The University of Montana Presents

The 12th Annual UM Conference on Undergraduate Research

Program and Abstracts

April 12, 2013 ~ Missoula, Montana

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UMCUR 2013

The University of Montana

Conference on Undergraduate Research

April 12, 2013

Sponsored By:

The Office of the President

The Office of the Provost

The Davidson Honors College

UMCUR Welcome

We are pleased to welcome students, faculty, staff, and alumni to the twelfth annual University of Montana Conference on Undergraduate Research (UMCUR). Over 180 students will present their research today, and we are delighted to celebrate their accomplishments!

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

We would like to extend a warm welcome to three students from the Scholars Program at Flathead Valley Community College who will present their research at UMCUR as part of an undergraduate research exchange between our campuses. Please join us in welcoming these students and their faculty mentors.

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

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

James McKusick

UMCUR Director

Undergraduate Research Committee Chair

Dean, Davidson Honors College

UMCUR Keynote Speaker

12:20 p.m., UC Theater ~ April 12, 2013

Exploring Social Worlds:
The Promises and Pitfalls of Qualitative Research

Dr. Daisy Rooks

Assistant Professor, Department of Sociology

The University of Montana

Abstract:

This talk explores the possibilities and challenges of conducting ethnographic research on contemporary social issues. The talk draws upon my experience teaching a research/service-learning course about hunger and homelessness for the past four years. Students in this course volunteer at Missoula's Poverello Center, receive training in qualitative research methods and conduct their own qualitative research into hunger and homelessness in Missoula. I start with a brief introduction to qualitative social research, with an emphasis on participant observation and in-depth interviewing. I then discuss several challenges of this sort of research, including the unpredictability of human subjects, the emotional impact of investigating charged social issues such as homelessness, and the assumptions and biases of researchers. Finally, I introduce some of the promises of qualitative social research, including its potential to give a voice to marginalized members of society, its attention to individual stories and life experiences and its capacity to capture students' interest and enthusiasm. Throughout the talk I'll share excerpts from students' field notes as examples of each of these points.

About Dr. Rooks:

Daisy Rooks is an Assistant Professor in UM's Department of Sociology. She earned her Ph.D. in Sociology in 2007 from the University of California, Los Angeles. Dr. Rooks is a practitioner of "public sociology," a movement to provide useful, accurate, and scientifically rigorous sociological research to policy makers and community leaders. She has published articles on the career trajectories of union organizers and interdisciplinary service learning. Since arriving at UM, Dr. Rooks has conducted research on labor-environmental coalitions in rural areas, media coverage of charter schools, and leadership in union recognition campaigns. She recently completed a book manuscript about activism in the 1990s entitled *Venture Activism: Incubating Agents of Change inside American Public Education and Organized Labor.*

UMCUR Schedule Overview

The University of Montana

Conference on Undergraduate Research (UMCUR)

April 12, 2013

University Center, 3rd Floor

8:00 AM Registration & Poster Setup - UC 3rd Floor, Grand Foyer

9:00 - 11:00 AM Oral Sessions - UC 326-333*

- Fine Arts, Humanities, Life Sciences, Social Sciences, Physical Sciences

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

12:20 - 1:30 PM Keynote Speaker - UC Theater

1:40 - 4:00 PM Oral Sessions - UC 326-333

- Fine Arts, Humanities, Life Sciences, Social Sciences, Physical Sciences

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

4:00 - 5:00 PM Oral Sessions - UC 326-333

- Fine Arts, Humanities, Life Sciences, Social Sciences, Physical Sciences

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

Awards Ceremony

This year, we are pleased to announce that President Engstrom will be hosting the UMCUR Awards Ceremony on Friday, April 26, at 2:00-3:00 p.m. in the Theta Rho Room at the Mansfield Library. We hope you will join us to celebrate our UMCUR 2013 award winners.

UMCUR Schedule Breakdown

8:00 AM	**Participant Registration and Poster Set-Up** - *UC 3rd Floor Grand Foyer*	
Concurrent Oral Sessions: 9:00-11:00 AM		
UC 326 ~ Social Sciences		
9:00	2	Hey Brother, Where's The Bathroom? Forty Years of Rainbow Gatherings and Human Waste Disposal - ***Stanley Wilson,*** *History*
9:20	103	Mapping History: Using GIS to Explore Changes in Downtown Missoula over Time - ***Jared Fischer,*** *Anthropology*
9:40	167	Assessing Fluctuating Asymmetry in the Pre and Post Contact Arikara - ***Kaleigh Best,*** *Anthropology*
10:00	158	The Effect of Redistricting on Voter Turnout - ***Bryn Hagfors,*** *Economics/Political Science*
10:20	11	Meth In Montana A Policy Review - ***Terri Griffith,*** *Social Work*
10:40	29	Adovcacy: Retrofitting Access to Educational Information Technologies - ***Courtney Damron,*** *Sociology*
UC 327 ~ Social Sciences		
9:00	126	SOBA Refill Stations - ***Alexander Chandler,*** *Accounting and Finance*
9:20	151	Effect of Unconditional Cash Transfers on Health in Indonesia: Food Consumption, Medical Consumption, and Children's Nutrition - ***Ardina Hasanbasri,*** *Economics*
9:40	139	Effective Computer Simulation Development Utilizing Dynamic Documentation - ***Tyler Davis,*** *Computer Science*
10:00	32	Supplementing Our Library Funds - ***Eileen West,*** *English*
10:20	116	Alzheimer's Disease: Maintaining Dignity & Quality of Life - ***Katelyn Miller,*** *Social Work/Pre-Med*
10:40	136	A Culture, Not a Costume: Perceptions of Native Communities in the Media - ***Jessica Murri,*** *Journalism*
UC 330 ~ Social Sciences & Physical Sciences		
9:00	79	The Effectiveness of a Letter-Writing Activity on Self-Reported Body Dissatisfaction - ***Julie Oldfield,*** *Psychology*
9:20	183	Perspectives of the Western Montana Grower's Cooperative: A Supplementary Case Study of Food Producers in Western Montana - ***David Wise,*** *Environmental Studies*
9:40		
10:00		
10:20	144	Atomic Structure Determinations for Neutron-Capture Elemental Ions - ***Allison Mueller,*** *Physics*
10:40	94	Modeling stream temperature to assess methods of managing the impacts of climate change and land use - ***Todd Blythe,*** *Environmental Studies*
11:00	140	Potential treatment of Parkinson and Schizophrenia/anixiety using Isoxazolo[3,4-d]pyridazinones selective for mGluR 2 and 4 - ***Christina Gates,*** *Chemistry*
UC 331 ~ Life Sciences		
9:00	131	Exploring the Variation of Mood States and Coping Strategies in Athletic Training Students - ***James Capp,*** *Athletic Training*
9:20	176	Eugenics: Improvement of the Human Genome - ***JonAlan Osborne,*** *Mathmatics**
9:40	20	Cell-specific regulation of MeCP2 expression in *Drosophila* Astrocytes - ***David Hess-Homeier,*** *Human Biology*
10:00	120	The role of RNase Y in rpoS transcript processing in *B. burgdorferi* - ***Richard LeCoultre,*** *Biochemistry*
10:20	82	Is Whirling Disease Driving Salmonid Community Shifts in Tributaries of the Blackfoot River, Montana? - ***Morgan Sparks,*** *Wildlife Biology/Journalism*
10:40	88	Social Media and City Planning: Friend or Foe? - ***Jake Koplen,*** *Geography*

**Flathead Valley Community College student. Please see UMCUR Welcome for more information.*

UC 332 ~ Humanities		
9:00	155	"Vibrations in Spoon River": Reading Edgar Lee Masters' Spoon River Anthology After a Century - ***Kelsey Fanning,*** *English*
9:20		
9:40	77	The Misconceptions of Monotheism: Reconciling the Theology and Narrative of John Milton - ***Erin Hastey,*** *English, Communication Studies, German*
10:00	51	Spatial Poetry - ***Beryl Clark,*** *Psychology*
10:20	53	Wasted Women: Modern Oppressions in *The Waste Land* - ***James Warwood,*** *English*
10:40	147	The Loss of Self in Abe Kobo's *The Wall* - ***Christina Strand,*** *Japanese*
UC 333 ~ Fine Arts & Humanities		
9:00	93	Justice and Reverence: Towards a Critical Language of Eco Art - ***Clay Pape,*** *Fine Arts*
9:20	45	First Reality: A Role Playing Game Parody - ***Garret Morrill,*** *Biology*
9:40	52	The Concept of Irony and Oscar Wilde – *Geoffrey Elliot, Literature and Philosophy*
10:00	12	The Effects of the Ash Creek Fire on the Northern Cheyenne Indian Reservation - ***Ketti Wilhelm,*** *Journalism*
10:20	87	The Little Shell Chippewa: Putting a Price Tag on Identity - ***Candace Rojo*** *and* ***Allison Bye,*** *Journalism*

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

UC South Ballroom

Life Sciences

#9	Hybrids lost: fading introgression in two freshwater sculpin populations - ***Grace Malato***, *Wildlife Biology*
#17	Dissecting octopamine circuits regulating male aggression and courtship in *drosophila* - ***Miranda Bradley***, *Psychology*
#33	Photos and Phenotypes: Using Camera Traps to Monitor Seasonal Mismatch Between Snowshoe Hares (Lepus americanus) Coat Color Change and Snow Cover - ***Skyler Suhrer***, *Wildlife Biology*
#41	Structural Analysis of a Cytomegalovirus-encoded Chemokine - ***Rebecca Hendrix***, *Medical Technology*
#54	Evaluation by Fluctuation Analysis of a Disk Diffusion Method for Identifying *Pseudomonas aeruginosa* Hypermutators in the CF Lung - ***Eric Dunham***, *Biology/ Biochemistry*
#66	Does Hybridization Affect Placental Morphology in Dwarf Hamsters? - ***Lindy Henry***, *Biology*
#67	Too Old to Have a Baby? - ***Heather Fraley***, *Wildlife Biology**
#95	Exploring the Effects of Moist Heat Pack Duration on Shoulder Range of Motion - ***Samantha Riordan***, *Athletic Training*
#98	Monitoring the effects of agriculture on stream biota: small scale irrigation inputs elevate densities of indicator taxa of water quality impairment - ***Milan Vinks***, *Wildlife Biology*
#102	The Secret Language of Birds - ***Sophia Jensen***, *Human Biology*

Social Sciences

#55	A Comparison of Sexual Minority Youth Who Attend Religiously Affiliated Schools and Their Nonreligious School-Attending Counterparts - ***Brandon Stewart***, *Psychology*
#64	Socioeconomic Implications of Sea Level Rise in the Mekong River Delta, Vietnam - ***Margaret Matchett***, *Pre-Pharmacy*
#69	PETSA (Personal Empowerment through Self Awareness) meets REDCap (Research Electronic Data Capture): Assessment of a tutorial on sexual assault using web and paper surveys - ***Evan Hartmann***, *Psychology*
#86	Pharmacy and Homelessness: The State of Pharmaceutical Care, Overcoming Barriers To Medication Therapy, and Serving Homeless Patients in Montana - ***KariLynn Dowling***, *Pharmacy*
#91	Dams Versus Conservation: The Politics of Scale in Southern Chile's Aysén Region - ***Elena Louder***, *Resource Conservation*
#145	Assessing Maladaptive Responses Through the Use of Follow-up Questions to Counter Attempts to "Fake Good" - ***Lindsey Jackson, Sarah Markuson, Lauren Poss, Mallory Hogan,*** *and* ***Rachel Helmer***, *Psychology,* ***Emily Copeland***, *Social Work*
#174	Effects of pain interference on use of complementary therapy in fibromyalgia - ***Sandra Skogley***, *Psychology*
#181	Mathematical Modeling: A Neuroscience Case Study - ***Patrick Funk***, *Mathematics*

Fine Arts

#118	Bloody Happy: Designing for a National New Play - ***Fiona McNeil***, *Theatre*

Humanities

#129	Neurological and Genetic Origins: Language and Religion - ***Stephanie Christiansen***, *Undeclared**
#143	Estrangement in Russian Cinema - ***Brinna Boettger***, *English and Russian*

Physical Sciences

#1	Using Image Detection to Locate Resin Ducts - ***Kegan Rabil***, *Mathematics*
#18	The role of rsh in *Borrelia burgdorferi* during infection of tick and mammalian hosts - ***Brenda Morris***, *Chemistry*
#38	Investigating Upstream Channel Response to Dam Removal, Blackfoot River - MT, ***Robert Livesay***, *Geosciences*
#39	Geometric correction of shortwave radiation measurements over complex terrain for use in hydrologic models - ***Zachary Hoylman***, *Geosciences*
#44	Effects of Transmissivity on Aerodynamic Function in Bird Feathers - ***Ashley Meyers***, *Environmental Studies*
#75	Skin temperature decreases during maximal running in compensable environments - ***Kyle Cochrane, Tucker Squires,*** *and* ***John Cuddy***, *Exercise Science*
#81	Bergan, AM, Rumph, B, & Moody, VJ. Department of Health and Human Performance, The University of Montana, Missoula, MT - ***Amy Bergan***, *Athletic Training*
#99	Metabolic and energy requirements for stand up paddleboarding - ***Matt McGady***, *Exercise Science*
#115	The Effects of Plasma Current In the World's Largest Stelarator - ***Erica Hadden***, *Physics*
#122	Purification and analysis of pH indicators for more accurate pH measurements - ***Emma Jacqueth***, *Chemistry*
#123	Proteinase K's effect on *C. elegans* and *C. burnetii* - ***Lance Watson***, *Human Biology*
#166	Visualizing Communication - Pattern Recognition on the Enron E-mail Corpus - ***Scott Halstvedt***, *Computer Science*
#178	Quantifying Error In Regional Climate Models Using Data Assimilation - ***Katie Monaco***, *Geosciences*
#179	Halogen Bonding - ***George Neuhaus***, *Chemistry*

**Flathead Valley Community College student. Please see UMCUR Welcome for more information.*

Concurrent Oral Sessions: 1:40-4:00 PM		
UC 326 ~ Social Sciences		
1:40	68	The End of an Era: The Last King of Siam - ***Neal Lynch,*** *Anthropology*
2:00	85	Eastern European Migrations: The Craniometric Perspective - ***Matthew Burgess,*** *Anthropology*
2:20	7	Reconstructing Coloma Ghost Town's Demographic Landscape - ***Jenna Franklin,*** *Anthropology/English*
2:40	141	Without a Roof: Why Some Missoulians Don't Have Shelter - ***Travis Tikka*** *and* ***Noah Sohl,*** *Sociology*
3:00	152	Tenselessness in Tagalog - ***Kelsey Fanning,*** *English*
UC 327 ~ Social Sciences		
1:40	170	Plea Bargaining: Are Lawyers helping you, or themselves? - ***Sara Ward,*** *Political Science*
2:00	101	Effect of Border Patrol Agent Staffing on Crime Along the Northern Border - ***Benjamin Ehlers,*** *Political Science*
2:20	40	Missoula Household Gardening: A Case Study for the Potential Incorporation of 1,000 New Gardens as a 501(c)(3) Nonprofit - ***Emerald LaFortune,*** *Environmental Studies/Non-Profit Administration*
2:40	133	Using Social Media as a Business-to-Business Company in All Areas of the World - ***Jenna Martin,*** *Marketing, International Business*
3:00	56	Sustainability Assessment of New Zealand Business: For a Better Tomorrow - ***Heather Schmit,*** *Psychology*
UC 330 ~ Social Sciences		
1:40	62	City on the "River of Awe": Changes in Missoula's Urban River Corridor - ***Sandra Burch,*** *Geography*
2:00	58	Collaboration and the Columbia River Treaty Review Process - ***Anthony Thompson,*** *Geography*
2:20	65	Black Magic: Saving The Soul - ***Jeffrey Hunter,*** *Liberal Studies*
2:40	142	Client-Staff Interactions at the Poverello Center - ***Katie Thom,*** *Psychology, and* ***Ally Guldborg,*** *Sociology*
3:00	57	Personality and Recreation Preferences - ***Clinton Begley,*** *Parks, Tourism, & Recreation Mgmt*
UC 331 ~ Physical Sciences		
1:40	36	Defining Wilderness Character for the Selway-Bitterroot - ***Andrew Hursh,*** *Resource Conservation*
2:00	34	The Mountain Plover: The Impending Challenges of Climate Change to Population Viability - ***Zoe Glas,*** *Wildlife Biology*
2:20	112	Contrasting Effects of Wildfire and Ecological Restoration in Old-Growth Western Larch Forests - ***Taylor Hopkins,*** *Resource Conservation*
2:40	76	Ecological Interdependence: The Buddhist Response to Climate Change - ***Harper Kaufman,*** *Religious Studies*
3:00	162	U-Th/Pb geochronology and Pressure-Temperature constraints on metamorphism, Freezeout Ridge area, Clearwater metamorphic core complex, northern Idaho - ***Elise (Ellie) Fitzpatrick,*** *Geosciences*
3:20	27	A new proof of an integral formula for counting perfect matchings in graphs - ***Lauren Morey,*** *Mathematics*
3:40	161	Axial Chirality to increase selectivity of AIMs as anti tumor agents - ***Michael Campbell,*** *Biochemistry, and* ***Matthew Weaver****, Medicinal Chemistry*

UC 332 ~ Fine Arts & Humanities		
1:40	23	A Comparison in Classical Music: The Operas of Wolfgang Amadeus Mozart and Franz Joseph Haydn - ***Joseph Licitra II,*** *Music History*
2:00	168	Bridging the Gap Between Theory and Practice: Interpreting Beethoven's Sonata No. 17, "The Tempest" - ***Allyson Carroll,*** *Music*
2:20	148	In the Woods We Return - ***Daniel Nelson,*** *English-Creative Writing*
2:40	43	The Willamette: A Story of Oregon's Green River - ***Erin Axelrod,*** *Environmental Studies*
3:00	97	Nightmare Imagery and the Ethical Aim of *De Rerum Natura* - ***Ellen Boland,*** *Classical Languages*
3:20	130	The Figuration of Phantoms: Helens from Homer to Walcott - ***Clare Mikeson,*** *English*
3:40	134	Critical Legal Studies: Challenging Traditional Legal Thought - ***Emily Cross,*** *Philosophy*
UC 333 ~ Physical Sciences & Life Sciences		
1:40	107	Cholinergic neuromodulation of parvalbumin interneurons during hippocampal gamma oscillations and pilocarpine-induced seizures – ***Evan DeCan****, Human Biology*
2:00	80	The Affect of Altered Exercise Intensity on Postural Stability – ***Claire Nickless*** *and* ***T. Simon****, Exercise Science*
2:20	156	Get Fit for Sport: Year Around Fitness Programs for Intellectually Disabled Individuals - ***Andrea Flippin****, Exercise Science*
2:40	83	Comparing the Effects of Moist Heat Pack and Pulsed Short Wave Diathermy on Shoulder Range of Motion - ***Taylor Baldwin*** *and* ***Erika Stinchcomb****, Athletic Training*
3:00	35	The Effects of Single Point Mutagenesis in the SSP Subunit of the Junin Virus Envelope Glyco-protein on Membrane Fusion – ***Donna Twedt****, Microbiology*
3:20	160	The Struggles of International Research in a Developing Country: A Study on Diabetes Prevalence Rates in the Rural Arumeru District of Tanzania – ***Tyler Ellis****, Biochemistry*

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

UC South Ballroom

Physical Sciences

#15	Synthetic Architecture Control of Polymer Nanoparticles for Analytical Separations - ***Leah Hall***, *Chemistry*
#30	A New Methodology for Determining Possible Hatching Events Within *Sphereoolithus* Eggs - ***Heather Davis*** *and* ***Robert Radar***, *Geosciences*
#50	UM Firn Densification Model - ***Evan Cummings***, *Computer Science*
#84	Impacts of two invasive goldenrod (Solidago) species at home and away - ***Kimberly Ledger***, *Biology*
#104	Questioning the Role of Turn Sequences within the Protein Folding Code - ***Alexandra Heyneman***, *Chemistry*
#106	Firn Densification in the Percolation Zone of Western Greenland - ***Arlan Dirkson***, *Applied Mathematics*
#109	Quantitative Fitting of transport model parameters to experimental profiles - ***Erica Hadden***, *Physics*
#119	Determining reservoir- and basin-scale stratigraphic architectures of the Bartlesville Sandstone from well log data - ***Eric Lavering***, *Geosciences*
#124	Determining Exoplanet Detection Sensitivity of the Minerva Observatory - ***Chantanelle Nava***, *Physics*
#125	Determining Sunscreen Efficacy in the Ultraviolet Range - ***Chantanelle Nava, Allison Mueller, Daniel Lehman, Wesley Harmon,*** *and* ***Jonathan Wagner***, *Physics*
#127	An Improved Configuration for Logging Trucks in Montana - ***James Dyke, Jr.***, *Forestry*
#128	Trace fossil assemblages and significant surfaces in Upper Cretaceous sediments in central Montana as indicators of environmental conditions and depositional setting - ***Jenn Torres***, *Geosciences*
#154	Geochemical Analysis of the Marginal Facies of the Bear Gulch Limestone, central Montana - ***Robert Radar*** *and* ***Amy Singer***, *Geosciences*
#169	Applying Quasi-Digital Seismic Data Obtained from Paper Seismic Traces to Analyze the Geology of Flathead Valley, MT, USA - ***Evan Hanson***, *Geosciences*
#172	A 3-D Visualization of pH Titrations: Equivalence Point Cliffs, Dilution Ramps and Buffer Plateaus - ***Daniel Barry***, *Biochemistry*

