequence. Annotation, the process of finding sequence locations in the genome, is performed by aligning these consensus sequences to a genomic sequence. Sequences of related TE subfamilies can be highly similar to one another. Therefore, all related subfamily sequences may align, each with a high score, to the same region of the genome. Current methods annotate the affected sequence as being the subfamily with the highest alignment score. This form of annotation is limited; solely using an alignment score does not accurately depict the complex relationship between TE families. One way to test the accuracy for this type of classification is by using segmental duplications (SD), which are large segments of DNA with nearly identical sequences. SDs result from large-scale duplications of genomic regions during cell replication. When a TE sequence is included in a SD, the result is two exact copies of that TE in the genome. Following the duplication event, each instance accumulates mutations independently, yet both instances should be classified as the same subfamily. We have found that current annotation methods cause more than 10% of TE copies found in SDs to be classified as different subfamilies. We have developed a computational analysis that performs a more statistically sophisticated annotation for these alignments. Instead of basing the alignment on a single alignment score, we compute confidence scores for the alignments. Confidence scores are calculated using an application of Bayesian statistics to the probabilities underlying the alignment scores. With this analysis, we can better explain the frequent discordant classification of TE copies observed in segmental duplicates. In the future, this analysis will be built directly into the software used to align subfamily sequences to genomic sequence, enabling improved genome annotation.

Mentor: Travis Wheeler

Psychological Forces Behind the Theatrical Drama of Tennessee Williams

Author(s): Peter Philips

Category: Performing Arts (dancing, playing instrument, reading)

Abstract / Artist Statement: Tennessee Williams believed that to develop a closer approach to dramatic truth beyond the dominant twentieth century realism of the American Theater, expressionism, employing unconventional techniques, would have to be employed. Only using "other" transformative shapes could poetic imagination define truth, life or reality. The truth for which Williams strove lives within the individual, the soul of his characters. This truth, as determined by the character's behavior, determines the viability of the person, the individual's own search for the reality of his life. Only through the mechanisms of "plastic forms" lighting, sound, music, sets and props could character truth be theatrically staged. Williams was describing expressionism, where the artist seeks to depict the subjective emotions and responses that objects and events arouse within the individual consciousness. Williams is concerned with the reality of the "broken world," with poetic paradox; light in dark, good within evil, body against soul, God and Satan. His dramatic form represents the struggle of man to transcend his humanity, "to provide for himself a mode of reconciliation with divine purpose." Williams rejects the Aristotelian concept of the protagonist as a "good"man substituting "for it an anti-hero, one neither good, knowledgeable nor courageous." Rather, he focuses on the anti-hero protagonist, a person of reflection and contemplation, as an image of the modern man who more truly reveals "the true nature of suffering as it appears in the life of the twentieth century." Williams Anti-Hero The changes which affect the
idea of the anti-hero are embodied in the science of psychology. Under psychological scrutiny the classic ideals of nobility, courage, and goodness assume a significantly different aspect. Along with the psychological definition the principals of Christianity are a more meaningful standard of human action. Christianity holds everyman a sinner, redeemable only through love. This doctrine insists, as does Williams, that all men are anti-heroic, and therefore guilty of the "human condition." This "inner oriented" ethic of the Christian protagonist for the "outer directed" heroism of the Greek hero was adopted by many American playwrights. Archetypes and the Psychological Myth In the drama of Tennessee Williams psychological myth is a primary element of his content. Williams finds in Jung's theories of image-making, primordial and archaic forms, archetypes, written in the collective unconsciousness. The archetypes, genetically coded and transferred to successive generations, are shared memories for the entire human race in religion, dreams, myths, and fantasies. They may be expressed through plot pattern, character type, or images that endow the story with symbolic meaning. Williams creates myths of modern life, weaving the dark images of his personal vision with psychological, religious, sociological and philosophical contents in a schematic explication of modern life. Through his dramatic characters Williams describes modern man's search for salvation. Through the myth of twentieth-century America, he relates individual oriented perceptions to the larger question of the destiny of civilization. The archetypes within Jung's theory of the collective unconscious may be used by Williams to inform his characters. The purpose of this research is to show through character analysis that Williams's drama players may derive from the archetypal images of the playwright's inherent collective unconscious.

Mentor: Bernadette Sweeney, Ph.D.

Regulation of neuron growth and development by the matricellular protein dCCN

Author(s): Elizabeth Catudio Garrett; Travis Pallister

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Multicellular organisms are a dynamic system, maintaining structure through interactions between individual cells, and the environment around cells known as the extracellular matrix (ECM). Communication between cells and the ECM is important in every aspect of development and organ function. Numerous studies have demonstrated disruptions in cell - ECM signaling can lead to diseases such as cancer, and cardiovascular disease. In addition, specific interactions between neurons of the brain and the ECM are critical for wiring of the developing nervous system, learning and memory, and neural regeneration following injury. The CCN (Cyr61, CTGF, NOV) members are an important family of regulatory ECM proteins that are secreted by cells, and function by cell-cell signaling. CCN proteins contain four well-characterized, conserved modules that enable a single CCN family member to interact with numerous other ECM proteins. CCN proteins have been described as the water cooler of the ECM, bringing various workers to the area at different times to regulate cell behavior, and aid in providing cell homeostasis. In vertebrates, there are 6 CCN family members. In the fruit fly, Drosophila melanogaster, there is one identified CCN protein (Drosophila CCN (dCCN)) which is highly expressed in neurons. Octopamine, a neuromodulator of courtship and aggression behaviors, is required for male behavior. Previously, rodent models have been challenging to use. Due to the simplicity of the Drosophila nervous system and single CCN protein, we are able to examine the requirement of dCCN in neuron function, octopamine neurons, and male behavior. To test the hypotheses that dCCN is required for neuron function, in octopamine neurons, and male behavior, progeny will be generated that have reduced dCCN in dCCN-expressing neurons and control progeny. Both control and experimental dCCN-expressing neurons will express a green fluorescence protein (GFP) reporter to visualize the neurons. Dissected brains and use of the confocal microscope will provide images and allow quantification of dCCN-expressing neurons in control and mutant brains. Progeny will be generated that have reduced dCCN in octopamine neurons as well as control progeny. Experimental progeny will be placed in behavioral assays to examine male aggression and data will be used as readout of neuron function. Progeny lacking dCCN in octopamine neurons will express a nuclear tag to allow visualization of dCCN expressing cells. An anti-tdc2
antibody will mark octopamine neurons. Brains and ventral nerve cords will be obtained and fluorescent images will be acquired using a confocal microscope. It is predicted that neurons without dCCN will survive but exhibit abnormal neuron function. It is also predicted that a lack of dCCN in octopamine neurons will display abnormal neuron function and altered aggression. This result would demonstrate that the ECM of the nervous system is a key player in neuron development and neuron signaling, and provide functional data useful in all organisms. This work is significant and important because experiments will reveal insight into how CCN proteins govern neuronal growth, development, interactions with neurotransmitters, function, and behavioral circuitry. Results will also contribute to the understanding of neuron and ECM interactions in general.