Life Sciences

#13	The Role of RNase Y in Gene Regulation During Transmission of *B. burgdorferi* - ***Jeanette Comstock***, *Biochemistry*
#14	Cell-specific effects of MeCP2 on aggression using *Drosophila* as a model organism - ***Austin Herron***, *Microbiology, and* ***David Hess-Homeier***, *Human Biology*
#19	In Vitro Exposure to US Southwestern Sand Dust and its Effect in Respiratory Health - ***Cassandra Moog***, *Biochemistry*
#21	Growing Algae With Chitin as a Nitrogen Source to Remove Phosphorous From Pulp Wastewater - ***Ryan Parks***, *Environmental Chemistry*
#31	Sigma Factors of *Coxiella burnetii* and their relationship to 6S rRNA-mediated regulation - ***Thomas Spallino***, *Human Biology*
#59	Rapid Evolution and Sequence Divergence at Tsga8 in Rodents - ***Kelsey Hom***, *Ecology and Organismal Biology*
#61	Investigating the Role of NADPH Oxidase in Ischemic Stroke Injury: An mRNA Knockdown Approach - ***Riley St. Clair***, *Biology/Psychology*
#90	Analysis of sediments carried by a tropical intertidal sea cucumber, *Holothuria inornata* - ***Mark Jackson***, *Wildlife Biology,* ***Kara Nygaard*** *and* ***Areli Tejeda,*** *Biology*
#121	Self-Identification with the Diagnosis of ADHD and its Relationship to Performance on Self-Report and Objective Measures - ***Brook Clark*** *and* ***Hannah Wadsworth***, *Psychology*
#157	Native Trout Conservation and Watershed Restoration: A response to Climate Change in the Greater Yellowstone Ecosystem - ***Zachary Brown***, *Environmental Studies*

Social Sciences

#5	Theme Houses at the University of Montana - ***Emily Caponi***, *Environmental Studies*
#6	A Few Good Women: American Female Soldiers in Direct Ground Combat - ***Natasha VanCleave-Schottland***, *History*
#22	Simulated traumatic brain injury: No relationship between self-ratings of success, objective measurement, and time spent preparing - ***Kaitlin McHenry***, *Psychology*
#46	To Save the Last Tree: A Case Study of the Tropical Timber Agreements - ***Kendall Houghton***, *Economics*

Social Sciences (CONTINUED)			
#63	Are Planned or Naturally-Occurring Cities More Sustainable?: A Comparison of Irvine, CA and Fremont, CA - ***Jill Stoeckl***, *Geography*	#165	School Based Behavioral Intervention Systems in the Northwest Region - ***Katie Thom*** *and* ***Bridget Gibbons*** *Psychology*
#71	Defeating the Social Desirability Bias in Child Abusers - ***Lindsey Jackson, Amanda Powers*** *and* ***Andrew Hinkle***, *Psychology*	#171	Motorcycle Medics - ***Kelsey McCall***, *Political Science*
#89	The Effect of Dosage on Speech Sound Disorder Therapy - ***Morgan Malany***, *Communicative Sciences & Disorders*	#175	A comparison of adolescents' ability to infer vocabulary meaning under two reading conditions - ***Jenny-Lynne Peterson***, *Communicative Sciences & Disorders*
#105	Can't Get No Job Satisfaction: Setting as an Indicator of Current and Desired Roles of School Psychologists - ***Axel Yount,*** *and* ***Madison Evans***, *Psychology*	#180	Does the Internet Represent a Threat to the Security of Symptom Validity Tests? - ***Sarah Lawley*** *and* ***Tory Kimpton***, *Psychology*
#132	Exploring the Experiences of Transgender College Students - ***Sarah Olafson, Sean Jeffrey, Robert Enoch,*** *and* ***Sally Rau***, *Psychology*		

UMCUR Schedule Breakdown

Concurrent Oral Sessions: 4:00-5:00 PM		
UC 326 ~ Social Sciences		
4:00	92	LGBT Youth and Homelessness - ***Dustin Satterfield,*** *Sociology*
4:20	60	Children and Obesity in Low Income Families - ***Paige Ely,*** *Sociology*
4:40		
UC 327 ~ Social Sciences		
4:00	113	Face-to-Face or Facebook? Rethinking Social Media - ***Rebecca Collins,*** *Undeclared, and* ***Kimberly Lamar****, Communicative Sciences and Disorders*
4:20	153	Reasons for non-disclosure of depressive symptoms in primary care - ***Patrick Morrison, Graham Payton,*** *Psychology, and* ***Kelsey Swingle,*** *Social Work*
4:40	114	Negotiating Satisfaction in Intimate Relationships - ***Nancy Grenager,*** *Communications, and* ***Mari Holms****, Communications*
UC 330 ~ Social Sciences		
4:00	100	Forging a Secular Coalition: The National Liberal League's Battle to Separate Church and State in Late Nineteenth-Century America - ***Maria Trujillo,*** *History*
4:20	37	The Power of Place in Return Migration - ***Harry Brennan,*** *Geography*
4:40	163	Integration of Icecamp with the Community Ice Sheet Model - ***Kyle Doyle,*** *Computer Science*
UC 331 ~ Physical Sciences		
4:00		
4:20	138	Integrated electron backscatter diffraction and energy-dispersive X-Ray spectroscopy analysis on polymorph phase transitions - ***Jennifer Meidinger,*** *Geosciences*
4:40	49	South America and the Red Planet: Analysis of NASA?s Climate Databases to Hypothesize Limits to Global Change on Mars - ***Abigail Nastan,*** *Biology*
UC 332 ~ Life Sciences		
4:00	10	FirRole of IVS in Increased Degradation of 23S rRNA during SCV phase of *Coxiella* - ***Kip Barhaugh,*** *Human Biology*
4:20	117	Modeling the RNA-Nucleocapsid Protein Interactions of Rift Valley Fever Virus Using a Combined Bioinformatics/Biochemical Approach - ***Alec Sundet,*** *Biochemistry*
4:40	16	Predator-Induced Multicellularity in *Chlamydomonas reinhardtii* - ***Jacob Boswell,*** *Genetics*
UC 333 ~ Fine Arts & Humanities		
4:00	164	A Study of Stock Scenery and What the Future Holds - ***Zackery Aschim,*** *Theatre*
4:20	4	Elephant Symbolism in Thailand - ***Jenna Lyons,*** *English*
4:40	111	Jacobite/Hanoverian Factionalism, the Russian Monarchy, and the 1734 Anglo-Russian Commercial Treaty - ***Kyeann Sayer,*** *History/Religious Studies*

UMCUR ABSTRACTS: ORAL SESSIONS

(in numerical order by abstract ID number)

Hey Brother, Where's The Bathroom? Forty Years of Rainbow Gatherings and Human Waste Disposal

Stanley Wilson (#2)

This project examines the health and environmental disaster that is human waste disposal in much of the world dooming millions to early deaths from easily preventable diseases. Next, Hey Brother digs into the Rainbow Family of Living Light (RFLL) offering background information about key RFLL members and the development of the Rainbow Family history including the annual Rainbow Gathering held by the RFLL on public land and the evolution of their protocols dealing with human waste disposal in a backcountry environment, their on going relationship with local, state, and federal agencies, and, in conclusion, what the RFLL may have to teach a world in desperate need of real relief from the global nightmare that is human waste disposal.

Hey Brother utilizes interviews with RFLL elders as well as other RFLL documents and hip-stories, or oral histories collected by respected RFLL figures, United States Forest Service (USFS) documents gained under the Freedom of Information Act (FOIA), newspaper accounts, and secondary sources both to further illuminate the RFLL and to lend depth to the account. Besides Rainbow related materials, works by experts such as Joe Jenkins and DR. Sin Van der Ryn lend further understanding to the subject.

Hey Brother is an important work because it presents solutions to the millions of will die every year because of poor sanitation. In poor communities, shantytowns, and refugee camps the world poor suffer and die because it is not safe to relieve themselves. The RFLL have developed successful methodologies for thousands to safely relieve themselves

Mentor: Michael Mayer, History

Elephant Symbolism in Thailand: Re-Articulating Views of the Non-Human

Jenna Lyons (#4)

Recently, I traveled to Thailand to work at an elephant sanctuary. I had many questions about Thailand, religious climate, and the exploitation of elephants there. I wondered how such a majestic animal could be mistreated on such a conjoint level in a Buddhist nation that considers elephants so sacred. Based on my observations, I determined that this developing nation has been forced to exploit its own natural resources in order to meet the demands of a global economy.

In the Theravada Buddhist tradition, the Asian elephant is a profound symbol of steadfastness and mental perseverance. The uncontrolled mind in the beginning of one's practice of Buddhist meditation is represented by a gray elephant who runs wild. After studying the dharma, the psyche is represented as a pure white elephant. The elephant also appears as a guardian of the temples and of Buddha himself. I was able to witness the sacred nature and reverence with which the Buddhist monks regard the elephants, as they would occasionally stroll through the refuge and admire the elephants. However, I was also able to witness tragedy; each day, thousands of elephants are forced to haul tourists up and down mountains on tourist treks. Prior to 1989, Asian elephants were used for logging purposes; forced to drag heavy loads up and down plots of land, many of them now endure wounds that will never heal.

As a culture highly focused on communication, we subvert silence. And, although beings such as the sun and moon make no noise, we understand their movement as symbols of transience and cyclical existence. Similarly, in the words of a contemporary Thai monk, the entire cosmos is a cooperative, and the key to understanding non-human species lies within the human-animal connection—a bridging of human nature and animality.

Mentor: Daniel Spencer, Environmental Studies

Reconstructing Coloma Ghost Town's Demographic Landscape

Jenna Franklin (#7)

For the past six years, the University of Montana has been researching the mining ghost town of Coloma, Montana. During this long-term research, various M.A. thesis and dissertation projects have helped Coloma become more than just a "mystery camp." Yet, there are still mines of knowledge left untapped. Coloma offers a unique opportunity to study how humans adapt to a new landscape at a late nineteenth-and-early-twentieth-century mining town of the American West. Anglo-American settlers and European immigrants intermingled in Coloma, fostering a complex community of individuals attempting to scrape a living from the rugged Garnet Range. They would have carried with them traditional cultural practices, beliefs, and social relations. This traditional knowledge would have contributed to the adaptive community's building of a meaningful place in a new space. How ethnicity and identity factored into an allocation of landscape meaning by the settlers of Coloma is the object of my study. Through an interdisciplinary combination of primary sources, archaeological evidence, and historical structure analysis, this research project attempts to reconstruct the ethnic make-up of Coloma. The results will contribute to a fuller understanding of Coloma's demographic landscape and bolster further interpretations of landscape learning in mining town communities of the American West.

Mentor: Kelly Dixon, Anthropology

Role of IVS in Increased Degradation of 23S rRNA during SCV phase of Coxiella

Kip Barhaugh (#10)

Coxiella burnetii is one of the most infectious pathogens known (ID50=1-10 bacteria). It is able to infect both humans and livestock; in humans it causes Q fever. Due to its low infection dose as well as its incredible resistance to environmental factors, Coxiella is recognized as a potential bio-terrorism agent (class B select agent) and thus is important to study. Coxiella has a biphasic development cycle; it cycles from a stationary phase, small cell variant (SCV), to a developmentally active, log phase, large cell variant (LCV). In this project, I have been investigating Coxiella's intervening sequence (IVS) within its rRNA gene. IVS's are selfish genetic elements that disrupt 23S rRNA genes and have to be excised in order to yield a mature, fragmented 23S rRNA. Previous work with Salmonella showed that fragmentation of 23S rRNA by an IVS correlated with enhanced degradation of its 23S rRNA during stationary phase. I hypothesize that IVS-mediated fragmentation of 23S rRNA enhances its degradation during Coxiella's transition from log-phase (LCV) to stationary-phase growth (SCV). The 23S rRNA of Coxiella was amplified using polymerase chain reaction (PCR). The PCR product was transcribed in vitro and the IVS sequence was excised using RNase III, a cellular rRNA processing enzyme. The fragmented 23S rRNA was used in an in vitro rRNA degradation assay with RNase A. As a control, intact 23S rRNA was also degraded with RNase A. It is hypothesized that because the fragmented 23S rRNA has four termini as a substrate for RNase A, degradation will occur at an increased rate compared to intact 23S rRNA. The results of this experiment will further clarify the purpose of the highly conserved IVS sequence in the Coxiella genome and its role in the development cycle of the bacterium.

Mentor: Michael Minnick, Division of Biological Sciences

Meth In Montana A Policy Review

Terri Griffith (#11)

Montana Department of Corrections's long term residential Methamphetamine Treatment Programs at the Elkhorn and Nexus facilities, the only programs of their type in the United States, are making substantial progress with the management of convicted drug offenders. Nexus and Elkhorn are long-term lockdown treatment centers that provide intensive chemical dependency treatment. This policy review research covers the methamphetamine related laws and administrative rules codified by the State of Montana between 1995 and 2012, including the inception and continuation of the Elkhorn and Nexus Methamphetamine Treatment programs. The policy research begins at the point of origin: the introduction of the original changes to the Montana Code Annotated with regards to dealing with the methamphetamine problem that plagued the state from the late 1990's through the current period. The review and critique will trace policy evolution from incarceration and lengthy sentencing to the creation and operation of state of the art treatment facilities, highlighting and briefly discussing salient events in the timeline.

Mentor: Timothy Conley, Social Work

The Effects of the Ash Creek Fire on the Northern Cheyenne Indian Reservation

Ketti Wilhelm (#12)

My research this semester was part of the University of Montana School of Journalism's long-established Native News Project. Each year, a reporter and photographer compose written and multi-media stories on a particular topic from each reservation in Montana. This year, the project's topic is spending; I have chosen to explore this topic as it relates to the devastating Ash Creek Fire, which burned approximately 250,000 acres of the Northern Cheyenne Indian Reservation this summer, including 22 homes.

The bulk of my research, in the form of in-person interviews on the reservation, took place during the first week of April. I spent several days interviewing three families whose homes burned about the financial losses and costs they incurred because of the fire, as well as tribal leaders responsible for the management of the fire and for helping people get back on their feet in the aftermath. This process of recovery included the Tribal Housing Authority securing FEMA trailers for the families who found themselves homeless. Those shelters are intended as temporary homes, but because of the extensive poverty in the area, for many families they are permanent. Some families had insurance on their homes, but most did not. Some took low-interest-rate loans offered by the Small Business Administration, others chose not to take on debt or were unqualified for the loans. These are just a few of the issues that my research touches on.

My written story is a work in progress and will be published in newspapers around the state in mid-May.

Mentor: Jason Begay, Journalism

Predator-Induced Multicellularity in Chlamydomonas reinhardtii

Jacob Boswell (#16)

In Life's nearly four billion year history, organizational transitions have occurred that fundamentally altered the course of evolution. One of these, the evolution of multicellularity, occurred independently in at least two dozen lineages, giving rise to a remarkable variety of complex forms. In the volvocine algae, many transitional structures are retained in extant lineages, ranging from the unicellular, flagellated Chlamydomonas reinhardtii to the extravagant Volvox barberi, which contains up to 50,000 differentiated cells. In addition to its normal unicellular state, C. reinhardtii is also capable of plastically forming amorphous multicellular clusters, called palmella, which may be triggered by the presence of grazing predators. The increased size of palmella relative to single cells offers C. reinhardtii protection from grazing predation, so we tested the hypothesis that the propensity to form palmella would increase due to this selective advantage. We performed experimental evolution by continuously co-culturing 8 replicate populations of Chlamydomonas reinhardtii with the predatory ciliate Paramecium tetrauerlia for ~350 generations. Response to selection is assayed via reaction norms for palmella formation, which capture shifts in phenotypic plasticity arising from predation pressure. Reaction norms are constructed by mixing experimental C. reinhardtii isolates with different concentrations of a cell-free filtrate of the predatory culture, and measuring the frequency of palmella formation at each concentration. Previous genomic comparisons show that gene families involved in the formation of extracellular matrix are expanded in Volvox relative to Chlamydomonas. Because of their expansion in the Volvox lineage, genes in these families are suspected of having a role in the evolution of multicellularity, and are likely candidates for control of palmella formation. We investigate changes in these gene families in the experimental populations, providing a mechanistic view into one possible route by which multicellularity can evolve.

Mentor: Raphael Francis Rosenzweig, DBS

Cell-specific regulation of MeCP2 expression in *Drosophila* Astrocytes

David Hess-Homeier (#20)

Sporadic mutations in methyl-CpG-binding protein 2 (MeCP2) cause Rett Syndrome a severe, neurodevelopmental disorder characterized by loss of motor and language skills, unusual stereotyped movements, autistic features, anxiety, and aggression. Duplication of the MeCP2 gene in males results in mental retardation, autistic behaviors, stereotyped hand movements and anxiety-related behaviors. The population prevalence of MeCP2 mutations is unknown. In addition, the mechanism by which mutations in the MeCP2 protein, MeCP2 protein levels, or whether neuronal or glial MeCP2 expression changes cause disease phenotypes is unclear.

Astrocytes are a type of glia found throughout the brain. Astrocytes provide neurons with nutrients, guide their development, and maintain signaling conditions at synapses. Because interactions between glia and neurons are essential for many critical brain functions, we proposed that MeCP2 activity in astroctyes causes gene expression changes that alter the function of neighboring neurons. Using the UAS-Gal4 binary expression system we can express wildtype and mutant human MeCP2 (hMeCP2) protein in Drosophila astrocytes. We demonstrated that wildtype hMeCP2 causes sleep and aggression behavioral changes. Using MeCP2 antibody labeling, we can visualize MeCP2 expression in specific neurons and glial cells in the adult brain.

High levels of MeCP2 expression were expected in astrocytes throughout the brain. Instead, expression was reduced and restricted to the subesophageal ganglion (SOG) region. The reduction was present in brains expressing the wildtype and mutant MeCP2R106W allele, but not the MeCP2Δ166 allele. The MeCP2Δ166 allele lacks the N-terminus and methyl-binding domain. We utilized qPCR on transcripts of whole brains expressing different hMeCP2 forms. Wildtype MeCP2 mRNA was present in brains exhibiting reduced expression indicating that reduced MeCP2 protein expression is not due to a transcription defect. A mechanism that regulates MeCP2 expression would be clinically relevant to MeCP2 disorders. My results may be extrapolated to human beings via conserved cellular mechanisms.

Mentor: Sarah Certel, Biomedical Sciences

A Comparison in Classical Music: The Operas of Wolfgang Amadeus Mozart and Franz Joseph Haydn

Joseph Licitra II (#23)

Alan Rich (1924-2010), an American music critic, once wrote that "no composer -not Giuseppe Verdi, not even Richard Wagner, for all their greatness- had Amadeus Mozart's gift for devising music so close to his characters, or for using music in its greatest variety to underscore the high points in his dramatic works." Despite this assessment and many similar ones, surprisingly little has been said to explain exactly why Wolfgang Amadeus Mozart's operatic works are considered by music scholars and critics to be more profound than operas by his peers, in particular Joseph Haydn, who also wrote many operas. Through detailed analysis of selected scenes and arias from Mozart's Don Giovanni and Joseph Haydn's Il Mondo Della Luna. I hope to discover some of the important similarities and differences between Mozart and Haydn's approach to writing dramatic music for the stage. My four major areas of comparison are the creation of dramatic situation, orchestration, the development of character in the music, and the approach to combining musical elements of opera seria and opera buffa. Through my own analysis and the support of secondary sources, I will identify which aspects of operatic writing Haydn and Mozart share in common, and which aspects represent important contrasts. I am hopeful this will contribute to a better understanding of both composers' contributions to the genre.

Mentor: James Randall, Music

A new proof of an integral formula for counting perfect matchings in graphs

Lauren Morey (#27)

With the modern proliferation of real-world networks, the almost quarter-millenium-old subject of graph theory has become increasingly important. A graph consists simply of a set of vertices and a set of edges, with every edge connecting two vertices. A perfect matching M in a graph G is a collection of pairwise disjoint edges of G with the property that each vertex of G is an end of an edge in M. The theory of matchings recently entered the limelight when the 2012 Nobel Prize in Economics was awarded to two pioneers of the subject (Alvin Roth and Lloyd Shapley). This talk will examine the question of how many perfect matchings a graph may contain. In [Combinatorica 1 (1981), 257--262], Godsil answered this question using an integral counting formula, and he proved it using an induction argument. Emerson and Kayll [Contributions to Discrete Mathematics 4 (2009), 89--93] mentioned the possibility of a different, more enlightening proof of Godsil's result, but they provided no details. Here I will present those details. The audience may appreciate the interplay between continuous and discrete mathematics.

Mentor: P. Mark Kayll, Mathematical Sciences

Adovcacy: Retrofitting Access to Educational Information Technologies

Courtney Damron (#29)

Historically, barriers to students with disabilities accessing Post-Secondary Higher Education have been comprised of architectural, programmatic and attitudinal inaccessibility in the campus environment. Although effective implementation of the ADA resulted in the continual removal of architectural barriers through the renovation and new construction of the physical environment, new barriers to programmatic accessibility have been created as the access to course materials has evolved to become more reliant on emerging educational and informational technologies. At the University of Montana, the failure to implement equal access to educational and web technologies has presented significant barriers to students with disabilities and abridged their civil right to post-secondary education guaranteed by Title II of the ADA and Section 508 of the Rehabilitation Act. The pervasive capability of attitudinal barriers surrounding disability has managed to impede equal access and successfully helped to construct programmatic barriers to accessible educational technologies at the University of Montana. Informed and effective, student advocacy reemerged to remove these barriers to access for students with disabilities at UM and other post-secondary institutions, reestablishing sustained efforts to ensure an institution remains committed to continual implementation of unfunded federal civil rights law for students with disabilities.

Mentor: Elizabeth Hubble, Womens and Gender Studies

Supplementing Our Library Funds

Eileen West (#32)

When the economy is at its lowest point, library use is at its highest. This is especially true of community oriented rural towns, where libraries preserve community history, organize community programs, and provide internet access. However, an economic downturn is also when library funding from the state is in danger of being cut from smaller communities. Drawing from a survey that I sent to the Association of Rural and Small Libraries (ARSL) List Serve, as well as from ARSL members' budget reports, my paper examines how rural libraries are currently supplementing their budgets. In the survey, I asked about grants, library groups, fundraising, and community use. The majority of the libraries that responded indicated that their outside funding comes mostly from grants, selling old library books, and groups that support the library. The purpose of my paper is to examine how successful these programs are, and to identify the most effective methods for supplementing library budgets. This paper encourages librarians, working in small rural libraries, to embrace unconventional ways of fundraising in order to better fund their many uses.

Mentor: Megan Stark, Library

The Mountain Plover: The Impending Challenges of Climate Change to Population Viability

Zoe Glas (#34)

As climate continues to change it is imperative that we understand what effects increased temperatures will have on biotic organisms. Mountain plovers provide an excellent case study to begin this process. In the summer of 2012 I studied the nesting habits of Mountain Plovers in Karval, Colorado. Mountain plovers are a species of concern under the Endangered Species Act as their populations have continually declined in the last 50 years. The birds nest on the open plains, subjecting themselves and their eggs to high heat stress.

My research focused on how ambient temperatures affect plover nesting behavior. Many nests fail each year; in part because the eggs overheat when the adult is not shading the nest. Climate change will impose increased temperature pressures, forcing the adults to adapt their behavior to cope or their nests will perish entirely.

I used game cameras to monitor the nest attendance habits of mountain plovers. Off bout duration (the amount of time spent off of the nest at a time) and frequency were analyzed to provide insight into how mountain plover nesting behaviors change relative to ambient temperatures. In addition, I analyzed 50 years of climate data in order to determine how temperatures have changed in plover habitat, and what temperature patterns are likely to occur in the future. My research approach integrates behavioral and climate data in order to provide a predictive framework for future plover nesting success.

Mentor: Victoria Dreitz, CFC

The Effects of Single Point Mutagenesis in the SSP Subunit of the Junin Virus Envelope Glycoprotein on Membrane Fusion

Donna Twedt (#35)

Arenaviruses are RNA-based viruses commonly found in rodents, and can cause severe hemorrhagic fever in humans, often resulting in death. In order to infect, the virus must enter the host cell by fusing its membrane with that of the cells. The viral envelope glycoprotein (GPC) which retains its stable signal peptide is necessary for this fusion activity to occur. For my studies, I wanted to understand how the three GPC subunits (SSP, G1, and G2) work together by looking specifically at how the stable signal peptide (SSP) subunit interacts with G2. This can be done by examining how they interact in the membrane because the G2 subunit spans the membrane and is thus in a position to interact with the membrane region of SSP. Cysteine-scanning mutagenesis was conducted to replace three important polar residues on the hydrophilic face of the membrane-spanning region of SSP (T13C, E17C, and N20C) with cysteine. Cells expressing GPC were then metabolically labeled with radioactive amino acids and GPC was immunoprecipitated. This method is generally referred to as a radioactive immunoprecipitation and was conducted to determine if the mutations affected cleavage of the G1G2 precursor or SSP association with the G2 subunit. The immunoprecipitations showed that cleavage and SSP association did in fact occur. I then wanted to know if the mutants supported fusion and thus performed a cell-cell fusion assay. The results indicate that fusion did occur in all of the mutants. These results suggest that the mutant SSPs are functional, and further studies are being pursued to crosslink the cysteine mutations introduced in SSP with cysteine mutations in G2 to determine how the subunits interact in the GPC complex.

Mentor: Jack Nunberg, Montana Biotechnology Center, Hedi Casquilho-Gray, and Emily Messina

Defining Wilderness Character for the Selway-Bitterroot

Andrew Hursh (#36)

Wilderness designtation is a historically vague management directive. Some of our longest-standing Wilderness areas, such as the subject of this study, the Selway-Bitterroot, have seen no formal characterization of what specifically is meant by the term and what sort of management it requires. Only recently has the prevailing attitude towards Wilderness focused on active, dynamic management over hands-off or unstructured decision-making. How do we define "Wilderness character," what the 1964 Wilderness Act calls us to protect? This study formalized some of the physical, biological, structural, and human components that characterize Wilderness and established protocol for future monitoring. The information gathered in this research should educate future Wilderness management decisions and clarify our knowledge of the resource and its components.

The research for this project was done within a formal assessment process developed through the Aldo Leopold Research Institute. Measurable features of Wilderness Character were chosen specific to the Selway-Bitterroot based on guiding language in Wilderness legislation. Aspects of the historical development, human use, natural and biological features, and remoteness of the area were strictly defined and recorded such that they could be monitored in the future. We collected baseline data on several dozen measures of Wilderness Character, such as fire management actions, genetic purity of Westslope Cutthroat Trout, air pollution and outfitter permitting. Though the Selway-Bitterroot was designated over 40 years ago, we used data from 2011 where possible to represent a baseline for monitoring.

This presentation will outline the challenges of defining and monitoring Wilderness Character, describe some of the striking features of the Selway-Bitterroot, and place the lessons of this research into the greater context of land management issues generally. Wilderness research is valuable for both our understanding of non-human dynamics of wild lands and for the improvement of the human systems by which we protect them.

Mentor: Natalie Dawson, Wilderness Institute

The Power of Place in Return Migration

Harry Brennan (#37)

In the last century the U.S. has experienced a significant population shift from rural to urban areas. Young adults represent an overwhelming proportion of this shift, leaving home after high school in search of economic, educational, and recreational opportunities. While some young migrants eventually choose to return home, many do not. Much research has been devoted to the motives behind the migration of rural youth, but fewer studies have focused on return migration. To test the hypothesis that the decision of whether to return or not is based at least partially on the characteristics of the places in which the people reside, I rely on ArcGIS and a dataset of roughly 300 interviews that took place at high school reunions in 21 rural communities. The first step of my analysis was to code the interviews as either 'away' or 'return' migrants. Next, I identified the most recent place of residence for away-migrants, and the place immediately preceding the return to their hometown for return-migrants. These places were compared using three characteristics of place: natural amenity value, size of the migration place, and whether the migration place was in-state. Of those factors, the size of the migration place had the strongest impact on the migrant's decision of whether or not to return home. Finally, using ArcGIS I created 28 maps to visualize the migration of the interviewees. Though future studies will be needed to test the influence of economic and social factors, this study provides new insight into rural return migration.

Mentor: Christiane von Reichert, Geography

Missoula Household Gardening: A Case Study for the Potential Incorporation of 1,000 New Gardens as a 501(c)(3) Nonprofit

Emerald LaFortune (#40)

Maintaining a household, food-producing garden has the potential to create an affordable, healthy, localized and sustainable food source for Missoulians. Recognizing this, 1,000 New Gardens is a University of Montana student group that provides free garden bed installation for Missoula community members. After installing 131 garden beds since 2009, 1,000 New Gardens' organizers feel that the organization has reached the limits of its ability to serve the community within a student group format and has begun to explore incorporating as a 501(c)(3) non-profit. With the first step to starting a 501(c)(3) nonprofit being determining a need in the community, this research will explore the benefits and barriers of household gardening within two Missoula neighborhoods and if the current services of 1,000 New Gardens are needed to encourage and support new and continuing household gardeners within the Missoula community. It will also provide an overview of other gardening and sustainable food system organizations in Missoula and how they compare and contrast with the mission of 1,000 New Gardens. This information will be used to determine if there is sufficient community need to continue to pursue 501(c)(3) status and if 501(c)(3) status is the best approach to addressing organizational shortcomings. This research has the potential to greatly assist 1,000 New Gardens become a sustainable and highly useful organization within the Missoula community. It will also provide valuable information for governmental and independent organizations and businesses that serve gardeners in Missoula.

Mentor: Jesse Munro, Political Science

The Willamette: A Story of Oregon's Green River

Erin Axelrod (#43)

The Willamette River flows from its origins in the mountains outside Eugene, Oregon, north to its confluence with the great Columbia. For thousands of years, the river has nourished the Willamette Valley and her people; my family has lived in the valley since the first missionaries settled in the region around 1840, deeply rooted in the land and its story. This essay delves into the changing nature of our relationship with the river, particularly in regards to the decline in river transport, the centrality of the port of Portland in the global market, and the century-long environmental cleanup efforts that extend to present day.

My multi-faceted approach to the history of the river relies on various research methods, including: reading of historical and environmental documents; personal experience; and interviews with family members. Through my analysis of historical, ecological, and spiritual aspects of the Willamette, I have found that the river is a symbol of continuity and beauty in the Pacific Northwest, as well as a call to action for my generation and those that follow to consciously mold a gentler way of living with the land. In the presentation, I will read selections from the essay and speak to the purpose of this project - to better understand the river I love and our relationship to it.

Mentor: Phil Condon, Environmental Studies

First Reality: A Role Playing Game Parody

Garret Morrill (#45)

Few personal projects demand as much time, effort, and dedication than does the making of an amateur film. Contrary to popular thought, amateur filmmaking is not inherently simple - it presents unique and difficult challenges unknown to professional filmmaking, from extensive organization and careful research to actor relations and impromptu stagecraft. An amateur in both a monetary and official education sense, I have endeavored to create a short live-action parody of a popular RPG videogame genre with limited funds, resources, and initial skills. Through directed research into its peculiar styles of filmmaking, special effects, and more, I have explored a genre of amateur film I have never before attempted, and have in turn learned a great deal about the hidden complexities to amateur filmmaking. By detailing the process from initial planning to final editing, I hope to convey a higher appreciation for the often undervalued genre of amateur films.

Mentor: Greg Twigg, Media Arts

South America and the Red Planet: Analysis of NASA's Climate Databases to Hypothesize Limits to Global Change on Mars

Abigail Nastan, Nathalie Cabrol, Cynthia Phillips, and **Nate McCrady** (#49)

Study of the morphology and mineralogy of Mars reveals features that seem to indicate presence of significant liquid water on the surface in the past, including putative dry lakes, valleys, channels, deltas and alluvial fans [1]. This has resulted in theories of a period of global Martian climate change between 3.7 and 3.2 billion years ago, from a wetter, and possibly warmer, environment to the arid one seen today. However, isotope studies and modeling have failed to provide definitive constraints on the early climate of Mars [2]. The study of analog sites on Earth may provide a different avenue to understanding possible changes on Mars during this period. Previous work on this project has sought to link four sites in the Andes of South America to stages of the proposed climate change through comparison of satellite images to features found on Mars. The northern sites on the Chilean and Bolivian Altiplano, with their drying lakes and alluvial fans, resemble a Mars towards the close of the theorized climate change. On the other hand, the southern sites in the High Andes more closely represent the hypothesized early Martian climate, with active deltas and glaciers. Remote sensing climate data from NASA's Giovanni databases can now be used to study how large a change in atmospheric pressure, temperature, humidity and precipitation might have occurred between the stages of climate change represented by these sites. For example, while there is no significant change in temperature between the northern and the southern sites, the southern sites receive more than 50% more precipitation. Additionally, we can study how quickly these variables are currently changing to place a rate of change on each of the stages.

[1] Kleinhans M. (2010) Earth Surf. Process. Landforms, 35, 102–117.
[2] Cassata W. S. et al. (2001) Icarus, 221, 461.

Mentor: Johnnie Moore, Geosciences

Spatial Poetry
Beryl Clark (#51)

My Senior Honors Research Project is a creative project in the form of a poetry chapbook. This chapbook is partnered with a 5-7 page expository essay complete with bibliography. My focus for this project is space in writing, specifically the spatialization of poetry on the page. This application could be through punctuation, inter-textual space, and vast amounts of negative space on page. I have researched techniques and ideas posed by, but not limited to, poets Barbara Guest, Janet Holmes, M. NourbeSe Philip, and Cecilia Vicuña. I examine their books of poetry as well as critical essays and poetics.

The expository essay focuses on why these techniques and ideas are important to enhancing poetry and three or four central ways I see space as operating on the poetic page. Thus I also discuss how negative space within the poem is analogous to "real" life: negative space, or what isn't happening, in our spoken language, in our body language, in our facial expressions, or in our thoughts determines what will or what will not happen in our lives. I explain how I applied these techniques in my own creative work.

The creative portion of the project is a poetry chapbook around 25 to 30 pages that applies the spatial techniques and ideas mentioned above. The bibliography will be of the books researched.
My presentation will condense my critical and creative work in an oral presentation with PowerPoint. That way, listeners will have the opportunity to gauge the relationship between the spoken text and the text as a visual entity. I will employ the first third of the presentation to focus on those poets I studied, the middle third reading my own poems and the last third answering questions from the audience.

Mentor: Elizabeth Robinson, English

The Concept of Irony and Oscar Wilde
Geoffrey Elliot (#52)

This project explores Soren Kierkegaard's Concept of Irony in relation to the works of Oscar Wilde at the end of the 19th century. In his work, Kierkegaard characterizes the ironist through the example of Socrates. The ironist maintains negative freedom, allowing him to be unbound by his words and actions. From this disposition, the ironist deconstructs the actuality of the time with infinite absolute negativity. This project will explore how Oscar Wilde's "The Critic as Artist" and "Decay of Lying" reinterpret the ironist as an Aesthete. Both of these works exemplify a specific aspect of the ironist's disposition through their praise of subjectivity and disdain for objectivity. Using Wilde's aestheticized conception of the ironist; the project will turn to Wilde's The Picture of Dorian Gray. I will focus primarily on Dorian's relationship to his portrait, with which he is both the object of work and its primary critic. Within this relationship, I will explore the extent to which Dorian Gray embodies Oscar Wilde's reinterpretation of Kierkegaard's ironist.

Mentor: John Glendening, Literature

Wasted Women: Modern Oppressions in "The Waste Land"

James Warwood (#53)

T.S. Eliot has frequently been criticized for his misogynistic treatment of women in his poetry. Few, however, have considered the role his portrayal of women plays in supporting his poetic themes. The narrative space of "The Waste Land" is dominated primarily by women, both contemporary and mythical, who illustrate the brutal relationship between men and women. This intensely personal relationship, however, is analogous to the relationship of the individual and society; like the individual, the women must make the decision to either speak out against their oppressors or keep silent and accept their circumstances. Either option places women at risk of further subjugation. In this way, the wasted scenography of "The Waste Land" acts as the backdrop to a crippled social world populated by subjugated individuals struggling to find their voice. Eliot portrays the female voice as the struggle against the ruined communication that characterizes the modern world. Contemporary and mythical characters converge in the poem, revealing the ineffectiveness of communication in a world where power barriers exist between the sexes. By juxtaposing a mythical woman from Ovid's Metamorphoses against a contemporary character from "The Waste Land," I demonstrate how far the poem's theme of social breakdown extends into our own society.

Mentor: Brady Harrison, English

Conservation at its Best: New Zealand's Fight against Environmental Degradation

Heather Schmit (#56)

While many nations are recognizing environmental degradation as problematic, there are still several countries that do not have protective measures established and essentially, are not complying with the world's efforts to reduce the causes of this problem in order to fight drastic changes. From climate change, water, land, and air pollution to extinction of fossil fuels and native species, environmental degradation is a serious threat to the worlds' ecosystem and future generations. Many businesses are now going 'green' by implementing more practical ways to manufacture products; however, the current laws governing the world of business merely regulate and modify the many ways people are harming the environment with pollution. Using both scientific and legal information to study and map the use of law as a management tool, Legal Atlas is a new venture that aims to bring awareness to these issues. Legal Atlas' focus is to help better manage resources and foster economic development, as well as improving environmental sustainability and reducing social conflict. Drawing on my volunteer experience with Legal Atlas', this project focuses on New Zealand tourism businesses as an example of best practices in relation to environmental sustainability for the Legal Atlas database. Today New Zealand is a nation that has gone above and beyond the requirements of government authorities to establish eco-friendly and long lasting businesses, as well as make conservation of natural beauty a priority. In order to bring awareness of the innovative solutions this country has established, all best practices presented will be contributed to the Legal Atlas database for use globally.

Mentor: Andrea Vernon, Office for Civic Engagement

Personality and Recreation Preferences

Clinton Begley (#57)

The author proposes that personality traits shape our motivations which in turn influence choices to participate or abstain from participation in particular outdoor recreation activities.
Through a quantitative survey, the relationship between an individual's personality type and their preference for certain outdoor recreation activities has been explored. To understand personality types, the Big-Five framework has ben used. This framework is a well established psychological model designed to distill an individual's personality predispositions into a five-part score. Participants have been asked to indicate the level of interest in participating in each outdoor activity provided in a list, as well as their perceived level of risk involving each activity. Finally, a series of Recreation Experience Preference items was used to understand expressed motivations of participation outdoor activities in general. This study has compared survey respondent's personality types to their motivations and preferences for outdoor activities to determine if any correlation exists between these factors and what role risk may play in their preferences.

While motivations in recreation have been studied in the past, recently developed personality frameworks provide a new opportunity to assess the connections between an individual's enduring personality traits and their preferences for leisure. No prior research has been conducted on this subject, in this way.
If a significant correlation is evident between activity preferences and personality traits, recreation professionals may be able to utilize personality frameworks to improve activity design of specific programs in satisfying the needs of those participating. This study will also help programmers understand the unique developmental needs of those most likely to participate, and perhaps alter programs to make them more attractive and valuable to groups with low occurrences of participation. If a significant correlation is not evident, then further research exploring the nature of recreation drivers and constraints may be suggested.

Mentor: Elizabeth Covelli-Metcalf, Parks Tourism & Recreation Management

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Collaboration and the Columbia River Treaty Review Process

Anthony Thompson (#58)

The Columbia River Treaty governs hydroelectric power generation and flood risk management in the Columbia River basin. Signed in 1964 by Canada and the United States, the treaty is currently being reviewed by the U.S. Entity (the U.S. Army Corps of Engineers and the Bonneville Power Administration) in order to make a recommendation to the U.S. Department of State in 2014 as to potential continuation, termination, or modification of the Treaty in 2024. In part because the treaty was enacted with no consideration of local or environmental concerns, the U.S. Entity has implemented a Sovereign Review Team (SRT) process to develop a recommendation by working with regional stakeholders and experts. According to the SRT website, "The Columbia River Treaty 2014/2024 Review will enable the U.S. Entity to make an informed recommendation, in collaboration with the regional sovereigns and stakeholders [...] The U.S. Entity will ensure an open, collaborative and regionwide engagement process to hear all interests in the Pacific Northwest."

The purpose of this study is to evaluate the extent to which the U.S. Entity has been successful in fostering a collaborative process. Primary data for this study come from the Panel Discussion summaries published on the SRT website. Using a qualitative content analysis method to identify dominant themes, a frequency count was constructed for each topic addressed in these SRT forums. In addition, the documents provide affiliations for each speaker, allowing for an analysis of representation by stakeholder groups. Finally, the location and timing of SRT outreach events can give an impression of the accessibility of treaty information for the general public. Content analysis results indicate strong interest among participants in both ensuring a collaborative SRT process and in taking environmental concerns seriously. This research provides a basis for evaluating the importance of stakeholder engagement in regional planning efforts.

Mentor: Dave Shively, Geography

Eating Behaviors of Low-Income Children

Paige Ely (#60)

More than one-third of United States adults are obese and another third are overweight (Center for Disease Control 2013). At the same time one in seven households are food insecure (World Hunger 2010). Seemingly paradoxical, both hunger and obesity rates are higher in low-income populations (Lewis 2010). In both cases, however, the population lacks a healthy diet and malnutrition can manifest. A key factor of malnutrition is eating behaviors. Within low-come populations, children are most vulnerable to adapting poor eating behaviors as they are reliant on their family and school for nutrition. The consequences are also most severe; inhibiting proper health during development can lead to mental and physical impediments that last for life (Mandal 2011). While some studies have been conducted on eating behaviors among low-income populations and among children, research lacks examining the two together. For this reason I am researching eating behaviors of low-income children. To best understand the multitude of variables at play I am conducting a literature review on the subject and a qualitative research project of my own. In order to ensure that I would only be observing low-income children's behaviors I choose to conduct my research at Head Start, a federal program that provides child developmental services to families below the poverty line (National Head Start Association 2012). With IRB approval I observed lunchtime of three to five year olds for a total of 15 hours. Through detailed ethnographic fieldnotes I described everything I observed, focusing on the children's attitudes towards the food, length of time spent at the table, quantity and type of food eaten, and how the children interacted with each other. I will continue this research program in the summer and share my results with Missoula Head Start to improve their health and nutrition program in the fall.

Mentor: Daisy Rooks, Sociology

City on the "River of Awe": Missoula, the Clark Fork River, and a Changing American West

Sandra Burch (#62)

The city-river interface is a key component of urban planning and development in the American West. Policy regarding this interaction and urban river water quality has changed significantly over time, in favor of river water quality. The purpose of this paper is to identify how these changes are exemplified in the city of Missoula's relationship to the Clark Fork River, and how these changes can be seen today. Literature on urban planning, government documents, archived resources, and current policies will be examined to assess the history of this relationship in Missoula. Channelization and the development of the river greenway will be subjects of focus. Results will show positive policy changes over time, and will be used to form a student-oriented field study conveying these changes. Together, the report and field study will allow a deeper understanding of the history of Missoula's relationship with the Clark Fork, and how this relationship reflects changes in urban planning in the West.