Mentor: Sarah Certel

“reTHINK”ing Roles: Using Organizational Input for Committee Recruitment

Author(s): Hannah Groves

Category: Social Sciences / Humanities

Abstract / Artist Statement: The reTHINK (Together Helping to Integrate New Knowledge) committee is a group of public health practitioners in Yellowstone County who work on improving cultural competence throughout public health service delivery. The group was put together in response to national public health accreditation requirements and is aligned with Culturally and Linguistically Appropriate Services (CLAS) standards. As a result of more than three years of foundation-building, along with external factors such as public health restructuring and organizational strategic planning, a need for formal re-evaluation of member roles, capacity, and time commitment is needed. The project will demonstrate how input from individuals both in and outside of a committee can be used to create member role descriptions. Defined roles will assist in new membership recruitment with the ultimate goal of creating a stronger, more cohesive group. The process of how the role descriptions are created will demonstrate how garnering input from a variety of perspectives can be used to recruit members in a meaningful way. Membership recruitment was a necessary activity identified by current reTHINK members as part of a retreat-planning process. The committee’s strategic plan will be created at the retreat. New members will be integrated into the committee at the retreat as well, which is why current members identified targeted and informed recruitment as a priority. The committee agreed that creation of role descriptions is valuable so that interested individuals had a clear picture of member duties, obligations, and time requirements before applying. CLAS concepts can be sensitive, and the group wanted to put a lot of thought into adding to existing membership. To inform the role descriptions, an online survey and key informant interviews will be utilized to collect qualitative information about what being a reTHINK member looks like. The online survey will be emailed to current reTHINK members to solicit members’ perceptions of appropriate time and capacity demands, as well as perceived value of participation. Key informant interviews will be used in supplement to the member surveys to collect information on perceived value and role of reTHINK within the organization from both members and non-members. Interview subjects will be pre-identified to provide diverse representation based on public health division, leadership level, reTHINK versus non-reTHINK status, age, gender, & time served in public health. Individual responses or specific results from the survey and the key informant interview results will not be shared with the academic community at large; instead, the process itself will be outlined with a description of how input was garnered and how that fed into the creation of the role descriptions. The decision to de-identify the data this way is to minimize potential negative personal or professional consequences for participants. This project will demonstrate that garnering input from stakeholders when recruiting new members can be a value-added activity and can enrich membership; this information can be used by other individuals, groups, or organizations needing to increase or re-invigorate membership in a meaningful way.

Mentor: Kari Harris
Sex Determination from a Geometric Morphometric Analysis of the Pubic Bone: A Pilot Study

Author(s): Katherine Jackson

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: As forensic sciences improve, there is a greater need for metric analysis of traditional techniques to help elevate the standards used for identification of human remains. It is well known that the pelvis is the best skeletal element to determine the sex of an individual, however, metric and 3D analyses of the pelvis are limited. Traditional morphoscopic techniques often use visual features of the pubic bone to determine sex; these methods are subjective and metric analyses may be able to improve their accuracy. Here, a 3D Microscribe Digitizer is used to collect landmark data on the body of the pubic bone, in order to determine sex based on a shape analysis. This pilot study is necessary to determine which landmarks, techniques, and statistics are most useful for future dissertation research. This sample consists of 5 females and 9 males, with a total of 24 pubic bodies from the University of Montana (UM) Skeletal Teaching Collection. The initial hypothesis of this project, based on a review of the existing literature and experience is that this 3D geometric morphometric analysis will accurately determine the sex of skeletons based on the shape of the pubic bone. The use of geometric morphometrics has become increasingly popular in forensic anthropological research. Geometric morphometrics is, at its most basic level, the metric analysis of shape. This method has been used in many biological studies for at least the past three decades, but is relatively new in the field of Forensic Anthropology. 3D geometric morphometric analysis is still a new technique in Forensic Anthropology, and because of this, there are relatively few studies utilizing the method and there is little standardization among the existing research. Further research using 3D techniques on the post-cranial skeleton is needed to help increase accuracy of sex estimation in forensic and archaeologic contexts. Research focused on the pelvis most commonly investigates changes in age, and few projects attempt to metrically determine sex. It is especially important today to develop accurate metric analyses due to the need for reliable and objective results in the court room. Improving the specificity of sex determination in the pelvis has the potential to improve both modern forensic anthropology as well as analyses within bioarchaeology. This presentation will review the results of this pilot project which will ultimately affect the methods of a larger dissertation project. The goal of this dissertation project will be to use a 3D Microscribe digitizer to assess sex from the pubic bone, as well as to compile a list of standard landmarks that can be used in future geometric morphometric studies of the pubic bone and pelvis. A larger, completely modern sample of pubic bones will be created for the dissertation by removing bone portions from individuals receiving an autopsy, after their next-of-kin have offered consent. The information gained from this research should be applicable to modern forensic cases as well as other various scenarios, such as mass or commingled graves.

Mentor: Dr. Kirsten Green

Size and shape of multi-walled carbon nanotubes influence epigenetic changes and lung disease in a mouse model

Author(s): Elizabeth Cole; Jessica Ray; Andrij Holian, University of Montana; Raymond Hamilton; Yoon Hee Cho; Pamela Shaw; Nathan Hechtman

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Rationale: The diversity in physico-chemical properties of engineered multi-walled carbon nanotubes (MWCNT) are a major human exposure concern. Studies indicate that
mechanistically, epigenetic changes could be at least partially involved in MWCNT-induced pro-inflammatory and fibrotic lung pathology. However, the precise mechanisms have not yet been defined. Furthermore, toxicological studies have not yet addressed all variables of exposure. Therefore, this project aimed to identify possible epigenetic biomarkers of MWCNT exposure and disease progression and to characterize distinct epigenetic changes in response to MWCNT of varied size and shape relevant to lung disease. Methods: Adult 2-month C57BL/6 mice were exposed via oropharyngeal instillation to one dose (50 micrograms) of either dispersion media only (DM), or to a different diameter and length MWCNT: “Wide Short” (WS), “Narrow Short” (NS), and “Narrow Long” (NL). Lung lavage fluid (LLF) and lung tissue (LT) were collected after 24 hours and 7 days exposure in order to examine pulmonary inflammatory responses. A mediator of inflammation, high-mobility group box 1 (HMGB1), was measured by ELISA from LLF 24h post-exposure. At 7 days post-exposure, LT airway thickening within LT were measured using laser scanning cytometry. From LT, global DNA and promoter methylation of inflammation and fibrosis-related genes were measured using the luminometric methylation assay (LUMA) and the pyrosequencing assay, respectively. Results: HMGB1 was non-significantly elevated in all MWCNT groups, with significant increases in NS and NL after 24 hours in LLF. After 7 days, a hierarchy in airway thickening was observed: NS Conclusions: The observed methylation trends suggest that dynamic epigenetic changes and multi-gene mechanistic processes are occurring within the acute to sub-acute immune responses to MWCNT exposure. These epigenetic changes are sensitive to the variables of MWCNT size and shape. The results suggest that methylation alterations might not correspond directly to MWCNT bioactivity.

Mentor: Yoon Hee/Cho

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**Testing for facultative switching between migratory strategies in a partially migratory, long-lived herbivore population.**

**Author(s):** Hans Martin

**Category:** STEM (science, technology, engineering, mathematics)

**Abstract / Artist Statement:** Migration is the seasonal movement of animals from one region to another, a behavioral strategy adapted to spatial variation in resource abundance. In addition to the access of resources, migration can also allow animals to escape from predators at local scales by moving to areas of lower predator density. While we often think of migration in a binary sense (either a population migrates or it doesn’t), many species of animal exhibit partial migration where a portion of the population exhibits migratory behavior and a portion remains as resident year round. As migratory paths and migratory behavior disappear globally, it is important to understand why individuals within a population migrate while some remain as residents and how this behavioral decision influences reproduction and survival. To answer these questions, I am studying the migratory behavior and resulting population dynamics of the Ya Ha Tinda elk herd in Alberta, Canada. The population has declined over the past 20 years from ~2,200 individuals to ~450 individuals and has seen dramatic shifts in the ratios of migrant and resident individuals in the population. What is interesting about this behavior is that recent research on this population determined that an individual elk switches between resident and migrant strategies throughout its life. We will use over 16 years of data on survival, reproduction, and movement to understand the effect that switching has on the population dynamics of this herd and why this switching behavior occurs. The management and persistence of this elk herd is important to both Provincial managers and Parks Canada biologists because this elk herd summers both in Banff National Park and on Provincial lands and winters on Provincial lands outside of the park providing both viewing opportunities within the park and hunting opportunities outside of the park.

Mentor: Mark Hebblewhite
The Battle of the Little Bighorn Gunshot Trauma Analysis: Suicide Prevalence Among the Soldiers of the 7th Cavalry

Author(s): Genevieve Mielke

Category: Social Sciences / Humanities

Abstract / Artist Statement: The Battle of the Little Bighorn is a widely studied battle by historians, archaeologists, and military personnel, among others. Although this battle is a popular topic among researchers of all fields there has not been much analysis done on suicide among the soldiers of the 7th Cavalry. The Battle of the Little Bighorn cost the U.S. army 268 men, who included the entirety of General Custer’s men and just over 1% of the men enlisted in the army at that time. The question of what happened and why the 7th Cavalry lost so many soldiers in comparison to the pointedly less Native American casualties is something that has not been fully answered. One possible explanation, in accordance with many other factors, is that of mass suicide among the soldiers of the 7th Cavalry. This study hopes to shed some light on the suicide question through an analysis of gunshot trauma of osteological specimens and first hand historical accounts of suicide on the battlefield. Access to skeletons was not possible due to reburial and so an analysis of skeletal material is based upon two archaeological reports conducted in 1983 and 1997 provided by the State Historic Preservation Office. The use of historical documents in conjunction with forensic methods can potentially illuminate on the possible causes of the mass casualties suffered by the U.S. 7th Cavalry during the Battle of the Little Bighorn. The topic of suicide today is something of a taboo, especially among active and veteran military members even though it is a prevalent problem. Through this discussion of suicide among military members, whether in 1876 or 2018, this topic can hopefully spark discussion and awareness for the public

Mentor: Kirsten Green

The Climate Change Sublime: The Immense Awe of a Planetary Threat

Author(s): Sean Quartz

Category: Social Sciences / Humanities

Abstract / Artist Statement: This essay attempts to address the lack of rhetorical awareness surrounding the enormous threat represented by climate change, which too often results in ineffectual and even counterproductive communication to audiences. Climate change is awe-inspiring, not because of its magnificence, but because of the immensity of its threat to humanity. Therefore, I argue that it is productive to conceptualize climate change as a sublime. I define the term “climate change sublime” as the tensions that arise from recognizing the planetary threat of climate change, whether through the mass extinction of species or significant adverse alterations to the livability of the planet, while simultaneously experiencing its exigence that evokes powerlessness, uncertainty, and a fear-based awe. The paradoxical tension of the climate change sublime is that its apprehension educes powerlessness while also demanding a reduction of its enormous exigent threat. Therefore, this paradox presents a significant obstacle for rhetors to overcome when motivating audiences to act to mitigate and adapt to climate change. However, within this obstacle also lies an opportunity to engage audiences. If audiences are gradually eased into the apprehension of the sublimity of climate change and then are immediately given information that reduces its threat, those audiences may have the capacity to be effective social actors in the face of this planetary threat. I argue that the documentary Chasing Coral overcomes the obstacle of the climate change sublime by gradually easing audiences into the apprehension of its immense planetary threat, of which the death of corals is only a symptom. Once the sublimity of climate change is sufficiently apprehended, the film immediately shifts to information that reduces the threat to empower the audience to be effective social actors in the face of this overwhelmingly dreadful sublimity.

Mentor: Steve Schwarze
The Portrayal of Unmarried and Married Women in Bhojpuri Folksongs

Author(s): Srijeet Mukherjee

Category: Social Sciences / Humanities

Abstract / Artist Statement: Bhojpuri people, culture and language originate from parts of southern Nepal, various districts of eastern Uttar Pradesh, western Bihar and some areas of Jharkhand in India. However, Bhojpuri speakers are also found in Mauritius, Fiji, Suriname as well as Guyana as their ancestors were taken to these parts as indentured laborers by the British. The Bhojpuri people have a lasting tradition of folksongs which have centuries of history affiliated with them and the inventory of these folk songs is still flourishing. These songs encompass a vast array of subjects giving equal weightage to episodes from religion, culture, seasons and occupation. Bhojpuri folksongs depict patrilocal, patriarchal and patrilineal Hindu joint families. The want for a male heir to take the family lineage forward has forever been desired by the Bhojpuri speaking families in Uttar Pradesh and Bihar, needless to say that there have been privileges and biases towards the male child in families which have male and female children. Male migration in Bhojpuri speaking communities is very common. There are songs that are born out of the longingsness that Bhojpuri women face because their husbands leave the villages to seek better employment in cities. Women in the Bhojpuri society have for the longest time been and been expected to be subservient. The want for a male heir to take the family lineage forward has forever been desired by families and the male child often gets more affection and privileges like education over the female child. Even after marriage, if the girl does not possess domestic skills the mother-in-law is said to blame her upbringing and blame the girl’s mother for not having trained her adequately. This often causes a strained relationship between the daughter-in-law and the mother-in-law. Furthermore, the companion of the newly-wed – her husband – more often than not is seen to have been migrating to other parts of the country for better employment opportunities and wages. This causes further trauma in the life of a newly-wedded bride. Except for the role of a sister, some songs pertaining to the familial roles essayed by a female, i.e. that of a daughter, daughter-in-law, mother and mother-in-law will be looked at and examined. Most of the folksongs are in the forms of monologues expressing troubles or worries of unmarried or married women. Some of the songs occur in pairs and are more in the form of a dialogue – either a question-answer pair or an accusation-defense pair. Considering folksongs to be a reflection of the Bhojpuri society, this paper will attempt to perform stylistic analyses on the lyrics of these songs, identify dominant or recurring themes to look at the ways in which unmarried and married women are perceived by that society. The purpose of this paper is also to look at the Bhojpuri folksongs from a socio-cultural lens and to see the markedness in the societal attitudes towards women in the Bhojpuri speaking society in India and also to present what women experience in their natal homes and the homes of their in-laws after marriage. Hari S. Upadhyay, “The Organization of the Hindu Joint Family as Depicted in the Bhojpuri Folksongs of India”. Philippine Sociological Review, Vol. 16, No. 1/2 (JANUARY-APRIL, 1968), pp. 61-65, Philippine Sociological Society Asha Singh, “Folksongs as an Epistemic Resource: Understanding Bhojpuri Women’s Articulations of Migration”. Public Arguments 3, Tata Institute of Social Sciences (2017) Nitin Sinha, “From ‘Naihar’ to ‘Sasural', How Folk Songs Map a Woman's View of Marriage and Migration”. The Wire, 3 December 2016 G.A. Grierson, “Some Bhoj’p?r? Folk-Songs”. The Journal of the Royal Asiatic Society of Great Britain and Ireland, New Series, Vol. 18, No. 2 (Apr., 1886), pp. 207-267, Cambridge University Press