Mentor: Sarah Halvorson, Geography

Black Magic; Saving The SoulBlack magic Saving the black soul (soul of the black community). The religious practices and the magical properties/manipulations derived from island and rural African-based communities have fascinated of the Black Community

jeffrey Hunter (#65)

There is misunderstanding surrounding the religious practices of some island, or rural African based communities. "Black" magic as demonstrated in such forms like Santeria of Cuba, Candomblé of Brazil having found a mode of cultural continuity, and integration between these religious practices with the fusion of Christianity in order to ensure a distinctly African spiritual survival has also left its mark on the white minds throughout history. While there has been outside, and Hollywood stigmas attached to these ritualistic behaviors it has also functioned as a unifying device for reconnecting to, healing and saving the Black soul / African community. Some may argue that religious influences serve as an opiate to keep the community passive and accepting of the status quo. Yet conversely others may see it as a vehicle that moves people into positions of social and political power developments throughout history have seen religion as a function for action against the oppressed. Regardless of the argument it is, and has always been a unifier therefore highlighting the argument that the "Black Soul" is alive. In what ways did the surviving African spiritual practices help save the African community either by mobilizing unity, or social contribution? In order to achieve a better understanding we should first look at some historical indigenous beliefs, former rituals, communal or common practices, and finally the importance of community within all African tribes of West Africa as well as the relevance to the current day African based religious communities.

Mentor: Tobin Shearer, History / AAS

The End of an Era: The Last King of Siam

Neal Lynch (#68)

It has been since 1238 that Thailand has had a monarch reigning as head of state. Today's King, King Bhumibol Adulyadej of the Royal House of Chakri began the world's longest reign in 1946, and although the coup of 1932 transformed Thailand into a constitutional monarchy, and the King a symbolic figurehead, he is nevertheless a unique head of state. King Bhumibol Adulyadej is revered and nearly deified by his people. He holds many powers, such as the head of the Royal Thai Armed Forces, the power of royal assent in order for a bill to become law, and the power of pardon. He is a great influential force in his country and the region. Yet, he is aging rapidly and his health is failing. Ultimately his death is imminent. Drawing on historical texts, contemporary literature, as well as other documentary resources, I will investigate how his death will impact Thailand politically and socially. South East Asia is currently a region of emerging social, economic, and political climates, with Thailand being the central influential entity in this region. Therefore, it is important to understand the cultural dimensions of the political leadership of King Bhumibol Adulyadej and to appreciate the extraordinary transition of this great monarch's passing.

Mentor: G.G Weix, Anthrolopogy

Ecological Interdependence: The Buddhist Response to Climate Change

Harper Kaufman (#76)

Increased temperatures, species extinctions, ocean acidification, melting sea ice, rising sea levels, and extreme weather events all point to the climate emergency that is quickly gaining speed on our planet. As life on earth becomes witness to a changing climate caused by the misuse and abuse of natural resources by humans, our generation faces perhaps the toughest battle nature has waged with humankind. This century must be a time of transformation and reform if we hope for our species (and many others) to continue to live on this planet. We must transform our energy consumption, our resource extraction, our polluting habits, but most of all our relationship with the land as a human race. The Vietnamese Buddhist monk Thich Nhat Hanh wrote: "If we continue abusing the earth this way, there is no doubt that our civilization will be destroyed. This will require enlightenment, awakening. The Buddha attained individual awakening. Now we need a collective enlightenment to stop this course of destruction." This Buddhist author and teacher offers an understanding of Buddhist precepts and philosophies that allow for a holistic and integrated perspective on humanity's place in the world. My paper proposes that certain Buddhist concepts can help foster a healthier and more sustainable human relationship with the natural environment. Using writings from Buddhist scholars Thich Nhat Hanh and Sulak Sivaraksa, I hope to prove the relevance of Buddhism, and religion in general, as a crucial contributor to the fight against climate change and the call for humanity's response to the ecological crisis. I have composed three paintings as a means to supplement the academic paper in order to communicate these Buddhist concepts to a wider audience. Each piece attempts to embody an ecologically aware Buddhist concept that may help us to realize our place an interdependent, and cooperative world.

Mentor: Daniel Spencer, Environmental Studies

The Misconceptions of Monotheism: Reconciling the Theology and Narrative of John Milton

Erin Hastey (#77)

Monotheism, as understood in western tradition, posits a single, immutable, ineffable Deity. Religious poets, theologians, and conversing laymen, however, have paradoxically made quite a habit of trying to describe a Being Whom they theoretically believe to be ineffable, and therefore beyond description. This indicates an understandable preference to focus on relational aspects of the Deity, in contrast to those which are by definition incomprehensible. This privileging of relationship over infinity is evident in the work of the 17th century Puritan poet and author John Milton. However, Milton's understanding of the relational nature of the Christian God is complicated by the poet's rejection of the doctrine of the Trinity. This doctrine seeks to solve a fundamental problem created by strict monotheism: how can an entity cast as singular perfection be in relationship with anything outside itself, and still maintain its perfection? In rejecting the Trinity, Milton rejects the only pattern that might allow him to reconcile the perfect, immutable Deity of theism with the relational God of biblical narrative. I explore the theological problems of the strict monotheism to which Milton subscribes, as evidenced in his posthumously published theological work and biblical explication On Christian Doctrine, and then note where this strict monotheism is subverted for the sake of narrative in Milton's magnum opus, Paradise Lost. Engaging classic and contemporary critical texts, as well as uniquely contemporary theological texts, this paper affirms what those religious poets, theologians, and conversing laymen know when they break their own rules by describing in language a God they believe to be ineffable: in any description of God, narrative picks up where reason runs out—a point aptly (though perhaps not intentionally) demonstrated within the work of Milton himself.

Mentor: Rob Browning, English

The Effectiveness of a Letter-Writing Activity on Self-Reported Body Dissatisfaction

Julie Oldfield (#79)

Body dissatisfaction (BD) has significant, negative impacts on general well being, and is a strong predictor of disordered eating behavior and eating disorders. BD, particularly in Western cultures, has become a nearly universal experience. Despite the fact that BD is extremely prevalent, there are few interventions designed specifically for the treatment of BD. Letter writing activities have become popular, both in clinical use and in popular media. However, to date, no research has been conducted to determine the effectiveness of letter writing activities for the treatment of BD. A handful of studies have examined the effectiveness of expressive writing, a paradigm closely related to letter writing, the results of which were inconclusive. This study seeks to examine the effectiveness of a letter-writing activity on self-reported BD in a community sample of college students.

64 male and female participants will be recruited from Introduction to Psychology classes, and will receive class credit for their participation (data collection is ongoing at the time of this submission). Participants will be randomly assigned to the experimental or control condition. Both groups will complete the Body Esteem Scale (BES; Franzoi & Shields, 1984), the Rosenberg Self-Esteem Scale (RES; Rosenberg, 1965), and one of two letter-writing activities. Then they will re-complete the BES and RES. Finally, they will complete a short questionnaire in which they rate the emotionality of the experience. At a one-month follow-up, participants will re-complete the BES and RES. Experimental group participants will be instructed to write a letter to their body; whereas, control group participants will be asked to respond to a non-BD related prompt.
The results of this study will provide useful information about the efficacy of letter writing interventions for BD among college students. In addition, the results may be used to inform clinical practice and community public health interventions.

Mentor: Cameo Borntrager, Psychology

THE AFFECT OF ALTERED EXERCISE INTENSITY ON POSTURAL STABILITY

Claire Nickless and T. Simon (#80)

PURPOSE: To determine if the center of balance was affected by the administration of bouts of exercise performed at different intensities. Our secondary aim was to determine how long it took for balance to return to baseline assessment values, following cessation of exercise. METHODS: 16 male subjects (25±5yrs, 183±10cm, 73±11kg, 4.4±.73 LO2?/min) volunteered and provided their informed written consent for the study. Participants were free of balance disorders and recent history of concussion. Subjects visited the lab twice and performed exercise at 40, 60, 80, 100, and 120% of the level necessary to elicit a maximal response from the body's respiratory and circulatory systems. Following each bout of exercise, balance scores were assessed every 5 minutes for 30 minutes from a portable force plate in four conditions: normal stability eyes open (NSEO), normal stability eyes closed (NSEC), perturbed stability eyes open (PESO), and perturbed stability eyes closed (PSEC). Perturbed stability required subjects to stand on a foam mat placed on the fore plate. RESULTS: Two-way anova indicated that following 120% intensity there was a significant decrease in NSEO from baseline. Stability scores returned to baseline after ten minutes. Our findings suggest a similar impaired stability following exercise at 80% intensity. CONCLUSIONS: Our results showed that immediately after exercising at 120% intensity there was a decrease in stability score compared to baseline. We conclude that balance is impaired for at least 10 minutes following vigorous exercise. These assessments and findings should be incorporated into sideline testing procedures used for the diagnosis of concussion in sport.

Mentor: Dr. Matt Bundle, Health and Human Performance (Biomechanics)

Is Whirling Disease Driving Salmonid Community Shifts in Tributaries of the Blackfoot River, Montana?

Morgan Sparks (#82)

The exotic parasite Myxobolus cerebralis, better known as whirling disease, can be lethal to certain fish species and remains a threat to salmonid populations in the United States. The parasite has had especially detrimental effects on populations in the genus Oncorhynchus (i.e. rainbow trout and westslope cutthroat trout) in some watersheds of western and central Montana, such as the Madison River and Rock Creek. Following the 1995 detection of M. cerebralis in the Blackfoot River, monitoring sites were established to measure its extent and severity in the river. Over the last two decades, Montana Fish, Wildlife and Parks has sampled the fish community in many of the same streams. Using these data we evaluated salmonid community trends in 11 streams with records of either low or high whirling disease infection levels. High infection levels have been demonstrated to have population level impacts. Previous to infection, in the late 1980s, Oncorhynchus species were dominant throughout the river, but over this time period brown trout (Salmo trutta) have become more abundant. To evaluate the potential role of whirling disease as a driver of fish community shifts in tributaries, we examined changes in community composition in streams with low to no infection levels versus high infection levels. We predicted that whirling disease resistant species such as brown trout would be the dominant species in tributaries with higher infection levels and that susceptible species (Oncorhynchus spp.) would remain the dominant species in tributaries with low infection levels. In our study, salmonid community composition changes did not appear to be strongly driven by whirling disease. Other biotic or abiotic factors are likely the primary drivers of community composition in these tributaries.

Mentor: Dr. Lisa Eby, Wildlife Biology

Comparing the Effects of Moist Heat Pack and Pulsed Short Wave Diathermy on Shoulder Range of Motion

Taylor Baldwin and **Erika Stinchcomb** (#83)

Thermotherapy has been used within the scope of athletic therapy for its beneficial therapeutic effects. Superficial thermotherapy is an inexpensive, easy way to heat local tissues at depths less than 2 cm; whereas, deep thermotherapy is more expensive and less traditional way to heat, but penetrates to deeper structures. This study compares the effectiveness of moist heat packs and diathermy on shoulder range of motion. To date, there is no research comparing these two modalities ability to improve shoulder range of motion. The purpose of this study was to see if there is a significant difference in using a moist heat pack or pulsed short wave diathermy to improve shoulder range of motion. Six athletic training students enrolled in the University of Montana Athletic Training Education Program were used in this study (3 males, 3 females). Their ages range from 20-25 with a mean age of 22 years ± 1.79. The mean height of the participants was 68.92 inches ± 2.34 with a mean weight of 166.5 lbs ± 29.15. All participants had no previous history of shoulder injury in either shoulder. A SPI TRONIC Digital Inclinometer was used to measure shoulder internal, external rotation, and horizontal adduction. Three measurements were taken before and after a 20 minute moist heat pack, diathermy, or control treatment. The participants completed each treatment once with at least 48 hours between treatments. Our results indicate that the use of modalities independently has minimal effects on shoulder range of motion. Therefore, in conjunction with current research, clinicians should use these modalities in conjunction with exercise to maximize benefits. Further research is necessary to determine if the use of hot packs or diathermy in combination with stretching routines or shoulder strengthening exercises may have a greater impact on shoulder range of motion than exercise alone.

Mentor: Valerie Moody, Health and Human Performance

Eastern European Migrations: The Craniometric Perspective

Matthew Burgess (#85)

The origins of Eastern European populations presents a complex picture of ancestral lineages with many groups sharing different aspects of their culture and genes. The Slavic peoples have contributed much to the Eastern European landscape. Their ancestral homeland of the Slavic peoples remains unknown but has been hypothesized to be one of two places, the Middle Dnieper region of Ukraine or the plains of Poland. This study will test these hypotheses using cranial measurements. There have also been migrations of Asian Steppe peoples who have contributed cultural practices and place names in Eastern Europe. The degree of genetic admixture between the Eastern European peoples and the Asian Steppe peoples has not been resolved, but a common hypothesis is that there was considerable contribution from Asian Steppe gene pools into the populations of Eastern Europe. This study will also test this hypothesis using cranial measurements.

I gathered published data from five Slavic and four Asian steppe populations and tested their relationships using means for six cranial measurements (Maximum Cranial length, Maximum cranial breadth, Zygomatic Breadth, Upper facial height, Orbital height, and Orbital breadth). I used the UPGMA phylogenetic method (statistical cluster analysis) to probe morphological relationships between the nine populations. The results suggest that the Slavic homeland might be the Upper Dnieper region of Western Russia, rather than either Ukraine or Poland. Further, the Slavic Peoples and at least some of the Asian Steppe peoples may be descendants of separate branches of the Scythian peoples of the Bronze Age. The relationship between Asiatic Steppe peoples and Eastern Europeans suggests that while the Steppe peoples have contributed substantial cultural features to Eastern Europe the direction of admixture seems more from Eastern European population into Asiatic Steppe populations.

Mentor: Randall Skelton, Anthropology

The Little Shell Chippewa: Putting a Price Tag on Identity

Allison Bye and **Candace Rojo** (#87)

When the Little Shell Tribe of Chippewa Indians of Montana refused the Turtle Mountain Reservation treaty, the United States government pushed them off their homelands and refused to recognize them as a sovereign nation. They were bounced between reservations and rejected from both Canada and the United States. In 2000, Montana recognized the Little Shell as an indigenous tribe; however, their petition to be recognized by the federal government was denied in 2009. The petition was filed in 1978.
Federally recognized tribes receive aid from the U.S. government, meaning the Little Shell do not, but they are still fighting for recognition. They do, however, receive some assistance from the state of Montana. Minimal governmental help forces the tribe to obtain funds from other outlets to pay for tribal employees, tribal events and legal fees for their recognition fight.

There are currently 566 federally recognized tribes in the U.S. and about 254 tribes fighting for recognition (Department of the Interior), proving the struggle isn't restricted to this tribe.
This multimedia and print story will focus on how the Little Shell operate on their limited budget — $22,000 — by running off the donated time of volunteers. Most tribal council members around the country are paid for their duties; however, the Little Shell have only two paid employees (a secretary and tobacco-prevention specialist) and no paid council members. Often members will use wages from additional jobs to supplement their tribal involvement, essentially paying for their cultural identity.
Information was gathered through in-person interviews on and off camera, analyzing tribal records and spending entire days experiencing the life of council members, volunteers and paid employees. Still photography also played a role in capturing the experience. The researchers spent a week between Great Falls (tribal headquarters) and the tribal president's home and office in Billings.

Mentor: Jason Begay, Journalism

Social Media and City Planning: Friend or Foe?

Jake Koplen (#88)

City planning continuously struggles to keep up with factors like population growth, changing demographics, a volatile economy and new technology. In an urban environment, problems are difficult to predict, and only become evident after the plans are in place. Facing constant challenges, planners must constantly play catch up. Due to arduous bureaucratic processes and constant demands—both public and private— and an oftentimes-unaware public, the discipline of city planning can become outdated and isolated from the very people it serves.

Today, social media is emerging as a resource for planners, allowing them to think about cities in an entirely new way. Thanks to the real-time, individualized data it creates, planners can use social media to update, create and modify current plans like never before.

This project analyzes social media's effect on city planning and urban design. By analyzing publicly accessible social media applications like Austin TX's SNAPPatx and Melbourne, Australia's FutureMelbourne, along with academically developed tools such as Carnegie Mellon's Livehoods, this report created a comprehensive picture of social media's reach into planning. Additionally, this report analyzes the ethical considerations of social media on a broader scale. Online ethics are hard to define. Since social media primarily resides online, examining the ethical limitations and issues surrounding social media is critical.

By comparing a planning project's initial intention to its actual result, this report assesses its success. For example, the SNAPPatx app allows residents to update other residents on events in Austin like accidents or delays. These data can then be used to find hotspots of these events, and new plans can be created proactively. Using new tools to examine the before and after of these situations shows that social media is in fact a viable resource for planners today and into the future.

Mentor: Tom Sullivan, Geography

LGBT Youth and Homelessness

Dustin Satterfield (#92)

While LGBT individuals represent between 5 and 10% of the overall US population, Ray (2006) estimates that 20-50% of homeless youth identify as lesbian, gay, bisexual, transgender, queer or questioning. The alarming numbers of youth living on the street who identify as lesbian, gay, bisexual, or transgender begs the question: why?

This project examines how LGBT youth's coming out experiences influence whether or not they become homeless. To answer this question, I conducted ten in-depth interviews with LGBT individuals between the ages of 14 and 24. All of these people were out to their immediate families and half had experienced homelessness. With IRB approval, I recorded and then transcribed the interviews. With this data, I predicted that youth who were forced out of the closet were more likely to become homeless than youth who came out on their own accord. I also expected to find that their family's reaction to coming out will play a role in the whether a youth becomes homeless. Identifying the major causes of the homelessness among LGBT youth will help policy makers intervene earlier and more effectively when addressing this important issue.

Mentor: Daisy Rooks, Sociology

Justice and Reverence: Towards a Critical Language of Eco Art

Clay Pape (#93)

Art has always been strongly connected to the social context in which it is produced. Artists are responders, mediators, and most importantly, world-shapers, who have the unique ability to reveal and challenge social paradigms and to respond to cultural challenges in new and profound ways.

This presentation will discuss contemporary art that pits human expression against the global environmental crisis through an array of particular strategies, motivations, and methodologies. I will frame this art form, ecological art, or eco art for short, through reverence and justice, illuminating its significance to both the arts and the quest for sustainability. I will also briefly introduce a critical strategy that views contemporary art and visual culture at large through an ecocritical lens.

Eco-Art is founded upon the principle that art can be a powerful moral, social, and political motivator capable of revealing and dismantling cultural barriers and constructing ethical value systems based on compassion for all life.

Mentor: Phil Condon, Environmental Studies

Modeling stream temperature to assess methods of managing the impacts of climate change and land use.

Todd Blythe (#94)

Warming due to climate change is expected to alter temperature in aquatic habitats but the degree, rate of change, and ecological effects are likely to be system specific. In addition, mitigation of these effects through water and land use management is also likely to be system specific. I analyzed factors controlling temperature in small streams (< 100 cfs) using SSTEMP, a USGS stream temperature model. I gathered field data on Gold Creek, a tributary of the upper-Clark Fork, for three study reaches and used the measurements to calibrate/validate the model. I used the model's built in sensitivity analysis to identify the most temperature sensitive parameters. I then constructed a hypothetical baseline stream and manipulated the most sensitive parameters to assess their affects on the baseline temperature. I found that the model is adequate for short term studies along short reaches for a stream like Gold Creek. Hence, the model could be useful for assessing the implications of proposed management strategies for regulating stream temperature, but, not for complex, long term temperature studies. I found that there are various feedbacks, according to the model, between air temperature and other parameters. Discharge and stream shade are the most effective parameters for regulating mean daily water temperature. Stream shade and associated insulating effects are more efficient at regulating daily maximum and minimum temperatures. Depending on the stream, other parameters may be more important for regulating temperature. Management strategies should consider streams independently based on their environmental characteristics, biological communities, and existing impairments. These results suggest that less impacted streams may naturally resist climate change effects better than impaired streams. However, less impacted streams will have less ability to respond to mitigation strategies.

Mentor: Vicki Watson, Environmental Studies

Nightmare Imagery and the Ethical Aim of De Rerum Natura

Ellen Boland (#97)

In the context of the ethical aims of Lucretius' De Rerum Natura, nightmare imagery can explain some of the difficulties presented to modern readers of didactic poetry. Lucretius' unique style has caused much debate regarding his vehement argumentation in favor of Epicureanism. His vivid treatment of dreams in both an ethical and scientific context can account for several rhetorical and didactic strategies, namely nightmares as a scare-tactic. A large part of Lucretius' work is devoted to convincing Romans to adopt his teachings, which he accomplishes using, among other tools, a wide array of threatening description. While researching this aspect of the poem, I examined Lucretius' explanation of dreaming in Book 4 particularly as well as relevant areas of Books 1-3. I used regular philological methodology and based my conclusions on close examination of the text while citing modern researchers. Charles Segal's article Dreams and Poets in Lucretius argues for the significance of dreaming in the poem and was influential in this paper. It is important when reading Lucretius to establish some historical context for his work while remaining true to textual evidence. The personae for teacher and student perform a key function in the poem, as do the precepts the author wishes to communicate.