Mentor: Leora Bar-el
The Presentation of the Chasuble to San Ildefonso: an Exploration of its Origins

Author(s): Nikolyn Garner

Category: Social Sciences / Humanities

Abstract / Artist Statement: The Presentation of the Chasuble to San Ildefonso is a 15th-century Spanish altarpiece panel that has been part of the Montana Museum of Art and Culture’s permanent collection since 1957. However, it was donated with little information about the artist who created it, the circumstances of its commission, the area of Spain where it originated, or its provenance from the time of its creation to the time of its donation to the University of Montana. Without research into these questions, this unique piece has not been exhibited as often as it deserves. I have explored these questions as well as analyzed the content of the altarpiece panel in the hopes of providing a fuller understanding of the piece and an appreciation of what it represents. The altarpiece depicts a significant event in the narrative of San Ildefonso, an important figure in Marian devotion in Spain. I have come to the conclusion that the altarpiece was created in Castille in the Hispano-Flemish style in the late 15th century. It was a modest commission and likely was used in a side chapel. It was eventually purchased by Antonio Gorostiza of Bilbao, Spain in the early 20th century. It was sold on the New York art market in the 1920’s or early 1930’s to Raymonde Erszanski. At the suggestion of friend and art dealer, Victor Hammer, she donated the altarpiece panel to the University of Montana as part of a large donation of various art objects from several donors. With a greater understanding of the altarpiece panel’s content, its origins, and its provenance, the panel can provide insight into the artistic and devotional practices of 15th-century Castille, Spain.

Mentor: Rafael Chacón

The Psychological and Physiological Effects of Performing the Primal Reflex Release Technique on Female, Division I Collegiate Athletes by Erika Vichcales

Author(s): Erika Vichcales

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Anxiety is a cognitive, behavioral, and physiological reaction to stress and the symptoms may manifest both emotionally and physically.1,2 Chronic anxiety and stress may cause hypersensitivity to stimuli or a pain response in normally non-painful areas, a condition called “central sensitization” (CS).6,7 Patients with CS often report chronic pain, as well as emotional and psychological symptoms including anxiety, fatigue, and depression. Various treatments are available for the symptoms of CS, but these treatments are often time-intensive, expensive, or come with undesirable side effects. Often they do not adequately treat the symptoms experienced by individuals with CS. The primal reflex release technique (PRRT) is a manual therapy approach to evaluate and relieve musculoskeletal pain in patients, including those who display characteristics of CS. The “primal reflexes”- withdrawal, startle, and protective joint reflexes—are activated when a startling or painful event occurs.9 These reflexes are a defense mechanism against threats and help prevent injury. However, these reflexes may remain in a hyper-ready state after the treat has passed, which creates pain, muscle tension, and hypersensitivity to stimuli. There is limited research on this technique, although case studies demonstrate decreased pain and muscle tension in patients treated with PRRT. While PRRT is generally used to treat pain, muscular tightness, and hypersensitivity no research has explored if using PRRT will change other symptoms that often occur with pain, including the physical and psychological symptoms common with anxiety. Therefore, the purpose of this research study is to determine if PRRT is an effective treatment for reducing psychological and physical symptoms of anxiety in NCAA Division I female
athletes. Participants for this study are NCAA Division I female student-athletes who exhibit hypersensitivity to pain or other symptoms of CS. This population was chosen because females report more anxiety symptoms than males, they are more likely to suffer from musculoskeletal pain than other college students, and at least 30% of collegiate athletes report symptoms of anxiety at the beginning of a season. The State-Trait Anxiety Inventory (STAI) is used to assess levels of state (current, “right now”) and trait (hey they “generally” feel) levels of anxiety. Heart rate and blood pressure are measured to provide data on physical symptoms of anxiety. Participants complete the state portion of the STAI and have their heart rate and blood pressure measured. An athletic trainer with more than 30 years of clinical experience, and 4 years of experience using PRRT, then performs the PRRT treatment. After the treatment is done the participant completes the state portion of the STAI again, and has their heart rate and blood pressure re-measured. Each participant returns 48-72 hours after the PRRT treatment to complete the state portion of the STAI one final time. This project will address the lack of research on how PRRT may affect some of the psychological and physiological symptoms of anxiety. If PRRT is shown to decrease anxiety symptoms, it may be used in conjunction with other forms of treatment for those who have pain with symptoms of anxiety.

Mentor: Melanie McGrath

The Stigma and the Damage Done: A Qualitative Phenomenological Assessment of the HIV Stigma in Missoula, Montana

Author(s): Bradley Applegate

Category: Social Sciences / Humanities

Abstract / Artist Statement: Purpose Human Immunodeficiency Virus (HIV) is a disease associated with a stigma that is evidenced to be a barrier to testing and treatment. Brent (2016) found this stigma is associated three behaviors; men having sex with men, people sharing needles for interventions drug use (IDU), and men employing prostitutes. In addition to the harm that the stigma causes to people who live with HIV and the barriers it creates that facilitate disease propagation, the close family members of people who live with HIV are also affected. Family members can be targeted because they are associated with the person who has HIV. Relationships between persons who live with HIV and their families can suffer due to the stigma. (Pretorius, Greeff, Freeks, & Kruger, 2016). This project explores how HIV-related stigma is manifest in Missoula County as perceived by healthcare professionals who work with intravenous drug users (IDU), men who have sex with men (MSM), and the general population. Methods According to De Chesnay, Bottorff, & Bottorff, (2015), Nursing research has a rich tradition of using Phenomenology. Phenomenology aims to understand the lived experience of another without preconceived notions and from an open and unbiased perspective. Qualitative phenomenology is the methodology that will be used for this project. People who live with HIV will be interviewed. The interview will consist of one question, “What is your experience with the HIV-related stigma in Missoula, Montana?” As the conversation unfolds, probing and follow up questions will be asked. These interviews will be recorded and the data is compiled with both similarities and differences between the different informants noted. Originality HIV-related stigma has been investigated world-wide, but data specific to rural United States locations, such as Missoula, Montana, is sparse. The qualitative phenomenological approach aspires to build a story about how the HIV stigma is alive and real by approaching the topic without preconceived notions. Phenomenology is an ontology that has been described as seeing the world as if one was seeing it for the first time, with a completely open and uninfluenced mind. Significance The significance of this project is to gain further insight into the HIV stigma in Missoula. Because qualitative phenomenology is unassuming, broad, and captures stories, it is the ideal point of departure for more focused research on the topic such as focus groups and surveys. Additionally, any information gained from this project will inform the interventions that local HIV outreach workers implement as they do their work. References