Although Lucretius has less to offer us now in the field of science, his poem is the precursor for many of the principles we take for granted, particularly atomic theory. The work is important to scientists who wish to understand the origins of their studies in addition to students of the humanities. The poem contributes much to philosophy, ethics, poetry, and history. Nightmare imagery plays a key role in Lucretius' strategy for converting Romans to Epicureanism, and it can account for aspects of the poem which may pose a problem to a modern audience.

Mentor: Dr. Matthew Semanoff, MCLL

Forging a Secular Coalition: The National Liberal League's Battle to Separate Church and State in Late Nineteenth-Century America

Maria Trujillo (#100)

While writing a letter to the Danbury Baptist Association in 1802, Thomas Jefferson could never have guessed the future impact of the phrase, "a high wall of separation between Church and State." A widely accepted description of the First Amendment today, this expression only became connected with the sanctity of the secular state towards the end of the nineteenth-century, and only because of efforts made by secular movements like the National Liberal League. This organization, despite the wide range of religious and political beliefs held by its members, became committed to a single cause–––the complete separation of church and state—and created one of the most diversified national organizations in the nineteenth-century. Though the movement failed to achieve many of its immediate and material goals, and existed only for a short while, the Liberal League succeeded in increasing public debate on secular issues and shaping many Americans' understandings of secularism, minority rights, and the meaning behind the First Amendment.

To investigate the history and essence of the National Liberal League's work, I gathered primary evidence from journals, pamphlets, and newspapers like the League's main organ The Truth Seeker. I also examined documents and speeches produced by prominent members such as Colonel Robert Ingersoll, D.M. Bennett, B.F. Underwood, and Elizur Wright. Secondary readings provided contextual support. By using the resources available through the University of Montana, I reconstructed the history of American secularism, and the unique position the National Liberal League occupied within it.
Though this exceptional movement operated around one of the most significant phrases in American history, almost no research has been undertaken to gain meaning from the organization's efforts. My paper and presentation will explore how this organization helped to shape American secularism and why it is so significant to American history.

Mentor: Kyle Volk, American History

Effect of Border Patrol Agent Staffing on Crime Along the Northern Border

Benjamin Ehlers (#101)

In recent years increased fears of illegal migration, drug trafficking, and potential terrorists crossing the United States border have resulted in a dramatic rise in Border Patrol agent numbers from the 1990's to the present. The purpose of this paper is to examine how increased Border Patrol agent staffing has affected crime rates along the northern border of the United States and Canada. To determine if there was a correlation between crime rates and agent numbers I gathered arrest data and agent staffing numbers from the Border Patrol. The information I gathered was from the Havre Sector in north central Montana. After the information was gathered I used a linear regression analysis to determine if there was a correlation between Border Patrol agent numbers and arrests between 1999-2011. The linear regression analysis suggests that there is a correlation between increased Border Patrol agent numbers and a decreasing number of apprehensions by the Border Patrol. This paper suggests that further investigations of the data and comparisons with other border sectors should be conducted to better understand deterrence theory and help determine possible policy changes that could be put into place.

Mentor: Christopher Muste, Political Science

Mapping History: Using GIS to Explore Changes in Downtown Missoula over Time

Jared Fischer (#103)

Downtown Missoula, particularly the sections along Front Street, Higgins Avenue, and Main Street, has changed significantly through the years. In an effort to begin studying those changes in detail, this project draws upon historic resources and combines them with modern technology. Sanborn fire insurance maps were used through the 19th and 20th centuries to record the buildings in urban areas and document attributes like construction materials, height, number of floors, and the general use of the building, thus preserving valuable historical information. Sanborn maps of Missoula were created in multiple years ranging from 1884 to 1957 and provide a visual display of the city's urban development. However, comparing individual hardcopy maps by hand is inaccurate and time-consuming.

Digital versions of the maps were imported into a Geographic Information System (GIS), and using techniques known as "rubbersheeting," were referenced to geographically accurate aerial photographs. This involved determining certain "control points" identifiable on both the modern aerial photos and the historic maps to align them. Digital layers were then created for each corresponding Sanborn map while attribute data from the original maps were input into a database within the GIS. This approach is becoming increasingly common in historic archaeology, and inspiration came from a similar project in the French Quarter in New Orleans (Berry 2003). These methods make comparing maps from various years much more efficient and the potential applications of this temporal GIS are numerous; in the future it will be used in the Missoula Historic Underground Project to more thoroughly understand the use history of individual buildings, the transformation and growth of city blocks, and the extent and nature of underground features, including basements, steam tunnels, sidewalk vaults, and other features present beneath the streets of Missoula.

Mentor: Kelly Dixon, Anthropology

Neuromodulation of parvalbumin interneurons during pilocarpine-induced seizures

Evan DeCan (#107)

Epilepsy, one of the most common neurological diseases, is widely studied in the medical and scientific fields. The pilocarpine model of induced epilepsy has become a standard for studying seizures in a laboratory setting, allowing further investigation into specific mechanisms underlying seizure activity. Parvalbumin-positive (PV+) interneurons, a specialized class of inhibitory cells, are implicated in pilocarpine-induced seizures. However, the underlying mechanisms by which PV+ cells contribute to seizure generation are unknown.

The precise balance of the inhibitory and excitatory neuronal networks is critical to normal brain function. Imbalances between inhibitory PV+ cells and excitatory glutamatergic networks could contribute to seizure generation and other pathological states. Here, we test the hypothesis that pilocarpine, a nonselective muscarinic receptor agonist, activates PV+ interneurons and renders hippocampal circuits vulnerable to seizures. Our laboratory has previously demonstrated that the elimination of M1 muscarinic acetylcholine receptors (mAChRs) from PV+ cells results in a loss of cholinergic modulation of PV+ cells, learning deficits, and seizure protection. .Using pilocarpine application to hippocampal slices, I will determine whether pilocarpine activates PV+ cells through glutamatergic circuits or by direct excitation of M1 mAChRs on PV+ cells. These studies will lead to a more comprehensive understanding of the processes underlying epileptiform activity.

Mentor: J. Josh Lawrence, Center for Structural and Functional Neuroscience

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Jacobite/Hanoverian Factionalism, the Russian Monarchy, and the 1734 Anglo-Russian Commercial Treaty

Kyeann Sayer (#111)

The 1734 Anglo-Russian Commercial Treaty is significant in that it granted England Most Favored Nation status for the first time since the assassination of Charles I prompted its revocation in 1649. Further, Russia extended this privilege at time when empire's newly acquired Baltic ports provided the potential to control Europe's access to raw naval store materials and it did so without requiring any reciprocal political conditions. The treaty's primary authority remains Doulgas K. Reading, who examined its economic, diplomatic and practical aspects in a 1938 monograph. Describing its diplomatic context, Reading minimizes the role of the Jacobite resistance within Russia, as well as its influence on the Russian monarchy and aristocracy.* In contrast, Rebecca Wills' 2002 work, The Jacobites and Russia – 1715 – 1750, reveals through subsequently disclosed sources that both the nobility and the English expatriates in Russia were divided into Hanoverian and Jacobite-Holstein factions through the 1720s. With Catherine I's death in 1727, the Jacobites lost the support of Russia's sovereign, creating the opportunity for renewed relations with England and its new Hanoverian sovereign, George II. This paper relies primarily on diplomatic correspondence regarding the conditions for a trade treaty during Peter the Great's reign, as well as Wills' explication of the decline of Jacobite influence in the Russian court, to place the 1734 treaty in the context of Hanoverian predominance and the decline of Jacobite-Holstein influence. As part of a larger project on the relation of trade politics, diplomacy and religion to the treaty, this work contributes to a contemporary, comprehensive understanding of the factors influencing Russo-English relations in the first half of the eighteenth century.

*See note 28 in Douglas K. Reading, The Anglo-Russian Commercial Treaty of 1734 (New Haven: Yale University Press, 1938), 72.

Mentor: Robert Greene, History

Contrasting Effects of Wildfire and Ecological Restoration in Old-Growth Western Larch Forests

Taylor Hopkins (#112)

Two western larch forests were studied to compare the effects of a wildfire and a restoration project (mechanical thinning and prescribed burn) to contrast forest characteristics pre- and post-disturbance at both sites. The sites chosen for this study were the Girard Grove of the Swan Ranger District near Seeley Lake, Montana, where a restoration project occurred in 2003 for the purpose of mimicking a historical mixed-severity fire regime; and the river valley of the South Fork of the Flathead, in the Bob Marshall Wilderness, where a mixed-severity wildfire occurred in 2003. Using a laser measuring device we were able to catalogue the graphical (X,Y) location of every tree and snag on a one-hectare plot at each site, for extrapolating forest spatial patterns before and after the two disturbances. A study to assess ecologically significant spatial patterns in western larch forests has never been done, especially a comparison between pre- and post-disturbance sites. We also gathered the diameter at breast height, tree type, and vitality of each tree. Then, using three 100 meter transects, we collected data on down woody debris (DWD) size, species, and decay. Using the same transects, we formed circle plots documenting sapling regeneration numbers and vitality based on height. These results show that the Restoration site did not ecologically share valuable characteristics possessed by the Wildfire site. The Restoration site possessed fewer saplings by a factor of four, with sapling growth being one of the major objectives of the project. Though soil ground cover data was not collected, we hypothesize that the Wildfire site displayed greater sapling numbers and vitality due to the severity of the burn creating bare mineral soil, valuable to larch sapling regeneration. Analysis of forest spatial patterns has revealed that the restoration project was weak compared to the Wildfire site and management goals.

Mentor: Taylor Hopkins, Forest Management

Face-to-Face or Facebook? Rethinking Social Media

Rebecca Collins and **Kimberly Lamar** (#113)

In modern, technologically advanced societies, social media have been credited with playing a pivotal role in bringing about activism and social change. Is this enthusiasm for sites like Facebook and Twitter justified, or do we give social media more credit than it deserves? We decided to test the efficacy of social media in actively promoting social change by creating our own localized activist campaign, hypothesizing that we needed some sort of offline activist component to our outreach to mobilize. We created a campaign to advocate for tap water on campus. To measure our success, we looked at the analytics provided on our Facebook page and Youtube channel, as well as surveys on Survey Monkey, and connected our likes, views, and results to the dates they occurred, often in concurrence with offline events. For our offline component, we staged a flashmob to both aid in spreading our message and to compare its efficacy to the success of the facebook page. Our research was also informed by a parallel campaign conducted by a group of students in Berlin, Germany, with which our test group—a seminar class of Global Leadership Initiative freshmen—collaborated.

Mentor: Henriette Lowisch, Journalism

Negotiating Satisfaction in Intimate Relationships

Nancy Grenager and **Mari Holms** (#114)

Everyone in a romantic relationship must negotiate small details in everyday life with their romantic partner. Conflict occurs when individuals disagree in terms of their needs, wants, and/ or beliefs. In this study, we examined the potential correlation between negotiation style and relationship satisfaction. Fifty-seven participants completed an online survey about their conflict styles and current level of satisfaction in their romantic relationship. The results showed a positive correlation between the tendency to use cooperative negotiation styles and reported relationship satisfaction, and a negative correlation between competitive negotiation styles and relationship satisfaction. The results indicate that how people negotiate everyday issues directly influences the amount of relational satisfaction they will experience.

Mentor: Steven Yoshimura, Communications

Alzheimer's Disease: Maintaining Dignity & Quality of Life

Katelyn Miller (#116)

Alzheimer's disease is the sixth leading cause of death in the U.S with currently over 5 million American's diagnosed. Among the top ten causes of death in the U.S., it is the only disease that cannot be prevented, cured, or even slowed. In this presentation I will begin by discussing the basics of Alzheimer's disease: cause, diagnosis, and treatment. Although there is much research going on, even on our own campus to try to solve this mystery disease, there are over 21,000 people suffering from Alzheimer's disease right now in Montana that will never find a way out of their confusion. The second half of my presentation will discuss behavioral strategies that I have obtained from literature on behavioral studies, discussions of behaviors in various caregiver support groups, and in online blogs for Alzheimer's caregivers. In the last year I have implemented and found these strategies to be successful in decreasing anxiety and increasing quality of life while working at a facility that specializes in memory care. I will highlight on key times of the day that I have found are common sources of stress for people with Alzheimer's including meal times, bathing, and everyday downtime. By implementing verbal and physical cues for behavior, I have seen anxiety and confusion decrease for the people I serve. Through small moments of recognition, calming activities, and social interactions I believe that we can provide a better day for a person living with Alzheimer's disease.

Mentor: Gayle Hudgins, Pharmacy

Modeling the RNA-Nucleocapsid Protein Interactions of Rift Valley Fever Virus Using a Combined Bioinformatics/Biochemical Approach

Alec Sundet (#117)

**Note: Jeremy St. Goddard will be joining Alec during this presentation. Jeremy did the computational work that led to the biochemical work of this project.*

Rift Valley fever is the result of a dangerous virus that infects both humans and livestock and shows potential for global spread. To this end, we are interested in disrupting the interaction of viral nucleocapsid protein, N, with the viral RNA genome, that is necessary for replication. This knowledge could lead to the development of new antiviral therapies. The first steps require an understanding of how the protein recognizes and binds the RNA. We will achieve this via a unique approach using the predictive power of computational science to select novel RNA sequences, or aptamers, that will be synthesized and analyzed for binding to N.

We first programmed an algorithm to look for common features on known N-binding RNA sequences. The core of the algorithm is formed from thermodynamic structure calculations performed by software called FoldAlign; our program integrated and interpreted FoldAlign. We then screened a randomly generated RNA sequence library in silico against the known N-binding RNA sequences. Furthermore, we built a filter within the algorithm to select the highest scoring sequences, as given to us by thermodynamic similarity. These 'winning' sequences were then synthesized in the laboratory and their binding properties determined. The relative binding affinities were then compared to the strength of the computational score to determine whether the algorithm was a good predictor of RNA sequences/structures that were recognized in a biochemical assay.

Information from these binding assays will be used to improve the algorithm by integrating in silico sequences that bind well to N protein into the pool of known N-binding RNA sequences, so that we are continually refining the thermodynamic motif(s) that the algorithm looks for. We hope this experiment leads not only to a better understanding of the virus, but also to antiviral therapies that end the deadly and infectious nature of this disease.

Mentor: Steve Lodmell, Chemistry & Biochemistry

The role of RNase Y in rpoS transcript processing in B. burgdorferi

Richard LeCoultre (#120)

Borrelia burgdorferi, which causes Lyme disease, is an enigmatic microorganism that has several unusual characteristics, including a limited array of ribonucleases (RNases) compared to other bacteria. B. burgdorferi requires the presence of an outer surface protein (OspC) to be capable of transmission from its tick vector to a mammalian host. Production of OspC depends on a complicated cascade of regulatory factors, including the alternative sigma factor, RpoS. Two species of rpoS transcript are produced, which are hypothesized to be biologically relevant for different aspects of the infection cycle. A novel, long version of the rpoS transcript appears to be responsible for transcribing genes required for the transmission of B. burgdorferi from tick vector to mammalian host, but the mechanism by which the 5´ end of this long rpoS transcript is produced is not known. I propose that the rpoS transcript is processed by an RNase Y homologue in B. burgdorferi. The Samuels laboratory has recently discovered an RNase Y (rny) homologue in B. burgdorferi, and recent research in Bacillus subtilis shows that this enzyme appears to be both responsible for global mRNA stability and degradation. To this end, I endeavor to examine B. burdorgeri RNase Y and potential interacting partner proteins through the use of molecular modeling and sequence alignment software. I have over-expressed recombinant RNase Y with a truncated transmembrane domain and purified it using a 6x Histidine-tag system. I am now using the purified protein to characterize the potential processing site of the long rpoS transcript by using various artificial rpoS RNA substrates through in vitro cleavage assays. This research will contribute to a better understanding of the transmission mechanism of B. burgdorferi and of the function of RNase Y, as well as provide the basis for developing new antimicrobial therapies against Lyme disease.

Mentor: Scott Samuels, DBS

SOBA Refill Stations

Alexander Chandler (#126)

The purpose of the study was to assess students' water consumption in the Gallagher Business Building to determine if designated water bottle filling stations will increase reusable water containers. Data was collected to determine the number of disposable water bottles purchased and the current usage of refillable water bottles.

A Kress Revolving Loan Fund application was submitted to fund the installation of two water bottle refilling stations. To date the grant was awarded and installation of the filling stations is being arranged. After installation data on student usage of refillable water bottles will be collected to test the hypothesis that increased convenience for filling water bottles will increase their usage.

Mentor: Suzanne Tilleman, Ph.D., SOBA

The Figuration of Phantoms: Helens from Homer to Walcott

Claire Mikeson (#130)

Since her introduction in Homer's Iliad, Helen of Troy has remained an endlessly captivating figure, shrouded in contradiction and serving, as Classicist Robert Meagher states, as the ultimate symbol of woman. Her infamous character has endured throughout history, recreated in a thousand books, poems, and films that trail in her wake. What these multifarious recreations share is Helen's troubling silence through a singularly masculine perspective. Perhaps the most significant contemporary conjuring of Helen is that of Caribbean poet and Nobel Prize winner Derek Walcott, whose epic Omeros echoes the Classical tradition in its form as well as its Greek-named characters. Unlike former representations of Helen, however, Omeros addresses an additional, complex component: the poet's awareness of the ethical dilemma of aesthetic representation. Through a close reading of Omeros informed by feminist and postcolonial criticism and research on ancient portrayals of Helen of Troy and her mythological counterparts, I examine the influence of the Classical tradition on Walcott's Caribbean woman. Drawing parallels between Helen of the West Indies and the women of Homer, Hesiod, and Euripides, I explore Walcott's adoption of the Greek eidōlon, a phantom image of a human form, and the ways in which this particular portrayal of Helen works surprisingly to break the mold of her namesake. The paper affirms Walcott's creation of a character who subverts the poet's representation and her inherited boundaries, giving a voice to both the silenced woman and the emerging culture of the Caribbean.

Mentors: Eric Reimer, English, and Linda Gillison, Modern Classical Languages and Literatures

Exploring the Variation of Mood States and Coping Strategies in Athletic Training Students

James Capp (#131)

Athletic Training Programs (ATPs) are rigorous and demanding, sometimes effecting athletic training students' (ATS) quality of life. Use of unhealthy coping further decreases life quality. Understanding ATS coping strategies during elevated stress periods helps with determining healthy, safe coping strategies. This information can help ATP educators structure program content and clinical rotations. To gather this information, this study examines ATS mood state changes and coping while completing an ATP. 17 undergraduate ATS participated in this study. The Profile of Mood States (POMS) is a 65-item questionnaire, measuring mood states on a 5-level scale: not at all, a little, moderately, quite a bit, and extremely. POMS scores 6 mood states: tension-anxiety, depression-dejection, anger-hostility, fatigue-inertia, confusion-bewilderment, and vigor-activity. The Brief COPE questionnaire consists of 28 questions on stress coping strategies. This measures on a 4-point scale, one signifying the practice never occurs, and 4 showing the student uses the strategy often. COPE illustrates stress management through: self-distraction, active coping, denial, substance use, emotional support, instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, or self-blame. Questionnaires were completed in September, October, December, and February. Mean POMS scores reflect increased tension-anxiety, depression-dejection, anger-hostility, fatigue-inertia, confusion-bewilderment and total mood disturbance mid-semester. Throughout the semester, vigor-activity decreased. Mean COPE scores show acceptance, planning, positive reframing, emotional support, active coping and self-distraction strategies to manage stress. Substance abuse, self-blame, venting, and denial strategies were rare. Being an ATS is stressful due to long hours, clinical rotations, classes, and limited personal time. Our results suggest throughout the semester anger, depression and fatigue replaces vigor. This affects ATS personally and their professional care of patients. ATS in this study demonstrate various coping strategies such as emotional support and self-distraction to manage stressors. If applied, these findings could improve ATS lives and help them handle program stressors.

Mentor: Valerie Moody, Health and Human Performance

Using Social Media as a Business-to-Business Company in All Areas of the World

Jenna Martin (#133)

Business is rapidly and continually becoming more global, especially within the digital world. Tools such as social media are of particular interest to companies in attaining and retaining clients at a low cost. While companies are becoming familiar with the best practices to use in popular social media sites in the United States, there is a gap in common knowledge about the best international sites to leverage as a modern global company. This information is of increasing interest to market researchers, small businesses looking to expand their client base and even large international companies trying to increase brand loyalty. In this paper, I examine the most popular social media sites in the European Union, North America, South America, Africa, Australia and New Zealand, and Asia. For each of those regions, I determine the ideal social media site that global business-to-business (B2B) companies should utilize in order to gain an online market in that region. Sites are chosen based primarily on number of users and type of content. I also recommend the most important procedures the company should put into practice and touch on how B2B professionals can measure the outcomes of their marketing efforts.

Mentor: Dr. Emily J Plant, Marketing

Critical Legal Studies: Challenging Traditional Legal Thought

Emily Cross (#134)

The Critical Legal Studies (CLS) Movement emerged approximately thirty-five years ago in tandem with the Civil Rights Movement and the second wave of feminism. Generally, CLS aims to reveal the underlying subordinating aspects of legal doctrine that tend to legitimize and sustain social hierarchies based on historically and culturally instilled stereotypes. CLS has proved especially useful in the areas of gender and race discrimination with the rise of feminist legal theory and critical race theory through thinkers like Patricia Williams, Catharine MacKinnon, and Mari Matsuda. This project will first examine feminist legal theory and critical race theory to explicate how CLS has influenced legal thought thus far. Then, the project will explore new ways in which CLS may be useful, particularly in the area of sexual orientation. In order to accomplish this it will look to ways in which CLS has already been applied to issues of sexual orientation, such as the relatively new development of Queer Theory. Finally, the project will suggest how these applications of CLS can be helpful to contemporary cases, specifically to issues raised by the Defense of Marriage Act and Proposition 8.

Mentor: Tom Huff, Philosophy

A Culture, Not a Costume: Perceptions of Native Communities in the Media

Jessica Murri (#136)

"The angry Indian, the pitiful Indian, Indians as the victims... It's hard to overcome," said Bill Yellow Robe, an award-winning playwright and Assiniboine from Northeast Montana. These stereotypes of Native Americans are perpetuated by mainstream media. This research audio story explores the lives of those touched by inaccurate representation in the media. Perspectives come from frustrated Native Americans like Bill Yellow Robe, Native journalists devoted to portraying an accurate picture of Native communities, and student journalists learning how to bridge this cultural gap. This stereotyping stems from mainstream media's coverage of reservations. The news often only focuses on tragedies that occur, painting an unrepresentative picture of Native communities. Stories of success and overcoming hardship do not often find their way into off-reservation newspapers. Native media outlets are vastly different from their mainstream counterparts because of their presentation of Native voices and perspectives largely absent from mainstream media newsrooms. There are efforts to close the gap between Natives and non-Natives in journalism. These efforts include a class at the University of Montana dedicated to covering Native News issues, teaching young journalists to report on reservations respectfully and accurately. On a national scale, larger media outlets are beginning to see the need for diversity in their newsrooms, and searching for ways to collaborate with Native media outlets. This story brings light to Native American communities in the media by offering a series of interviews with Native American journalists and non-Native newspaper editors around Montana, investigations into past news articles dealing with Native issues, and explores nationwide initiatives to bring Native and non-Natives together to reach a greater cultural understanding. But there's still a long way to go to overcome this seemingly subtle form of racism.

Mentor: Dennis Swibold, jouranlism

Integrated electron backscatter diffraction and energy-dispersive X-Ray spectroscopy analysis on polymorph phase transitions

Jennifer Meidinger (#138)

This research project has utilized the new scanning electron microscope (SEM) in the Dept. of Geosciences to conduct chemical and crystallography analysis of polymorphs- minerals that have the same chemical formula, but different crystal structure. Specifically, this study explores phase transitions in the Al2SiO5 minerals- kyanite, sillimanite, and andalusite. Aluminous schists in the Goat Mountain area of the Clearwater metamorphic core complex in northern Idaho contain all three of these minerals. Electron backscatter diffraction (EBSD) and energy-dispersive X-Ray spectroscopy (EDS) were the primary techniques that were applied. This report addresses the chemistry and microstructure of these rocks through an integrated mineral chemistry (EDS) and crystallographic (EBSD) study. The primary goal is to gain a better understanding of the tectonic history of the Clearwater area with respect to deformation of these rocks. In preparation for analysis, thin sections were polished using the Buehler VibroMet 2 Vibratory Polisher and carbon coated with the Denton Vacuum Desk V. Sample preparation is extremely critical to get clear results. EDS provides the chemical evaluation of the thin section and element maps were produced. EBSD generates crystal orientation maps and patterns needed to interpret the microstructure. The Clearwater metamorphic core complex consists of mid crust that is exhumed during crustal extension. Based on lithological differences, the complex is categorized into two distinct zones: the internal zone-basement amphibolite, anorthosite, and schist; and the external zone- metamorphosed Middle Proterozoic Belt Supergroup sediments and pre-Belt schist and gneiss. The area of focus was on the unique schists near Goat Mountain and the bounding Jug Rock shear zone to the east. The results will allow us to interpret the processes of the earth with a better understanding and will benefit future research.

Mentor: Julie Baldwin, Geoscience

Effective Simulation Development Using Dynamic Documentation

Tyler Davis (#139)

Developing computer simulations often requires collaboration between computer scientists and individuals from other disciplines. The complex program implementations make effectively communicating the methods and physics used in the simulation challenging. In addition, maintaining concurrency between the code also becomes difficult due to its dynamic nature. The solution to this problem is the use of dynamic documentation tools, such as Sphinx. Such tools allow programmers to create a docstring, or a specific type of comment, that can be parsed and used to create a new document. HTML documents, for example, are commonly created using documentation tools. This approach to documentation allows these simulations to be developed more effectively as the documents can be updated frequently with relative ease.

Mentor: Jesse Johnson, Computer Science

Potential treatment of Parkinson and Schizophrenia/anixiety using Isoxazolo[3,4-d]pyridazinones selective for mGluR 2 and 4

Christina Gates (#140)

The seven transmembrane superfamily (7TM,or G-protein coupled receptors (GPCRs) is one of the largest superfamilies in the human genome, and with approximately 30% of marketed drugs targeting the 7TMs, this class of proteins is among the most successful among therapeutic targets. Each has a binding site which is called a Venus flytrap domain due to its shape. Through this domain a response can be produced in the cell, and depending on the compound that bindings to it, the response can either be increased or decreased. Within this family there is a group called metabotropic glutamate receptors (mGluR) on which the isoxazolo[3,4-d]pyridazinones compounds that we created were tested and found to have activity at mGluR 4 and 2. Interactions at mGluR4 are important targets for the treatment of Parkinson's disease. When activated, mGluR4 helps to ease the symptoms of Parkinson's disease and may even slow progress of the disease. MGluR 2 is a target for anxiety, by helping to alleviate it. The other important aspect of the activity was that the compounds were only active at these receptors and not others and did not have overlap between them. This interaction may imply that the compounds may not be acting at the Venus flytrap domain but rather at another regulatory site, which is more selective. The compounds' selectivity and activity will be optimized using a structure-based binding to the regulatory site as the working hypothesis. Based on this hypothesis more compounds were created via a new process to try to further access more binding regions in the receptor. Our progress on the new synthesis and biological evaluation will be described.

Mentor: Nicholas Natale, Biomedical Sciences

Without a Roof: Why Some Missoulians Don't Have Shelter

Noah Sohl and **Travis Tikka** (#141)

Every night in Missoula, even in the dead of winter, dozens of people, mostly men, sleep outside. They sleep in various locations including alleys, under bridges or construction scaffolding, in vehicles, by the river and in front of local businesses. While emergency shelter exists for adult men and women at the Poverello Center, these individuals cannot or choose not to take advantage of it. This presentation will present results from a variety of data sources to identify the different reasons that some homeless people are not taking advantage of a warm place to sleep. The data we will draw upon includes: ethnographic field notes documenting approximately 50 hours of participant observation at the Poverello Center, two interviews with people experiencing homelessness, Missoula's 2010 Homeless Needs Assessment report, and other pertinent literature. We expect to find that there are several reasons for people not staying at the shelter. Some may have violated the policies regarding drugs, alcohol, or violence, while others may make a deliberate choice to sleep outside. We believe we will find a myriad of reasons for these decisions. Our findings will inform policy makers, service providers and the general public about the realities and needs of our homeless citizens.

Mentor: Daisy Rooks, Sociology

Client-Staff Interactions at the Poverello Center

Ally Guldborg and **Katie Thom** (#142)

Interactions between people from different groups can shape relationships and create varying types of atmospheres. For people experiencing homelessness, interactions are especially consequential. Using 48 hours of participant observation at the Poverello Center in Missoula and ethnographic field notes that document that time, we seek to explore client- staff interactions. Our presentation will focus on two aspects of interactions: interactions between clients and staff of opposite genders, and interactions between clients and staff in the kitchen area. We will use examples from our observations to demonstrate how client-staff interactions are essential for both parties involved. The interactions with staff support and assist clients with getting back on their feet, providing mutual social support. In particular, we will demonstrate how these interactions inspire clients' creativity and motivation.

Mentor: Daisy Rooks, Sociology, and Greg Machek, Psychology

Atomic Structure Determinations for Neutron-Capture Elemental Ions

Allison Mueller (#144)

Neutron-capture (n-capture) elements are formed when the nucleus of a particular element absorbs a neutron, leaving the nucleus in highly excited and unstable state. This excited nucleus then decays in one of several possible pathways which can ultimately produce a new element where the number of protons has increased by one. These elements have recently been detected for the first time in astrophysical objects, so their chemical evolution is largely unknown. Determining the abundance of n-capture elements in astrophysical objects would facilitate a deeper understanding of the chemical evolution of the Universe. To further study these elements, information regarding the "energy-dependent photoionization cross-sections" for each element is necessary. These cross sections are a measure of the probability that an electron will be ejected from the atom after it absorbs a high energy photon. Data has been collected at the Advanced Light Source at Lawrence Berkeley National Laboratory for several atomic species, including Rb+ and Br2+, analysis of which are the emphases of this research project. One important goal of the analysis is to identify the complex auto-ionization resonance features of the spectrum. When these resonances are closely related, they can form what is known as a Rydberg series, which is a series of peaks that decrease in height from low to high energy and can function as a highly accurate probe of the energy levels of the atom. Each series' energy is a function of quantum mechanical restrictions and multiple physical variables. By adjusting the many variables in the computer program Origin, precise series identifications for Rb+ and Br2+ were obtained.

Mentor: David Macaluso, Physics & Astronomy

The Loss of Self in Abe Kobo's The Wall

Christina Strand (#147)

The loss of oneself, who one is, is a common occurrence before during and after war. The loss of oneself is seen in Abe Kobo's Akutagawa Prize winning short novel Kabe, or The Wall. The short novel was written after World War Two, during the US occupation of Japan and the Korean War, in 1951. The theme of losing oneself and being trapped due to this loss is a representation of Abe's life and how he lost who he was, as well as his feeling of being trapped by such a loss. This theme is also seen in Abe Kobo's Woman in the Dunes. To English-speaking audiences, he is best known for this novel, which was published in 1962 and adapted to film in 1964. As exemplified in both Woman in the Dunes as well as The Wall, Abe's work contains a note of surrealism, and functions as a commentary on contemporary Japanese society.

The Loss of Self in Abe Kobo's The Wall shows the theme being manifested in the main character losing his name and being given number in place of his individual identity. The theme of being trapped due to this lack of self is also prominent. The prominence of these themes has much to do with the turbulence of the Korean war and US occupation; many Japanese people were trying to pick up what was left of their identity as individuals and as a nation.

Mentor: Robert Tuck, Japanese

In the Woods We Return

Daniel Nelson (#148)

Man's connection to nature has long been a subject in literature throughout the world. Whether being depicted as a place of spirituality, where man can find himself or discover some truth about the universe, or as a powerful merciless entity, nature has had a profound effect on humanity and the stories we tell each other. And the Rocky Mountains, running from one end of the North American continent to the other, are one of the most tremendous displays of nature's splendor. My project, titled In the Woods We Return, is an expression of the writing skills I have acquired throughout my college career inspired by the various styles of authors I have studied. Using nature as the setting and as a primary influence for the characters, much like Norman Maclean's A River Runs Through It and Thomas McGuane's essay "The Heart of the Game", In the Woods We Return is a story of two men on a moose hunt deep in the Gros Ventre Wilderness in northwestern Wyoming where they come to terms with the events of their life and commune with the primal forces deep within the mountains. During my presentation I will briefly explain my influences and the creative process I took to create this work, and then share with the audience a segment from the story itself.

Mentor: Robert Stubblefield, English

Effect of Unconditional Cash Transfers on Health in Indonesia: Food Consumption, Medical Consumption, and Children's Nutrition

Ardina Hasanbasri (#151)

Cash and in-kind transfers play an important role in alleviating poverty in developing countries. Compared to in-kind transfers, cash transfers give recipients greater flexibility in how they spend the money. However, there are concerns that the recipients may use the cash transfers to purchase unnecessary goods such as alcohol and tobacco. This raises the question whether unconditional cash transfers are effective tools to alleviate poverty. Previous literature uncovers that cash transfers given in developing countries are used mostly for food consumption, which can increase children's nutrition and well-being. In Indonesia, the government initiated an unconditional cash transfer program called Bantuan Langsung Tunai (BLT) through which transfers were first made in October 2005 followed by a second round in 2008. The program targeted about 19.1 million households to receive Rp 100.000,00 (approximately $10) a month to help cope with an increase in gas prices. Literature regarding BLT's effect on health is limited. A quantitative study confirming its effects on children's nutrition has not been conducted yet. Thus, this research focuses on evaluating three types of effects on health: food consumption, medical consumption, and children's nutrition. I use data from the Indonesian Family Life Survey (IFLS), a longitudinal survey that has tracked over 7000 households across the country since 1993, to conduct my analysis using a propensity score methodology. Since the targeting of BLT recipients was based on a number of characteristics that the government considered as good identifiers of economic well-being, randomness was not implemented in the program. In this research, I create a control and treatment group from the data using the propensity scores to incorporate randomness. I estimate the average treatment effect on the treated (ATT) on food and medical consumption, as well as children's BMI z-score for each age group to evaluate the program's impact on nutrition.

Mentor: Ranjan Shrestha, Economics

Tenselessness in Tagalog

Kelsey Fanning (#152)

"Tenseless" languages are typically defined as those which lack obligatory tense morphemes. English would be considered a tensed language because it requires a morphological distinction between past (-ed) and present (-s). Tagalog verbs obligatorily encode for aspect and focus, features that convey how an event occurs and who or what is the most important participant in that event. However, Tagalog does not require tense marking, giving rise to the contested claim that Tagalog is a tenseless language. Resolving this debate requires answering the question as to whether the lack of obligatorily realized tense morpheme truly qualifies Tagalog as tenseless. Because context (and not overt morphology) dictates the temporal interpretation of a verb, I argue that it is unlikely that tense functions as a feature built into Tagalog syntax. I propose that Tagalog lacks the syntactic feature tense, distinguishing it typologically from languages like English which do morphologically encode temporal information.

The Parametric Substantiation Hypothesis (PSH), proposed in Ritter and Wiltschko (2009), states that tense itself is not a universal inflectional feature across the world's languages. Instead, tense exists as one of several possible inflectional categories that help speakers interpret their relationship to the events described in a discourse. Following the PSH, I propose that Tagalog speakers employ focus to convey relationships between participants in described events and participants in a discourse. In other words, verbal inflection in Tagalog orients speakers with respect to which noun in a clause is most perceptually salient to participants in the discourse, rather than conveying when an event occurred. My analysis contributes to the ongoing discussion of the syntax of tenselessness both in Tagalog and cross-linguistically and offers further support for the PSH.

Mentor: Leora Bar-el, Linuistics

Reasons for non-disclosure of depressive symptoms in primary care

Patrick Morrison, Graham Payton, and **Kelsey Swingle** (#153)

This research aims to discover some potential reasons individuals in college settings might choose not to disclose depressive symptoms to their primary care physicians. Depression is one of the most prevalent mental health disorders, yet many people with depressive symptoms are not treated or referred to treatment by their primary care physicians. One potential reason that individuals with depression do not undergo treatment is because patients choose not to disclose their depressive symptoms. Research has shown that stigma plays a role in whether or not individuals with mental health illness disclose symptoms in primary care settings. The present study, with data collection recently underway, utilizes an online survey containing a vignette depicting an individual with depressive symptoms. Following the vignette, participants complete several objective measures aimed at discovering correlations between stigma and depression and assessing potential reasons for depression nondisclosure. The two main variables being measured in this study are participants' attitudes regarding stigma and nondisclosure of depressive symptoms. Proposed analyses will examine associations between stigma and nondisclosure and will describe the range and scope of students' concerns about disclosure. Proper identification of the reasons for depressive symptom nondisclosure in primary care may have implications for stigma reduction in this population and may generalize to other populations. Results may also serve to inform psychoeducational efforts aimed at increasing the likelihood of depressive symptom disclosure.

Mentor: Duncan Campbell, Psychology

"Vibrations in Spoon River": Reading Edgar Lee Masters' Spoon River Anthology After a Century

Kelsey Fanning (#155)

This project argues for revitalization of critical engagement with Edgar Lee Masters' Spoon River Anthology as Modern American text. I explore Masters' impressive capacity as a satirist and as a proponent of the American psychologist William James' theoretical models. My research expands an existing critical connection established between Masters and James and employs the critical vocabulary of Mikhail Bakhtin to illustrate the distinctly Modern qualities of the Anthology. I contend that Masters' investment in generic revitalization, satiric subversion of prevalent American tropes surrounding practices of death and dying, and heavy investment in avant-garde psychology qualify his Spoon River Anthology for inclusion in the Modern American cannon and as text in need of ongoing critical research and discussion.

Mentor: Ashby Kinch, English

Get Fit for Sport: Year Around Fitness Programs for Intellectually Disabled Individuals

Andrea Flippin (#156)

The intellectually disabled population has increasing rates of obese and overweight individuals. Special Olympics, an organization designed to support recreational and Olympic type sporting events for this population, has brought focus to the issue by encouraging integration of fitness and healthy living into their lives. These athletes are physically active during their selected sports season, but it is reported they are not meeting their daily recommended amount of activity during the off season. The aim of the "Get Fit for Sport" program was to categorize Special Olympian physical fitness and develop year-round personalize training programs. The plan of providing year-round programs to each athlete was to encourage them to complete their daily activity requirements in the off season as well as additional light activity when they are in season. Four subjects were tested on aerobic activity, flexibility, strength, and balance to determine current physical capabilities. The test data were used to categorize the subjects as weak, moderate or strong in the four tested areas. Included in our results was a personalized survey conducted by the testers to understand the subjects' preference of exercise, intellectual ability, and accessibility of equipment. Data collected from the tests and surveys were used to create personalized fitness plans for each subject. Within these plans each athlete was given an example week that they could incorporate into their lives. During the week all four categories are focused on, aerobic activity examples, strength training exercises, stretches for flexibility, and exercises to improve balance. Giving the athletes a well-rounded program for life long fitness.

Mentor: Donna Bainbridge, Physical Therapy/HHP

The Effect of Redistricting on Voter Turnout

Bryn Hagfors (#158)

This presentation aims to address the subject of voter participation, particularly how it responds to the legislative redistricting process. Rational voter theory dictates that as cost of engaging in the political process rises, participation falls. One means of raising the costs associated with engaging in elections comes in the form of candidate recognition; if one does not recognize the candidates on the ballot, the costs of being an informed voter rise. In this context, the process of redistricting has the potential to disengage a large number of voters each election cycle, as it places new boundaries on legislative districts and changes the districts in which some people vote. Using regression analysis to test demographic and political data from elections between 1978 and 2004, this study will test the hypothesis that legislative redistricting leads to lower voter turnout rates. Adding another dimension to the academic conversation surrounding political participation, this analysis will point to whether the current system of redistricting does indeed disenfranchise voters, and if so will provide policy recommendations for addressing this issue.

Mentor: Christopher Muste, Political Science

The Struggles of International Research in a Developing Country: A Study on Diabetes Prevalence Rates in the Rural Arumeru District of Tanzania.

Tyler Ellis (#160)

International research is plagued with various struggles, the main being obtaining permissions to conduct such research. Permissions from people such as an Ethics Review Committee along with governmental clearance are required to proceed. Upon leaving the boarders of the United States of America, a researcher must not only obtain these permissions, but also respect the local requirements of the country that the research project is being conducted in. Once permission is obtained, the fate of the research project is ultimately left up to the discretion of the host. Selection of a host is vital, for they are ultimately responsible for facilitating the travel as well as providing participants to conduct a study on. The host can also make obtaining previously discussed permissions easier through locally acceptable routes. The next struggle is the language barrier and obtaining competent translators to work to conquer this barrier. Developing countries have limited resources and supplies. Once the researcher runs out of materials, he/she is usually finished. One has to plan ahead to obtain needed materials before starting the project. Some scientific methods, such as true randomization, are not possible due to inability to travel to desired locations. The ability to see the overall project and alter the experiment's protocol to adapt to the conditions provided by the hose is rarely encountered in research within the United States of America. An international researcher needs to be able to think rapidly and adapt to create a successful project while keeping the variables limited; no matter what struggles present themselves. This novel methodology outlines basic struggles on how to conduct and adapt to the struggles of international research in a developing country. This is done utilizing a case study on the prevalence rates of diabetes and pre-diabetes in rural villages of the Arumeru District of Tanzanian.