**Mentor:** Kari Harris

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**The effect of female priming on male Betta splendens**

**Author(s):** Susan Greene

**Category:** Social Sciences / Humanities

**Abstract / Artist Statement:** Male Betta splendens are naturally aggressive to attract a mate and defend a territory. This makes them a good model for studying aggression and choice behavior. For this study we used both a natural manipulation, presentation of a female fish, and a drug manipulation, the antidepressant Fluoxetine. It was hypothesized that the males would have shorter latencies if exposed to a female prior to each trial, longer latencies if the males were exposed to Fluoxetine, and less aggressive responding if exposed to Fluoxetine. An alleyway maze was used for testing, with a female presented to the male on one end and a mirror or blank wall on the other. Guillotine doors were used to control the amount of time the male was exposed to each, and the males were never exposed to the mirror or blank wall and female at the same time, always female first, and then mirror or blank wall. The aggressive responding of the male fish was also analyzed based on fighting behavior present or absent. We found no significant differences for preference for a mirror versus a non-mirror trail, or latency for choice for the mirror. However, a significant effect was found for fighting data, with primed males displaying more aggressive behavior than the males who were not primed. Another significant effect was also found, showing males exposed to Fluoxetine had higher latencies for non-mirror trials than those not exposed to Fluoxetine. This provides support for the hypothesis that the drug could impact motor movements and decrease arousal in the fish.

**Mentor:** Allen Szalda-Petree

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**The legacy of smelter aerosols on soil physicochemical and plant community characteristics in a degraded watershed**

**Author(s):** Scott Robinson; Ben Colman; Robert Pal

**Category:** STEM (science, technology, engineering, mathematics)

**Abstract / Artist Statement:** In southwest Montana, more than a century of copper mining and smelting has left a significant biogeochemical legacy of metal/metalloid-contaminated terrestrial and aquatic ecosystems. In historically forested terrestrial ecosystems, long-term deposition of contaminants from smelter emissions, coupled with forest-clearing for fuel and grazing, have shifted the vegetation from forest to grassland-dominated, expanded the range of invasive species, and produced large areas of bare ground causing extensive erosion and secondary deposition of organic matter and metal(lloid)-contaminated sediment from the steep slopes and saddles of mountain uplands. Current steep slope restoration initiatives stem from the hypothesis that soil metal(lloid) concentrations and nutrients have been eroded from poorly vegetated areas over time, and therefore, it is nutrient limitation rather than metal(lloid) toxicity that is preventing natural revegetation post-
smelter aerosol cessation. Here, we compared watershed-wide patterns of soil physicochemical and vegetation characteristics of 6 communities (3 grassland, 2 aspen, and 1 conifer) in Muddy Gulch, a smelter aerosol-affected watershed in southwest Montana, to test the hypothesized patterns and barriers to restoration, as well as provide insight into the relationship between existing soil and biological conditions prior to restoration. We observed strong patterns in soil physicochemical properties and vegetation community characteristics across Muddy Gulch. Total metal(loids) (sum of arsenic, copper, lead, and zinc), soil organic matter (SOM), and vegetation cover all increased as slope decreased. Values of all three variables peaked in the valley bottom vegetation communities and decreased as one moves from the toe slopes to the side-slopes and saddles of the watershed. Interestingly, plant diversity did not necessarily increase with increasing plant cover. Bioavailable metal(loids) (sum of easily extractable arsenic, copper, lead, and zinc) tended to be highest in communities with the highest total metal(loids). Soil pH drove bioavailable metal(loids), with small increases in pH coinciding with large decreases in copper and lead bioavailability, while small decreases in pH resulted in decreased arsenic bioavailability. We found fewer differences in bioavailable metal(loids) between communities, likely because small differences in soil pH had sizeable impacts on bioavailability that possibly obscured differences between communities. Our results suggest that extensive soil erosion of poorly vegetated and bare areas does not necessarily indicate low levels of contaminant availability and may continue to have implications for restoring vegetation and promoting ecosystem development in southwest Montana.

**Mentor:** Ben Colman

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**The role of mRNA deadenylation in translational repression required for stem cell maintenance**

**Author(s):** Xiaobo Wang

**Category:** STEM (science, technology, engineering, mathematics)

**Abstract / Artist Statement:** Post-transcriptional regulation mediated by RNA-binding proteins is critical for gene expression at specific time and space. Pumilio and FBF (PUF) family RNA-binding proteins are highly conserved from yeast to human and best known as translational repressors in the process of cell division and differentiation (Quenault et al., 2011). FBF-1 and FBF-2, two PUF family proteins, are required for maintaining mitotic cells by repressing translation of meiotic mRNAs (Crittenden et al. 2002). Both FBF-1 and FBF-2 can interact with CCR4-NOT deadenylase component CCF-1 and promote CCR4-NOT-mediated deadenylation in vitro (Suh et al. 2009). FBF-1 and FBF-2 are very similar in primary sequence, and regulatory targets. But they have differential abilities to maintain mitotic progenitor numbers, as FBF-1 alone can support a larger number of mitotic progenitors than FBF-2 (Lamont et al., 2004). These distinct functions of FBF-1 and FBF-2 may be mediated by their interactions with different binding partners. In support of that model, I identified the allosteric cofactor DLC-1 as the first FBF-2-specific interactor (Wang et al., 2016). Although both FBF-1 and FBF-2 interact with CCR4-NOT complex in vitro, it is still unclear whether interacting partners may affect the recruitment of CCR4-NOT machinery to FBF-1- and FBF-2-mediated regulation in vivo. In our recent study, we found that FBF-1 function in vivo requires CCR4-NOT complex, suggesting FBF-1 may regulate target mRNAs through shortening polyA tails. By contrast, FBF-2 function in vivo shows less dependence on CCR4-NOT complex, which correlates with its interaction with DLC-1. Genetic assays suggest that addition of a single DLC-1 binding site to FBF-1 interferes with its deadenylation-mediated activity. These data support our hypothesis that DLC-1 binding may prevents FBF-2 from activating CCR4-NOT deadenylase complex. The proposed study will advance our understanding of the mechanisms regulating differential recruitment of CCR4-NOT deadenylase machinery to the mRNA-protein complex and may provide insights into how RNA binding proteins are regulated by cofactors.