Mentor: Benjamin Miller, Seattle University-School of Nursing

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Axial Chirality to increase selectivity of AIMs as anti tumor agents

Michael Campbell and **Matthew Weaver** (#161)

The focus of this project is to improve the efficacy of Anthracenyl isoxazolyl amides (AIMs) by adding axial chirality via strategic halogenation. AIMs are a new class of antitumor agents specially synthesized to bind and interact with G-quadruplex (G4) DNA; binding G4 DNA has been shown to repress the replication of oncogenes in cancerous tumors. By using asymmetric halogenation to introduce axial chirality into the AIMs, our goal is to create a molecule that is divided by a bond, or axis, that cannot freely rotate due to steric hindrance. Many biologically active molecules are chiral and the stereoisomers often display a significant difference in activity due to interactions with chiral targets, such as DNA. Our efforts are currently centered on over halogenating the anthracene followed by selective cleavage. Over halogenation of unsubstituted anthracenes in synthetically significant yields has been published by Cakmak. However, with the added complexity of the substituted anthracene used as a starting material in the production of the AIMs, the addition of halogens has become quite a challenge. We have successfully isolated a 2,3,4,5,10-pentabromo-anthracenyl-nitrile oxide. The original methods by which we synthesized this compound proved to be inefficient and require optimization. The methods that we are investigating require consideration of the mechanism of the reactions, and catalysts can change the course of the respective reactions, in which ionic and radical intermediates are expected to predominate. The future focus will then shift to optimization of the cycloaddition and methods of selective cleavage. The benefit of stereospecific activity is that a patient may be able to take less of the chemotherapeutic agent and achieve equally beneficial results with fewer side effects. Our progress will be described.
Mentor: Nicholas R. Natale, BMED; Additional Author: Matthew J. Weaver

Mentor: Nicholas Natale, Biomedical sciences

U-Th/Pb geochronology and Pressure-Temperature constraints on metamorphism, Freezeout Ridge area, Clearwater metamorphic core complex, northern Idaho

Elise (Ellie) Fitzpatrick (#162)

Recent geochronologic and metamorphic data from the Freezeout Ridge area, northern Idaho, reevaluate stratigraphic relationships and further define conditions of metamorphism in the western portion of the Clearwater metamorphic core complex (CMCC). The Freezeout Ridge area was previously mapped by Hietanen [1968] as metasedimentary rocks of the Mesoproterozoic Belt Supergroup (~1.45 Ga); however, these metasediments are now recognized as exposures of basement rocks upon which the Belt Supergroup was deposited. U/Th-Pb monazite and xenotime geochronological data collected by laser ablation split stream (LASS) dating records ages as old as 1.5 Ga in the Freezeout Ridge schist (FRS). These ages predate the deposition of the Belt Supergroup, suggesting the protoliths of the FRS are supracrustal basement rocks. Doughty et al. [2007] concluded peak metamorphic conditions to be Cretaceous (82-80 Ma and 72-70 Ma) in the external zone of the CMCC. This study will further constrain peak metamorphic conditions in the Freezeout Ridge area through scanning electron microscopy/energy dispersive X-ray spectrometry (SEM/EDS) and thermobarometry. SEM/EDS will analyze the equilibria between different minerals in two samples of garnet-bearing amphibolite and mineral chemistry will be used to calculate the P-T conditions of metamorphism. If the peak metamorphic conditions in the Freezeout Ridge amphibolite samples match the conditions of other localities, the resulting metamorphic events that affected those rocks are assumed to be correlative. Interpreting age data collected from LASS petrochronology and analyzing conditions of metamorphism through SEM/EDS and thermobarometry in the Freezeout Ridge rocks will allow for a better understanding of the geologic processes within core complexes, which are a vital part of the geologic history of northern Idaho.

Mentor: Julie Baldwin, Geosciences

Integration of Icecamp with the Community Ice Sheet Model

Kyle Doyle (#163)

One of the primary computer programs used for modelling the flow of ice sheets is the Community Ice Sheet Model, or CISM. While this program is a very powerful and useful tool, there are other models which portray certain aspects of ice sheet flow in a more accurate manner. Being able to integrate more accurate models into the CISM is an important part of furthering our understanding of ice sheets. The focus of this project is to incorporate a new model, Icecamp, into the CISM. This is a challenging task, particularly as Icecamp is relatively new and has little documentation or testing. Testing will be the main focus of my contribution using the standard methods of intercomparison between different models.

This will require research into existing ice flow models, Fortran coding techniques, and extensive research on Icecamp's current functionality. The main focus of the project is modification of existing code, which will require understanding the underlying functionality and extending it significantly. In addition, there are many computing techniques which may contribute to Icecamp, which will also be investigated throughout the course of the project.

Mentor: Jesse Johnson, Computer Science

A Study of Stock Scenery and What the Future Holds

Zackery Aschim (#164)

Over the last several decades the scenic element of theatre has had its struggles in regard to building stock scenery. Through research and working in the industry I am reexamining what is the "norm" with stock scenery and looking to improve what my predecessors have done. The theatre is an ever evolving world always looking for the next step. To strive for the future I want to take a step back and try to reexamine scenery in hopes of actively bringing about the next generation of thinking. For example stock platforms are an age old tradition in theatre however through varying degrees of research and hands on experience I find there is room for improvement. This semester I have been shadowing my mentor in a class that deals entirely with stock scenery and looking at why we build the way we do. The problem is that as the world around us changes so too must scenic construction.

There is an old idiom the dictates the construction field – "Cost vs. Weight vs. Strength." This constant struggle helps guide us into the decisions we make when building. Research has shown that some of the strongest materials are becoming too expensive due to deforestation. In the same sense inferior materials can be weaker and weigh outrageous amounts. However we must struggle to find a balance in this ever changing world. Stock scenery is a cost saver but only if it lasts. As with anything the current way of building has limitations. The platforms here are built well but due to poor storage and just constant wear and tear tend to break. There is such a strong foundation for stock scenic elements however there is room for improvement and in theatre we are always looking to the future.

Mentor: Mike Monsos, Theatre

Microevolutionary Changes in the Face from the Prehistoric to Historic Arikara

Kaleigh Best (#167)

The purpose of this research is to build a cultural-historical perspective based on skeletal evidence to examine microevolutionary changes in the face between prehistoric and Historic Arikara. Using coordinate data observed on crania recovered from sites associated with the Arikara of the Middle Missouri Region of South Dakota, statistical tests are used to assess patterns of morphometric change in facial morphology through time. This study looks at 366 individuals from four archaeological sites spanning all three time periods and utilizes 3D coordinate data for 14 cranial landmarks. Aside from this information, archaeological data and first hand accounts of Europeans will establish the socio-cultural context of the Arikara. Data is subjected to a Procrustes Analysis and compared using mean configurations from each temporal range. The hypothesis of this project is that the environmental stress encountered by post contact populations of Arikara should alter facial dimensions in a way that distinguishes them from pre contact populations.

Mentor: Dr. Ashley H. McKeown, Anthropology

Bridging the Gap Between Theory and Practice: Interpreting Beethoven's Sonata No. 17, "The Tempest"

Allyson Carroll (#168)

Classical musicians generally believe that that an interpretation informed by theoretical analysis will result in a deeper understanding of the work and therefore a more moving performance. Many theoretical models however, use highly specialized and abstract terminology, and few musicians learn them to the degree that they may prove useful in a performer's interpretation of a work. Thus there is a gap between theory and practice. The purpose of this research is to provide a straightforward method of analysis that aids a performer first in understanding how a piece of music 'works' structurally and then offers a practical way of attaching meaning to the analysis so as to fully realize a work's affective potential in performance. Drawing upon theoretical models developed by Leonard B. Meyer, Edward T. Cone, and Gregory Karl, I analyze Beethoven's Piano Sonata No. 17 (The Tempest," so named for its dramatic similarities to Shakespeare's play). Then, through a discussion of listener expectations and musicological components such as the historical setting of the work's composition, I show expressive possibilities for a performer to apply this analysis. I hope this will provide a pedagogical model for how teachers might explore and deal with theoretical musical elements in plain language with reference to real human experience so that performers might arrive at a meaningful, communicative realization of a work.

Mentor: James Randall, Music

Is plea bargaining in a defendant's best interest?

Sara Ward (#170)

Within the Bill of Rights is the sixth Amendment, which gives a person the right to a speedy trial by jury. It is considered one of the fundamental rights that citizens of this country are assured. Today there are many trials that are covered on television that people intensively follow. Because of this, it is somewhat surprising to learn that about ninety-percent of all criminal cases each year never even make it to trial, instead, those cases are plead down with the help of plea bargaining. Why would someone want to forgo one of the most basic rights of this country, and instead submit themselves to punishment without a fight? However, with steep legal fees and the amount of time a trial takes, a quick bargain with the prosecution may not seem too terrible to some people. But there are many who believe this process is diminishing the public's trust in the legal system and the legitimacy of the courts in the United States. Some people believe that the judicial process in this country has become too bureaucratic - depersonalizing the judiciary and the court system. Throughout this presentation the process of plea bargaining, its pros and cons, and the arguments in favor of and against plea bargaining will be analyzed based upon research gathered from numerous law reviews, journals, and an in-depth interview with a former deputy district attorney.

Mentor: Christopher Muste, Political Science

Eugenics: Improvement of the Human Genome

JonAlan Osborne (#176)

There is an ongoing dichotomy in society between the autonomous rights of the individual and the collective rights of the people. Contained within this conflict is the topic of eugenics, defined as the improvement of a population via controlled reproduction in order to propagate desired heritable characteristics. In today's society, the idea may seem abhorrent and out of favor, but the pro-eugenics argument held sway in the United States in the early 1900's. This presentation will review the history and ethical justifications of the early eugenics movement, and examine its implications today. This becomes significant when considering the current political landscape as socialist movements arguably become more prevalent. Are we straying back toward the ideals that promoted such a mentality?

Mentor: Ivan Lorentzen, Psychology

Perspectives of the Western Montana Grower's Cooperative: A Supplementary Case Study of Food Producers in Western Montana

David Wise (#183)

The Western Montana Growers Cooperative (WMGC) is a coalition of growers in Western Montana whose goal is to provide the region with fresh, quality products from farms. An original study was conducted by graduate students in the fall of 2012 to understand the role of WMGC producers, staff, and customers in the local and regional food system. In this study, students focusing on the producers only interviewed the top fifteen Co-op members by sales based on the desire to learn specifically about the Co-op's best producer assets. Original producer interviews contained fourteen open ended questions which sought to understand individual and collective producer dynamics. In my follow up research, I conducted ten additional qualitative interviews with producer members who were not included in the original sample and gained a unique perspective from individuals who had received less research attention. Other than small changes to secondary probing questions, I used the original fourteen questions in my interviews so that results could be compared between the different groups. By comparing the results of the additional interviews with results from the Co-op as a whole, I sought to understand whether or not the perspectives of producers who sell less to the Co-op differ from perspectives of the top fifteen producers. My research reveals important theoretical and practical differences between the Co-op producer-members and will help the Co-op in the future as it continues to grow and adapt to the diverse needs of members and in an effort to fulfill its role in the local and regional food system.

Mentor: Neva Hassanein, ENST

UMCUR ABSTRACTS: POSTER SESSIONS

(in numerical order by abstract ID number)

Using Image Detection to Locate Resin Ducts

Kegan Rabil (#1)

Computers are an indispensible tool in the lives of many citizens, but that powerful technology can also be harnessed to aid in research. This project focuses on creating a code that is capable to detecting, locating and measuring resin ducts. Resin ducts are the remnants of veins that once transported resin through the bark. They appear as small bright circles that lie in the tree rings and bark of trees. The number of resin ducts and their respective size in a tree can be indicative of the tree's health and ability to protect itself from Bark Beetles, a pest that threatens the health of trees.

Before completion of this project the time needed to locate all the resin ducts and measure their areas in a single slab of a large tree was close to three hours. By using the powerful mathematical processing program, Matlab, a code was created that was capable of searching through an uploaded picture for resin ducts, marking their location within the picture then outputting their respective areas in a fraction of a second. However, it was also designed with the capacity for a human researcher to oversee its function to make critical distinctions between ambiguous areas of the picture. Early versions of the code were tested to be approximately 87%, but in the interest of accuracy sliders were added in order for the researcher to control the sensitivity of the program on a case-by-case basis based upon the quality of the picture. This code can be used for a variety of different studies of resin ducts in order to determine many characteristics of trees and their surrounding environments.

Mentor: John Bardsley, Math Department

Theme Houses at the University of Montana

Emily Caponi (#5)

Central Question: Can the University of Montana Benefit from a Theme Housing Community?
Theme houses provide a unique living-learning environment where students with similar interests partake in a shared, enriched academic experience. Living learning communities (LLCs) can take shape in the form of dorms or residence halls, but a theme house model specifically appeals to a broader demographic than the typical incoming-freshman- targeted LLCs. The physical venue, too, allows for a greater variety of activities, projects and collaborations to take place and can foster a deeper sense of engagement.

The University of Montana has had some success with LLCs in its residence halls and currently exhibits some non-institutionally endorsed student group houses as well. One example of the University of Montana supporting a theme house is the UM Forum for Living with Appropriate Technology (FLAT), which is centered on sustainability. The FLAT has proven to be successful by many measures and the university seems to have many of the ingredients to replicate it to some extent with the added elements of other themes.

The first objective of this project will be to review and analyze what has generally been found in the literature on theme housing. Next, I will profile three schools comparable to the University of Montana that have established theme housing. Finally I will make recommendations for the University of Montana to consider in pursuing theme housing itself.

Mentor: Neva Hassanein, Environmental Studies

A Few Good Women: American Female Soldiers in Direct Ground Combat

Natasha VanCleave-Schottland (#6)

The issue of American women in combat is something that has recently come to the forefront of American politics. In January of 2013, Leon Panetta, then Secretary of Defense, issued legislation that legalized and allowed women to actively participate in direct ground combat roles that had been previously been closed to them. However, controversy still remains over the aspect of female soldiers truly becoming integrated into dangerous combat situations. Drawing on Department of Defense records, first-hand accounts from female soldiers, and other reports, this paper examines reasons why women should be allowed to serve among men in dangerous direct ground combat operations. I briefly recount the history of women actively participating in war efforts, beginning from the Civil War up to the current war in Iraq and Afghanistan. Using this historical context, I then argue that female soldiers have been serving in direct combat in the Iraq and Afghan wars due to the changing nature of the battlefield. This sets the basis for my argument that women should be allowed to fight alongside their fellow soldiers on the front lines and be able to apply for jobs that require a high physical and mental state. This presentation and paper brings light to a subject that requires immediate attention and urges America's armed forces to reconsider their position of allowing women to serve in ground combat.

Mentor: Elizabeth Hubble, Women and Gender

Hybrids lost: fading introgression in two freshwater sculpin populations

Grace Malato (#9)

Rates of hybridization and introgression are increasing worldwide because of human mediated actions, such as species introductions and habitat degradation, and are having deleterious effects on native populations. The conservation implications of hybridization and introgression varies among species, thus understanding patterns of hybridization is an important step as we explore species interactions and evaluate potential consequences of genetic exchange. Although it is known that species of Cottus (sculpin) can hybridize, few have examined the potential patterns of hybridization among sculpins to explore potential implications on populations in the watersheds in the Rocky Mountain region. Several C. cf. cognatus X C. sp. hybrid individuals were previously detected in Trout and Fish Creeks in the lower Clark Fork River, MT. We collected tissues samples across the length of Trout and Fish Creeks in 2012 to discern patterns in hybridization. Little evidence of introgression was present in 2012 samples. We then analyzed 46 more of the MFWP 2007 samples and compared similar numbers of samples from 2012 samples from overlapping locations in Trout Creek and in Fish Creek. There was substantial loss of in the number of hybrids and proportion of C. cognatus alleles in both populations from 2007 to 2012. This reduction could be indicative of reduced fitness of hybrids or the reduction in C. cognatus alleles observed could also be due to genetic swamping due to relatively high proportions of the C. sp. parental type.

Mentor: Lisa Eby, College of Forestry and Conservation

The Role of RNase Y in Gene Regulation During Transmission of B. burgdorferi

Jeanette Comstock (#13)

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

Mentor: Scott Samuels, Division of Biological Sciences

Cell-specific effects of MeCP2 on aggression using Drosophila as a model organism

Austin Herron and **David Hess-Homeier** (#14)

Rett Syndrome is a severe neurodevelopmental disorder characterized by a loss or reduction in methyl-CpG-binding protein 2 (MeCP2) expression. Symptoms include loss of motor function, social problems, increased aggression, unusual stereotyped movements, and learning disability. When the MeCP2 gene is duplicated in males, MeCP2 duplication disorder results. The symptoms of MeCP2 duplication disorder include mental retardation, hypotonia, recurrent respiratory infections, epilepsy, limited or absent speech, progressive spasticity, and stereotyped movements of hands. MeCP2 is expressed in nearly all the cells of the nervous system. In this study, we are testing if human MeCP2 expression in octopamine neurons (invertebrate equivalent to norepinephrine) and specific glial cells causes changes in male aggressive behavior. We are using octopamine neurons since the behavioral changes associated with MeCP2 related disorders in humans suggest changes to neurons which affect behavior such as dopamine, serotonin, and norepinephrine neurons. To answer this question, we are using the model organism, Drosophila melanogaster, as male aggression in fruit flies is a robust, easily observed innate behavior. In order to test aggression, we place two males of the same genotype into a fight chamber where they compete for food at territory. After the fight is finished, the aggressive behaviors are quantified as latency to lunge (aggressive behavior), latency to encounter, and total number of lunges. Drosophila males expressing MeCP2 in octopamine neurons take nearly 1000 seconds longer to first encounter and first lunge, and lunge significantly less than control males. When expressing MeCP2 in astrocytes, latency to encounter and latency to aggression are also significantly increased indicating it takes longer for the experimental males to start fighting. Our results demonstrate that MeCP2 expressed in either astrocytes or octopamine neurons affect aggressive behaviors in Drosophila.

Mentor: Sarah Certel, Division of Biological Sciences

Synthetic Architecture Control of Polymer Nanoparticles for Analytical Separations

Leah Hall (#15)

Analytical separation science is an enabling science which contributes to nearly every field of chemistry, biology, and engineering. Within the field of separation science electrokinetic chromatography (EKC) provides rapid analysis of complex samples utilizing field-deployable instrumentation. EKC utilizes the movement of nanoparticles relative to a background solution to facilitate the separation of small analyte molecules. This research has developed novel nanoparticle chemistries that improve the performance of EKC separations. Reversible Addition-Fragmentation Chain Transfer (RAFT) polymerization was used to control the architecture of the nanoparticles in order to engineer the desired function. The nanoparticles were synthesized using 2-acrylamido-2-methylpropane sulfonic acid (AMPS) monomer and butyl acrylate to form an AB-diblock polymer nanoparticle with an ionic shell and a hydrophobic core. The RAFT process entails synthesizing a chain transfer agent (CTA) containing a trithiocarbonyl functionality which mediates polymerization in order to synthesize the A-block polymer. Polymerization of the A-block polymer is continued with addition of butyl acrylate to form AB-diblock polymers which are aggregated to form a nanoparticle with a hydrophobic core. The nanoparticles are characterized by dynamic light scattering (DLS), nuclear magnetic resonance (NMR) and linear solvation energy relationship (LSER). The NMR demonstrates successful synthesis of the AB-diblock polymer, the DLS results support a particle diameter of 30 nm ± 25%, and the LSER results indicate improved separation performance. The novel nanoparticles improve EKC by making it compatible with more detection methods, allowing separation of a wider range of samples, and allowing for customization of the separation process towards specific applications.

Mentor: Christopher Palmer, Chemistry

Dissecting octopamine circuits regulating male aggression and courtship in drosophila

Miranda Bradley (#17)

Organisms receive information about their environment through stimuli such as touch, light, or chemicals. Chemicals that are designated as pheromones produced by males and females aid in social behavior, e.g. courtship and aggression, by identifying the gender of an organism and whether that organism belongs to the same species. Many amines such as dopamine, serotonin, and norepinephrine (or octopamine, the invertebrate equivalent of norepinephrine), function as neuromodulators to regulate pheromone input. By identifying specific cell-cell contacts between octopamine neurons and neurons that respond to pheromones and examining the roles of these neurons in male social behavior, we directly connect amine regulation to pheromonal communication. In this study, we ablated specific pheromone-responsive neurons designated as Gr32a neurons or removed the Gr32a gene in small subsets of 8-10 Gr32a-expressing neurons to demonstrate that this gene and these neurons are essential to start male aggression and inhibit nonproductive male-male courtship. In a second set of experiments, we ablated octopamine neurons, or removed the gene encoding the enzyme to make octopamine, and likewise demonstrated that this neuromodulator, is essential for males to start fighting in a timely manner and shut off male-male courtship. To further identify components of the octopaminergic modulatory system that effect aggression, we ablated target neurons that receive OA signaling through the function of an OA receptor, OAb1R. When we remove OAb1R-expressing neurons, the males fight significantly less than control males as measured by quantifying the number of lunges (an important aggressive behavioral pattern) and take significantly longer to start fighting. Due to the importance of neuromodulator-signaling in many behavioral processes and the increasing capabilities of manipulating individual neurons in Drosophila, results presented here pave the way to decipher how sex-specific aggression and courtship are wired into the nervous system of any organism.

Mentor: Sarah Certel, Behavioral Neuroscience

The role of rsh in Borrelia burgdorferi during infection of tick and mammalian hosts

Brenda Morris (#18)

The stringent response is an adaptation to environmental stresses, such as nutrient availability, which allows bacteria to alter their metabolism, and has also recently been implicated in regulation of virulence in some pathogens. The effects are mediated by modulating the levels of guanosine-3'-diphosphate-5'-triphosphate and guanosine-3',5'-bisphosphate (collectively known as (p)ppGpp), the synthesis and hydrolysis of which are regulated in many bacterial species by the genes relA and spoT. In some bacteria, including Borrelia burgdorferi, the etiologic agent of Lyme disease, these functions are mediated by a single gene, the relA-spoT homolog rsh. In this project, an rsh mutant that is unable to hydrolyze (p)ppGpp will be created in B. burgdorferi. The effect of constant high levels of (p)ppGpp on transmission from the tick to the mouse and persistence in the tick will then be tested in vivo. We hypothesize that low levels of (p)ppGpp are required for persistence of the bacterium within the tick and that high levels are necessary for transmission into the mammalian host.