**Mentor:** Ekaterina Voronina
The use of forensic anthropology outside the medico-legal context: Creating a historic biological profile

Author(s): Elena Hughes

Category: Social Sciences / Humanities

Abstract / Artist Statement: The analysis of skeletal remains in the medico-legal context falls in the hands of a forensic anthropologist. The hands on skills that forensic anthropologists learn, and practice, help them to recreate the life and personhood of the deceased. In order to do so, the skeletonized remains of an individual or individuals is examined for characteristics indicative of age-at-death, sex, ancestry, pathology, stature, as well as trauma. This information is used to create a biological profile that can then be given to law enforcement to help identify the individual. There are various types of analyses that can be done to create a biological profile, but the type best suited for each case depends greatly on the conditions of the human remains and the bones that are present. For a complete skeleton that is well preserved the most common methods include the analysis of morphoscopic cranial traits for sex and ancestry characteristics, the analysis of morphoscopic traits of the pelvis for sex characteristics, the measurements of long bones (preferably of the femur or humerus) for stature calculations, and a close examination of the entire skeleton for any evidence of trauma that occurred either before death and is still in the process of healing or that occurred close to the time of death. This research will show how forensic anthropology can be applied to cases outside of the medico-legal context by analyzing the remains of an individual who died and was buried by their family long ago. In Beaverhead County, MT an old unmarked family plot was exhumed on request of a living descendent to find and move a specific family member that he knew to be buried there. When the family plot was excavated however, the remains of three individuals were found. The purpose of this research was to assist in the identification of these individuals so that the living family member may positively identify them. My analysis focused on the remains of just one of the three individuals. These remains were most consistent with those of a female, aged 35-48 years old at the time of her death, who stood between 5’3”-5’7” tall, and showed no signs of trauma. Due to extensive damage of her cranium during excavation, no ancestry could be identified. There were some associated artifacts with her remains which suggest she was buried in the late 1800’s or early 1900’s, the most significant artifact for identification being a perfectly preserved pair of dentures. While the creation of biological profiles by forensic anthropologists is normally done in the medico-legal context, this case shows the wider applicability of the field for use in a private context and for use with remains much older than normally analyzed forensically.

Mentor: Kirsten Green

To Know is to Grow: How Different Types of Contact with Transgender Individuals is Associated with Varying Levels of Anti-Transgender Prejudice

Author(s): Oak Reed

Category: Social Sciences / Humanities

Abstract / Artist Statement: Purpose: In societies around the world, transgender individuals are often stigmatized and discriminated against due to their gender identity. Previous research suggests that transgender individuals, compared to other highly stigmatized sexual minority groups, experience some of the highest levels of prejudice (e.g., Dispenza, Warson, Chung, & Brack, 2012; Hughto, Reisner, & Pachankis, 2015; etc.). Importantly, gender-based prejudice is associated with negative mental health outcomes, particularly major depressive disorder and attempted suicidality (Nemoto, Boedecker, & Iwamoo, 2011; Clements-Noelle, Marx, & Katz, 2006). Therefore, examining and deploying methods to reduce anti-transgender prejudice may provide
a socio-cultural approach to reducing mental health disparities among transgender individuals. Importantly, contact as an intervention strategy has been shown to reduce anti-transgender prejudice quickly and effectively, especially when compared to other prejudice reduction methods (Walch et al., 2012; Case & Stewart, 2013; Tompkins, Sheilds, Hillman, & White, 2015). Despite these advancements, further examination of the relationship between various forms of contact (i.e., personal contact with transgender identified individuals, and contact with general media outlets or educational materials that describe transgender identities and/or experiences) and gender-based prejudice reduction is needed. Methods: Undergraduates at a Northwestern public university (N = 349; Mage = 21.8, SD = 6.8) were recruited for participation in the study through their psychology courses. Extra credit was offered in exchange for participation in the study. Participants completed an online survey via Qualtrics and responded to a general demographic questionnaire, a measure of different types of contact with transgender individuals (e.g., social, educational, general media), the Genderism and Transphobia Scale (Hill & Willoughby, 2005), and the newly developed scale to measure anti-transgender sentiments. A mixed-methods design was used, and qualitative data collected was collected regarding anecdotal experiences of contact with transgender individuals. For our initial analyses, we conducted a series of independent-samples t-tests to determine if having had the three types of contact with transgender individuals was associated with different levels of anti-transgender prejudice. Originality: This is the first study of which we are aware that indicates an association between contact measured in a myriad of ways with transgender individuals and varying levels of anti-transgender prejudice. Previous studies were typically limited to solely measuring personal contact, whereas this study expands upon the definition of contact by including personal, educational, and general media contact. In future analyses, we will assess whether the three different types of contact differentially predict participants’ attitudes toward transgender individuals. Significance: Such differences in the relationship between contact method and anti-transgender prejudice might inform interventions across multiple contexts, including educational and clinical settings. The statistically significant findings across all types of contact in association with anti-transgender prejudice could advocate for further training in multi-cultural competencies, increase in non-discrimination policies, and so on. Further, these results may inform the nature of broad, socio-cultural representations of transgender individuals as a potential form of anti-transgender prejudice reduction.

Mentor: Bryan Cochran

TRUCE: a Hidden Markov Model for Annotation of Tandem Repeats

Author(s): Daniel Olson

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: Modern technology has provided a plethora of raw scientific data available to be analyzed. There are over 18,000 genomes sequenced to date, and the number is growing faster each year. Scientists can no longer analyze this massive amount of data by hand. Efficient and proficient computational tools are necessary for scientific progress to keep up with the data growth. Computational biology seeks to produce the algorithms and tools necessary to analyze biological data. Repetitive sequences in genomes are common, comprising more than 3% of the genome. Sequences such as the three-letter repeat, CAGCAGCAG are called short tandem repeats, and are an important feature of biological sequence. Tandem repeats are often associated with binding domains in proteins as well as human diseases such as Huntington’s disease. In the context of computational biology, short tandem repeats are a significant source of false positive matches in sequence comparison – for example, when two DNA sequences are compared, they may show a highly significant level of similarity simply due to their repetitive nature, rather than to actual shared evolutionary history. Although detection of tandem repeats is important to bioinformatics and biology in general, current tandem repeat annotation tools miss many repetitive regions that can be easily identified by a human expert. We
present a new tool, TRUCE, the Tandem Repeat Unifying disCovErer which is built with a robust hidden Markov model (HMM) that enables TRUCE to produce accurate tandem repeat annotations even when given highly degenerate repetitive sequences. Unlike current industry standard software used to detect tandem repeats, TRUCE is built on a probabilistic model, allowing it to produce probability scores corresponding to confidence in repeat annotation. Because of this, it can be directly incorporated into homology search tools such as BLAST and HMMER, reducing false positive matches caused by tandem repeats. TRUCE is also nearly 100x faster than the current industry standard tool.

Mentor: Travis Wheeler

Turán number of star forest hypergraphs

Author(s): Omid Khormali; Cory Palmer; Daniel Gerbner; Abhishek Methuku

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: A graph is constructed from points (called vertices) and lines (called edges) which join a pair of points. The graphs are used to model many problems. For example in Facebook, we can consider each person as a vertex and if two persons are friends we join them by an edge. Then this graph is used to study the friend patterns in Facebook. A hypergraph is a generalization of a graph, except that instead of having edges that only made up of 2 vertices, their edges are sets of any number of vertices. This happens to mean that all graphs are just a special type of hypergraphs. Hypergraphs model many practical problems in many different sciences for example; machine learning, data mining, image processing, database schemes, telecommunications and chemistry. Therefore the study of the structure of hypergraphs is very important to using them in modeling of problems. Extremal hypergraph theory is the study of how the intrinsic structure of hypergraphs ensures certain types of properties under appropriate conditions. One of the main problems in extremal hypergraph theory is determining the Turán number for hypergraphs. The Turán number, ex(n,H), of a hypergraph H is defined as the maximum number of edges in a hypergraph on n vertices which does not contain H as a sub-hypergraph. Compared to what we know for graphs, there is much less known about hypergraph Turán problems. In this research, we find the Turán number of linear star hypergraphs, Sk, which contains k many edges of size r intersecting only in one vertex. We also worked on the Turán number of Berge-stars. Let G be a graph and H be a hypergraph both on the same vertex set. We set that a hypergraph H is a Berge-G is there is a bijection f from E(G) to E(H) such that for e in E(G) we have e subset of f(e). In addition we find the Turán number of forest of (linear and Berge) stars. The forest of stars are the disjoint union of several stars. Stars are very common structures in any hypergraphs. Studying and understanding the behavior of stars are very useful and important in modeling the problems by hypergraphs. We believe our results will potentially improve the applications of hypergraphs.

Mentor: Cory Palmer

Uncovering the Rules of Language: What the Case of the Word 'Glimpse' Can Teach Us

Author(s): Jessica Holtz

Category: Social Sciences / Humanities

Abstract / Artist Statement: Humans are able to naturally produce grammatical sentences they’ve never heard before in their native languages and have others understand what they mean, an amazing feat for a process which we go through daily without much effort. Languages are rule-governed and systematic in ways that are
sometimes not so transparent. These rules are what create the structure within a language, making it learnable and usable. By studying these rules and systems we can better understand how the human brain processes and produces language (Pinker, 2007). One way in which we classify verbs in order to better understand them is to organize them into temporal and aspectual classes. This study looks at semelfactives, a class of aspectual verbs. A series of tests put forth by Van Valin (2006) explain the largely systematic way in which different classes of verbs function. However, he proposes that semelfactives are inconsistent in their compatibility with dynamic adverbs, or adverbs that indicate some sort of action, citing the semelfactive glimpsed which cannot occur with words like vigorously or actively as in the problematic sentence: He glimpsed the intruder strongly. Meanwhile, others can, as in She sneezed once violently. (Van Valin, 2006). The data I have collected in order to examine these claims provides evidence that semelfactives are in fact consistent and systematic, showing that the test used to determine their classification to be useful and effective. In addition, this helps us understand more about the system governing how classes of temporal verbs function. Semelfactives are events that happen suddenly, with the end result being the same as the beginning, such as in He glimpsed at the side-view mirror, where the event has taken place, but he and the mirror are not changed in any way by the action. I propose that this is not in fact an inconsistency, but a matter of additional features of the verb which Van Valin may not have taken into account affecting the test’s accuracy. The issue instead is the fact that semelfactives are problematic and often ungrammatical with animate object. That is to say, you can glimpse at the side-view mirror, but if you glimpse at the intruder it sounds odd. I suggest based on my findings that rather than some semelfactives being compatible with dynamic adverbs and others being incompatible it is actually the case that all semelfactives are compatible with dynamic adverbs. My findings indicate that Van Valin’s tests are more consistent than he might have thought. Semelfactives are consistently dynamic as far as my data and other studies have shown, and the issue of some being incompatible with non-dynamic adverbs has more to do with the odd combination of the word glimpse and an animate object than it has to do with an exception to the rules. This, in turn gives more evidence that when something appears to be an exception to a rule in a language, it may simply be a case of another rule operating, making things appear less systematic on the surface.

Mentor: Leora Bar-el

Using Immunization Information Systems to Increase Vaccinations Rates: Strategies for maintaining the sustainability of these systems.

Author(s): Bekki Wehner

Category: Social Sciences / Humanities

Abstract / Artist Statement: There are many strategies used by public health partners to increase immunization rates. One specific strategy for combating low or declining immunization rates is the use of a statewide immunization information system (IIS). IIS are confidential population-based systems that record immunization doses given at providers in certain states or areas (cdc.gov, 2012). These systems can provide complete records for reasons such as determining what doses are needed next to assisting physicians in clinical decision making. Multiple published articles and abstracts show strong evidence that IIS is an effective tool to increase immunization rates. The Community Preventive Services Task Force focused on five key features of an IIS which included the use of reminder/recall, the ability to evaluate a public health response, vaccine management, clinical decision support, and as a data source for coverage rates and missed opportunities (Community Preventive Services Task Force, 2015). Nearly all states and territories have an IIS that houses immunization records for their state’s population. The maintenance of these systems is usually a function of the state public health department or a contractor. The Association of Immunization Managers (AIM) is one key partner in creating tools and administrative support for public health entities to continue to use best practices to strategically increase rates. AIM is currently looking at the financial impact of maintaining IIS in the states and how this can be overcome by seeking out increased funding or cost saving measures like sharing development
costs across multiple states. This presentation will summarize some of the already available best practices provided by other key partners and the most recent survey conducted by AIM about the operations of IIS. The presentation will highlight key data that drives program operations and reveals challenges to the sustainability of these systems. Examples of data collected include annual operating cost, the number of staff needed to successfully run an IIS, and varied programmatic uses. The collection and analysis of these data will assist AIM creating tools for all states and territories to reference when planning for the future of their IIS. In addition, these data can be used by states and territories to advocate for support of the systems from both a financial and policy standpoint. References: Recommendation for Use of Immunization Information Systems to Increase Vaccination Rates. (2015). Journal of Public Health Management and Practice, 21(3), 249-252. “About Immunization Information Systems.” Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 15 May 2012, www.cdc.gov/vaccines/programs/iis/about.html.

Mentor: Kari Harris

Utilizing Food Trucks to Support Healthy Weight Initiatives in Yellowstone County

Author(s): Maia Dickerson; Kristi Drake; Jeanne Hammond Manske

Category: Social Sciences / Humanities

Abstract / Artist Statement: While food trucks have gained popularity because they offer fast, convenient and unique ways to purchase food, those wanting healthy food choices may have to seek other options. The 2016-17 Community Health Needs Assessment for Yellowstone County reports that over the last year, 36% of all adults received advice about diet and nutrition from a physician, nurse or other health professional. Segmented data indicates 30% of overweight and 52% of obese residents received this counsel. These data indicate that coaching about healthy eating and healthy weight is prevalent in the community, and a large population may want healthy food choices when they are eating out. By conducting a focus group, the Healthy By Design Coalition seeks to establish a conversation and evaluate interest in developing a program in which food truck vendors are encouraged to provide healthy menu options for residents working to establish or maintain healthy weight status. Focus group invitations will be sent out via personal invitation, social media and a distribution list of licensed food truck vendors. We hope to engage 5-15 food truck vendors. Participants will be asked about their perceptions of healthy food, given guidelines for healthy food menu options and prompted to discuss their interests and concerns about participating in a program that highlights food truck healthy menu options. Two scribes will be note takers and compile answers to determine main themes. With permission, the focus group will also be recorded. As a result, there will be an established definition of “healthy food” for retail food establishments. Potential barriers to food trucks offering healthy menu options may include a lack of food storage space and need for additional cooking space to accommodate different cooking methods. Focus group members will suggest, refute or agree on additional barriers. We anticipate that vendors would support providing at least a few healthy menu options if barriers were minimal because vendors want new customers and recognition. Literature indicates that studies regarding the addition of healthy food menu options and their impacts to customer eating habits are limited to fast food and sit-down restaurants. With this focus group, we hope to further develop the examination of how healthy food options influence eating habits. There are a variety of potential barriers to adding more healthy items to food truck menus, and we perceive that these barriers are the greatest deterrent to developing more healthy food menu items. Therefore, by working with food truck vendors to prioritize and overcome barriers, we establish coalition credibility and create allies in promoting healthy weight initiatives by making healthy choices more readily available. Additionally, creating a system in which food trucks with healthy menu options are highlighted and recommended through a larger event recognition program would entice more food trucks to participate because they would have priority at some of the largest outdoor events in Yellowstone County.

Mentor: Kari Harris
Why do slow trees grow old? Exploring the physiological mechanisms that link slow growth and longevity in ponderosa pine

Author(s): Beth Roskilly

Category: STEM (science, technology, engineering, mathematics)

Abstract / Artist Statement: It has been shown that slow-growing trees live longer than fast-growing trees. The most common explanation is that limited resources cannot be simultaneously devoted to growth, reproduction, and stress resistance (which enhances longevity). Thus, allocation to growth comes at the cost of resistance to stress, causing faster-growing trees to die earlier in their lives. However, such an explanation has not been properly tested and there are alternative explanations. Understanding the mechanisms leading to old age is relevant because old trees store a lot of carbon. We hypothesized that the mechanistic basis for the growth rate-survival tradeoff lies in specific wood traits that perform important, but conflicting, functions related to water transport. The woody tissue of a tree, the xylem, must meet the competing functional demands of water transport efficiency and safety (preventing breakage of the water column under drought), as well as biomechanical support of the stem. Efficient water transport is critical to carbon uptake and enhances growth rate. The maintenance of water transport under dry conditions and stem biomechanical strength protect against some of the major causes of tree mortality such as windthrow and drought. In conifers (trees that produce cones rather than flowers) water can only move upwards through specialized xylem structures called pits. Pit structure affects both water transport efficiency and safety, and therefore it plays a pivotal role in a tradeoff between the two functions. Because greater water transport efficiency enhances growth, but greater safety enhances survival, we hypothesized that pit structure explains the growth-survival tradeoff in ponderosa pine. We sampled two mixed-age ponderosa pine stands to first test whether the oldest trees exhibit slower growth rates relative to younger trees. We then tested whether slow-growing trees have pits whose structure enhances water transport safety (survival) at the cost of efficiency (growth). The oldest trees (over 350 years at sampling) had slower growth rates throughout their lifespans compared to young trees ( < 190 years), even when corrected for climatic differences between time periods. While some young trees had relatively slow growth rates compared to other young trees, no old trees grew as quickly as fast-growing young trees, indicating that slow-growing trees live longer than fast-growing trees. Slow-growing trees, whether old or young, had safer pit structure relative to fast-growing trees but did not differ in wood density or cell size. Our results indicate that trees with pit structure associated with increased drought tolerance have slower growth rates and live longer. Contrary to common thought, our findings highlight that resource allocation conflicts are not the proximate mechanism leading to the growth-survival tradeoff. Instead, biophysical constraints associated with a single trait lead to important functional conflicts (water transport efficiency vs. safety) and life history trade-offs. Our results provide crucial insight into how forests are likely to respond to increasing drought with climate change and have important implications for forest management strategies, such as breeding programs that select for fast growth in trees, which may compromise drought tolerance, tree longevity and, therefore, carbon storage.

Mentor: Anna Sala

Women Under Fire: A Needs Assessment of Female Wildland Firefighters

Author(s): Bonnie Bishop

Category: Social Sciences / Humanities

Abstract / Artist Statement: The purpose of this need assessment was to explore the primary health issues, as well as the social and environmental risk factors, that female wildland firefighters face in their career within the U.S. Forest Service. The needs assessment sought to understand female wildland firefighters perspectives,
perceptions and lived experiences comparative to unique gender obstacles, challenges, or disadvantages during their individual career experiences. Wildland firefighters can be found at work in extreme temperatures and all weather conditions across our nation’s most rugged terrain carrying heavy equipment and jumping out of airplanes or sliding out of helicopters. Recent research on gender and wildland fire has characterized wildland firefighting as a “highly masculinized occupation” and as a “means through which traditional gender roles and power relations are maintained” (Reimer, 2017). Since the 1980’s, there have been increased efforts to recruit women into wildland fire, yet women still represent a relatively small proportion of the workforce, filling 10-12 percent of wildland fire positions and seven percent of leadership roles (Stamper, 2017). Harassment and assault of women in wildland fire is far too common, as has been revealed over the past several years by the media and congressional oversight, academic surveys and studies, and internal surveys (Spradlin, 2017).

By utilizing the PRECEDE-PROCEED Model proposed by Green et. al the main purpose of this assessment was to provide a structure for applying theories and concepts systematically for planning and evaluating health behavior change programs. The methods of the assessment included gathering qualitative data directly from the target population about their perceived health needs, conducting a thorough literature review concerning the health of female wildland firefighters and planning health strategies to improve health outcomes. Public awareness has continued to grow concerning the perpetual work place discrimination, sexual harassment and work place retaliation women face as wildland firefighters. This assessment aimed to add to the conversation by delving into the perceived needs of this unique population and to pose viable health strategies that could contribute to the improvement of female wildland firefighters in Montana.

Mentor: Dr. Laura Dybdal

Zoning to Protect Farmland: A Case for Missoula County

Author(s): Kaitlin McCafferty

Category: Social Sciences / Humanities

Abstract / Artist Statement: Zoning to Protect Farmland: A Case for Missoula County  
Urban sprawl reflects an inefficient use of land that diminishes both rural landscapes and quality of life; turning farms, ranches and open space into siloed suburban communities resulting in less walkable cities with more traffic and air pollution, among other negative consequences. Farmland constitutes a particularly important resource that faces often degradation or loss due to sprawl. Quality agricultural soils are particularly desirable for development because they are flat and well-drained. Farmland is also important for urban communities in terms of food security, environmental health, and economic well being. As American cities continue to grow, farmland around urban areas has become threatened by development pressure, affecting both the urban cores and the rural areas around them. Many urban agriculture and food system advocates have increasingly looked to zoning as a solution. An agricultural-exclusive zoning code on a parcel of land can protect it from non-agricultural uses and suburban development. My research looks into how six counties have used agricultural zoning to preserve their peri-urban agricultural land. These six counties are King County, WA, Sonoma County CA, Ventura County, CA, Dakota County, MN, Dane County, WI, and Palm Beach County, FL. I looked at intent, impact, successes and challenges that these six counties have dealt with when implementing tools such as exclusive agricultural districts, specific agricultural exclusive codes, and incentive programs, to name a few. Through research consisting of reviewing peer review journals and city and county planning websites combined with phone interviews with county planners, I gained insight into particular issues of other cities, how they address these community-specific issues. My paper concludes with recommendations for Missoula County, which is currently in the process of rewriting its zoning codes, and experiencing the threat loss of farmland due to sprawl.

Mentor: Neva Hassanein

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