Mentor: D. Scott Samuels, DBS

In Vitro Exposure to US Southwestern Sand Dust and its Effect in Respiratory Health

Cassandra Moog (#19)

Much of the American Southwest comprises of desert, where about 12 million people live. Population increase and global climate change will cause drastic changes over the next 20 years, expanding the desert, causing larger, more frequent, and more severe sand dust storms. Airborne particulate matter is known to have health consequences within the respiratory system. Studies regarding the effects of Asian sand dust found an increase in hospital visits for respiratory associated distress. Additional evidence suggests dust storms increase inflammation and allergic airway responses in murine models. Black Rock Desert in Nevada is known to have large dust storms. Each year 50,000 people gather together for one week in this desert for an event called Burning Man. It takes place on the playa and frequent dust-storm make it an excellent environment for studying their negative health impacts. The composition of the sand dust is around 50% SiO_2, with the second and third most common compounds being Al_2O_3 and Fe_2O_3 respectively. The high level of silicate material in the dust is of concern due to the known detrimental effects within lung tissue, particularly when combined with bacteria and/or its components. An in vitro model would provide useful information of the type and severity of inflammatory response induced by the inhalation of SW sand dust particles.

Mentor: Dr. Andrij Holian, Biomedical/Pharmaceutical Sciences

Growing Algae With Chitin as a Nitrogen Source to Remove Phosphorous From Pulp Wastewater

Ryan Parks (#21)

Every year, about 750 million pounds of crab, shrimp, and lobster are harvested in the United States. Currently, the shells, which compose half of this mass, are sent to landfills, creating a costly problem in heavy shellfish producing regions. These shells are comprised of protein, calcium carbonate and chitin (a polymer of nitrogen and carbon), with 35-60% of the shell being chitin. We are developing commercial applications that turn this chitinous waste into a valuable resource for the mass cultivation of algal biomass, a process that can be coupled with the removal of phosphorous from waste streams.

Conventionally, algae cultivation employs synthetic nitrogen fertilizers that are made by burning fossil fuels, giving it both a large carbon footprint and a high price tag. Our lab has discovered many algae and cyanobacteria species that are capable of using chitin as a nitrogen source. Our research develops commercial applications for this discovery, in hopes that waste chitin will replace conventional nitrogen fertilizers. The resulting algae biomass can then be used to make biofuels and other commercially valuable products.

Algae also require a source of phosphorus. In the U.S., paper mills discharge 120 million tons of water, containing 2,500 tons of phosphorus. This wastewater (after primary and secondary treatment) is currently discharged into our waters, leading to eutrophication.
This research project couples algal growth on waste chitin with growth on phosphorus-rich pulp wastewater. Our primary goal is to quantify the rate of phosphorus removal from pulp wastewater using several species of commercially desirable algae. Preliminary results show that our chitin technology is superior to the current standard, which uses algae grown on the synthetic nitrogen sources like ammonia. We hope that our work leads to a viable new method for the tertiary treatment of nutrient-rich wastewaters using algae and chitin.

Mentor: Carrine Blank, Geosciences

Simulated traumatic brain injury: No relationship between self-ratings of success, objective measurement, and time spent preparing

Kaitlin McHenry (#22)

A traumatic brain injury (TBI) is a brain pathology caused by external force that may affect cognitive function and personality. Symptoms of a TBI are sometimes imitated by people who are motivated by an incentive such as insurance money. Neuropsychologists use assessments to differentiate between those who are suffering from the symptoms of a TBI from those who are faking. One of these examinations is the Computerized Assessment of Response Bias (CARB), which is designed to identify those who are giving poor effort, indicative of faking symptoms. The subjects in this study were 24 psychology 100 students from the University of Montana. The subjects in this study were told to simulate a TBI and were asked to prepare for the role outside the lab, using any resource. The participants were asked to take a series of neuropsychological tests, including the CARB, and to fill out a post-experimental questionnaire which included rating how successful the participants thought they were in producing the results asked of them and estimating how long they prepared for the role.

It was found that 94% if the participants who rated themselves as successful in simulating a TBI were identified as giving poor effort on the CARB, indicative of faking a TBI. This data indicates that there is no relationship between self-rating of TBI simulation and success of simulation as measured by the CARB. Additionally, it was found that the participants spent an average of 24.9 minutes preparing for the role of TBI simulation. No relationship was found between time spent preparing and either the self-rating of success or performance on the CARB. This data indicates that college students are not successful in gathering and using information relevant to TBI simulation and that the students are not accurate in assessing the quality of their simulation.

Mentor: Dr. Stuart Hall, Psychology

A New Methodology for Determining Possible Hatching Events Within Sphereoolithus Eggs

Heather Davis and **Robert Rader** (#30)

The Zhejiang province of China has provided an astounding amount of dinosaur eggs. The Museum of Natural History in Hangzhou houses over 1,000 of these mid- Cretaceous eggs. There has been extensive debate over whether eggs exhibiting circular openings represent a hatching event, predation, or breakage and crushing due to burial or more recent weathering. Using a new method, we suggest that eggs with openings valued at ≥ the modeled value are possible hatching events.

We examined 38 Sphereoolithus eggs chosen based on three factors: (1)the observation of gleying inside the opening must not be attached to the primary shell structure, (2)the opening had to be observed within the least deformed hemisphere, and (3) it had to have clear and measurable axes in three dimensions.

Using calipers, we measured the eggs' lengths, widths, and heights, as well as the widest and longest points of the openings. This data was used to find the potential volume of the egg and the opening size. For this, we utilized a series of previously published equations, which allowed us to determine the eggs' volume, potential fetus size, and the minimum burrowing capacity. We compared our modeled results to our measured results and found 14 of the 38 eggs we studied fell within the predicted model.

To our knowledge, this system of modeling egg-hatching openings is the first of its kind. This method could help in distinguishing dinosaur eggs that are hatched from those eggs that are crushed by natural causes or suffer predation. This could also help identify the original position of the eggs, which is important in a region such as Zhejiang where fossil eggs are often sold to museums by the public, creating a gap in stratigraphic and sedimentological data.

Mentor: James Staub and George Stanley, Geosciences

Sigma Factors of Coxiella burnetii and their relationship to 6S rRNA-mediated regulation

Thomas Spallino (#31)

Coxiella burnetii is a bacterium known to be the causative agent of Q fever in humans. Q fever most commonly manifests with a crippling flu-like illness along with pneumonia. A minority of cases result in a chronic infection which usually involves life-threatening endocarditis (inflammation of the inner lining of the heart and valves). C. burnetii is an extremely infectious bacterium, and is resistant to environmental stresses such as high temperature, ultraviolet light, and common disinfectants. It is an obligate, intracellular parasite which resides in the acidic, lysosome-like compartments of a host cell. Little is known about C. burnetii's virulence determinants. Our group is currently investigating the role that small RNAs (sRNAs) play in regulating RNA transcription. Sigma factors are proteins that associate with RNA polymerase (RNAP) to influence differential transcription, based on the local environment of the organism. The hypothesis of this research is that a particular type of sRNA known as 6s sRNA regulates gene expression in C. burnetii. More specifically, 6S RNA does this through interactions with RNAP and the three sigma factors, RpoS, RpoH, and RpoD. To date, we have cloned the three sigma factors of C. burnetii and have begun purifying the recombinant proteins. Through the employment of various molecular techniques we will be able to see if RpoD, RpoH and RpoS associate with the 6s sRNA. If there is time, RNA polymerase will also be tested in the same manner to see if it interacts directly with 6s sRNA. With these data we can elucidate how 6s sRNA interacts with RNA polymerase to influence gene expression.

Mentor: Mike Minnick, DBS

Photos and Phenotypes: Using Camera Traps to Monitor Seasonal Mismatch Between Snowshoe Hares (Lepus americanus) Coat Color Change and Snow Cover.

Skyler Suhrer (#33)

Snowshoe hares biannually change coat color to match the landscape. They depend on this photoperiod-cued change to hide from predators. With climate change affecting snowfall patterns, hares are at risk of higher predation. This issue is the subject of a long-term study.

The project uses traditional methods--field technicians, live trapping, and telemetry--to collect data. These methods are constrained by access, weather, daylight, and other limiting factors. Using camera trap images, I have developed a new data collection protocol that addresses these constraints After analyzing 3,400 photos to date, I have found that photo data can provide relevant, accurate, and detailed information. It would provide an easy and cost-efficient way to supplement traditionally-gathered data.

My thesis has grown to include four stages. The initial project was developing a novel and noninvasive way to track the hares' seasonal coat color changes. Now I am applying my protocol to a 10,000 image database. The photos are donated by-catch from unrelated research projects (a lynx survey, wolf project, and general biodiversity study).

Already I have confirmed, developed, and applied my method. I was able to fine-tune my protocol as to maximize efficiency. Now I am continuing the application on a grand scale: 10,000 images from five different locations in the United States and Canada.

The remaining analysis will be complete by 31 July. With the resulting dataset, I can statistically plot correlations, looking for trends and differences between locations, at different elevations, and across the latitudinal gradient.

This camera-based method can be modified and applied to any species that changes appearance over time. As such, it can be used to monitor a number of species across the planet. Such a development would open many doors in wildlife research.

Mentor: L. Scott Mills, Wildlife Biology

Investigating Upstream Channel Response to Dam Removal, Blackfoot River, MT

Robert Livesay (#38)

As dam removal becomes more accepted as an effective approach to river restoration, understanding the upstream channel geomorphic response is vital. This study is being conducted to examine upstream channel evolution of the Blackfoot River (BFR) in response to an 8-meter drop in base level that was caused by the 2008 removal of the Milltown Dam. This research tests the hypothesis that the first 4 km of the BFR channel has reached a new equilibrium, where change to topography and sediment profile no longer reflect the 2008 removal of the Milltown dam. Cross section elevation and grain size data from 8 BFR sites were collected: 5 sites within the area influenced by Milltown Reservoir and 3 sites upstream. To quantify the geomorphic response, I compare the change in grain size and cross section elevation for each site from data collected in 2009, 2010 and 2012. Results from 2010 indicate the main drivers of channel response are channel confinement and spring run-off magnitude. Long-term studies of upstream channel response to dam removals are rare. Results from this study will help increase the temporal understanding of dam removals and can be applied to future dam remediation projects

Mentor: Andrew Wilcox, Geosciences

GEOMETRIC CORRECTION OF SHORTWAVE RADIATION MEASUREMENTS OVER COMPLEX TERRAIN FOR USE IN HYDROLOGIC MODELS

Zachary Hoylman (#39)

Large-scale hydrological modeling is often used to explain complex, multi-variable, heterogeneous environmental processes, driven by water and energy fluxes. Elaborate physics, needed to describe a triphasic system, creates a demand for computer-assisted models. We generate a model to analyze the re-distribution of solar radiation over complex topographic regions to understand how shortwave radiation interacts with a hydrologic cycle. The model is a function of the geometric characteristics of the terrain, three-dimensional orientation in relation to the sun's zenith angle and atmospheric properties. The model we propose uses information collected by pyranometers and a Digital Elevation Model (DEM), which calculates how solar irradiance is spatially distributed over the specified domain. This information, coupled with physical hydrological functions, will provide detailed knowledge of watershed runoff and evapotranspiration rates. This is critical to understand the dynamics of water at regional scales, as well as long-term potential impacts of changes in solar radiation to worldwide systems, and the people that those systems serve. This analytical simulation of the distribution of solar energy can be applied to any hydrologic system with the necessary input data, notably to mountain regions characterized by complex topography such as the Rocky Mountain Range. Water resources at the Crown of the Continent, especially in headwaters of the Colombia and Mississippi rivers, are extremely important for they largely dictate an increase or decrease in obtainable water for the entire continent. The Bitterroot Mountains of Montana are used as a test bed for our model. Identifying how these systems operate is imperative to allow the continuing usage of fresh water without depleting our limited supply. This research is significant to understand this multifarious system and will help decipher a broader understanding of the processes involved. Recognizing how to better manage this system is crucial impending an inevitable shortage of fresh-water.

Mentor: Marco Maneta, Geosciences

Structural Analysis of a Cytomegalovirus-encoded Chemokine

Rebecca Hendrix (#41)

Transplantation represents the last resort for treatment of most end-organ diseases. A major problem for long term survival of transplant recipients is chronic rejection, a process that is driven largely by immunomodulatory proteins called chemokines. Infection with human cytomegalovirus (HCMV) accelerates chronic rejection, and this may be due in part to the ability of the virus to alter the expression of host chemokines. However, it has recently been appreciated that the HCMV gene UL128 encodes a protein that shares amino acid sequence features with a class of human chemokines. One hypothesis is that this virally encoded chemokine activity contributes to accelerated graft rejection. In support of this hypothesis, the rat CMV homologue, r129 has been shown to have chemokine activity. Both UL128 and r129 are larger than typical host chemokines, with extended C-terminal sequences that may relate to other functions of these proteins. It is clear that the UL128 protein also plays a role in determining tropism of the virus by facilitating entry into specific cell types. This leads to the hypothesis that the chemokine and entry functions of UL128 reside on separate domains. The goal of the proposed studies is to generate methods and reagents to conduct structural analyses of r129 and UL128. Detailed structural understanding of these proteins will allow for formulation of testable hypotheses regarding the functions of these proteins, as well as the design of mutants for use in studies of HCMV-related pathologies.

Mentor: Brent Ryckman, DBS

Effects of Transmissivity on Aerodynamic Function in Bird Feathers

Ashley Meyers (#44)

We studied the relationship between flight performance and the transmissivity of feathers in birds to provide insight into the evolutionary significance of feather structure. Several aspects of bird feathers change during development and are correlated with improved aerodynamic performance. As birds age, their wings fill in (macro-scale transmissivity decreases), flow decreases across the barbules of individual feather (microscale transmissivity decreases), and feathers get stiffer. Our present experiments allow us to test the effects of microscale transmissivity in isolation from the other two variables. We examined primary feathers from four peacocks (Pavo cristatus). This species was used due to size convenience of their feathers. First we measured force production by the untouched, intact feathers in a wind tunnel set to a constant 7 meters per second air speed. Airflow through the barbules (transmissivity) was measured using a pressure gauge and suction pump. The feathers then underwent different manipulations to change transmissivity and the processes were repeated once for each feather; we decreased transmissivity by applying Tresemè Mega-Firm Hairspray and then increased transmissivity by brushing the feathers with a toothbrush. The results were displayed in a parabolic graph that plotted lift against drag, a common device used to understand transmissivity. Lift:drag ratio (aerodynamic efficiency) increased with hairspray application and decreased with brushing. Our results thus provide new insight into the functional signficances of transmissivity, and reveal that other evolutionary pressures besides minimizing transmissivity have shaped feather morphology in birds. Alternative pressures might include phylogenetic inertia, or a compromise with the need to avoid breakage.

These data provide insight for biomimicry and engineering of miniature autonomous vehicles (bird bots).

Mentor: Bret Tobalske, Biology

To Save the Last Tree: A Case Study of the Tropical Timber Agreements

Kendall Houghton (#46)

Between 1990 and 2005, the tropical nation Comoros lost approximately sixty percent of its nation's forests to clear-cutting (NASA 2012). Although the starkest example of deforestation during that time period, Comoros' loss of wilderness represents a long-standing trend among all tropical nations. The first of the International Tropical Timber Agreements (ITTA) was created in 1983 to reduce the rate of timber harvesting in tropical countries (ITTO 2012). Despite a second and third agreement in 1994 and 2006 respectively, deforestation continues. This study utilizes timber exports to evaluate whether or not the ITTA have been effective. GDP, GDP per capita, population and world timber prices are introduced as additional explanatory variables through econometric regression on panel data. Treaties rarely garner complete compliance, and when they do not it is important to understand how and where they fail. If any more effort is to be placed on strengthening and renewing the ITTA in lieu of other approaches, governments ought to be well informed of the likely results and the necessary adaptations.

Mentor: Helen Naughton, Economics

FLUVIAL WESTSLOPE CUTTHROAT TROUT MOVEMENTS AND RESTORATION OF HABITAT IN THE NEVADA SPRING CREEK COMPLEX

Tracy Wendt (#47)

Anthropogenic degradation of aquatic habitat has diminished native trout throughout the American West. As a result, the restoration of degraded streams is a significant element of wild trout management. In the Blackfoot river in western Montana, catch-and-release harvest regulations combined with habitat restoration are both important for the recovery native cutthroat trout especially in the mid-to upper basin where cutthroat trout stocks are now increasing in many streams. An example of this expansion has been occurring in the Wasson Creek, Nevada Spring Creek and lower Nevada Creek complex for several years. Here, natural channels and flow and temperature regimes were restored, re-establishing both habitat conditions and migration corridors necessary for native trout. Under these conditions, the abundance and distribution of native trout have been expanding from Wasson Creek downstream into Nevada Creek. To assess the life history tactics of of adult westslope cutthroat trout associated with this expansion, FWP radio-tagged 20 westslope cutthroat in wintering areas in Nevada Creek just downstream of Nevada Spring Creek in 2011-12. We then tracked those fish through their spawning period in May into summer in order to examine movement patterns within the restored reaches. A high percentage (n =10) fish moved from Nevada Creek through Nevada Spring into the headwaters of Wasson Creek through stream reaches where enhanced instream flows, grazing improvements as well as fish ladders on diversions and fish screens on ditches were employed. However, four radioed fish moved out of Nevada Creek into the Blackfoot River and then ascended upper river tributaries. The preliminary results of this telemetry study show that restoration can not only improve environmental conditions necessary for migratory for native trout, but also promote recovery migratory native fish from other reaches of the Blackfoot River.

Mentor: Laurie Marczak, College of Forestry and Conservation

UM Firn Densification Model

Evan Cummings (#50)

In regions where ice sheets are increasing in mass, there is a 50-200 m layer of old snow called firn which does not melt in the summer months. The density of firn tracks the transformation of snow into glacial ice at approximately 917 kg m^-3. The process of firn densification is important in at least two ways: 1) it can be a dominant component in the observed rate of change of the surface elevation, and 2) storage of liquid water in the lower density firn layer is now considered a critical component in the mass balance of ice sheets. If the rate of change of surface elevation can be equated with the rate of change in the mass of the ice sheet, we would have an excellent means of monitoring ice sheet mass balance. However, knowledge of firn densification rates is needed to make the inference of mass rate of change from volume rate of change.

Several firn models have been created for areas without melt. Herron and Langway [1980] developed a firn densification model based on Arrhenius-type equations with variable rate constants, and found that the densification rate increased suddenly around 550 kg m^-3. Zwally and Li [2002] expanded upon this model and found an alternate temperature-dependent value for the rate constant. Arthern et al. [2010] developed yet another set of equations based on their in situ measurements of Antarctic snow compaction, while Ligtenberg et al. [2011] modified the Arthern parametrization to better fit areas with a higher average annual temperature.

We have reformulated these models with the finite-element software package FEniCS and integrated them with an enthalpy-formulation proposed by Aschwanden et al. [2012]. This integration allows us to account for the melting and subsequent re-freezing of firn layers into ice lenses.

Mentor: Jesse Johnson, Computer Science

Evaluation by Fluctuation Analysis of a Disk Diffusion Method for Identifying Pseudomonas aeruginosa Hypermutators in the CF Lung

Eric Dunham (#54)

Pseudomonas aeruginosa (PA) hypermutators occur frequently in chronic respiratory infections (CRI) of cystic fibrosis (CF) patients and negatively affect clinical outcome. To attempt to determine whether Staphylococcus aureus SA coinfection affects the prevalence of hypermutable PA in CF-CRI, we sought to validate the disk diffusion method for identifying hypermutators by performing fluctuation analyses on candidate PA.

PA and SA samples were collected during quarterly evaluations between 2008 and 2010 in a 100-patient longitudinal study at Seattle Children's Hospital. PA were subjected to a preliminary screen for hypermutator status using a disk diffusion assay with five different antibiotics. PA scored as hypermutators and a subset of those scored wild-type were subjected to fluctuation analysis of resistance to rifampicin (Rif) using the Ma-Sandri-Sarkar Maximum Likelihood method. The number of spontaneous mutations to RifR was used to estimate mutation rate, using the number of colonies formed on Mueller-Hinton agar with and without 300 mg/mL Rif. We chose to estimate mutation rate, rather than mutation frequency, because mutation frequency estimates are susceptible to error arising from "jackpot" mutations occurring early in log phase, which become overrepresented in populations assayed at stationary phase.
Initial fluctuation analysis results confirm hypermutator status in 24% of strains deemed potential hypermutators by disk diffusion assay. Hypermutators were defined to be strains having mutation rate > 4.00E-8, a value established by converting the mutation frequency cutoff used to validate the disk diffusion method to a mutation rate using previously described formulae.

Our results indicate that the disk diffusion method's high rate of false positives makes it inadequate for PA hypermutator screening. We aim to improve the predictive value of disk assays so they can be used to enhance patient care and to establish a mutation rate cut-off for the subset of PA hypermutators most closely associated with clinical decline.

Mentor: Frank Rosenzweig, Biological Sciences

A Comparison of Sexual Minority Youth Who Attend Religiously Affiliated Schools and Their Nonreligious School-Attending Counterparts

Brandon Stewart (#55)

Adolescents who identify as lesbian, gay, or bisexual (LGB) evidence a heightened risk for experiencing negative mental health outcomes, diminished psychosocial well-being, and more alcohol use than their heterosexual peers (Toomey et al., 2011; Heck et al., 2011). Due to the health disparities between sexual minority youth and heterosexual youth, investigations into protective factors, such as religiosity, are necessary. Studies conclude that individual religiosity is not a protective factor against alcohol use for LGB individuals who attend high school (Rostosky et al., 2007). However, investigations of sexual minority youth who attend schools with religious affiliation, and how attending a religiously affiliated school may relate to alcohol use and school belonging in this at risk population, are lacking in the literature base. It is hypothesized that attending religiously affiliated schools will have an effect on alcohol use and school belonging scores among sexual minorities who attend.

To test this hypothesis, data from a previous study investigating the effects of gay-straight alliances on sexual minority mental health and substance use will be analyzed. Data from 25 sexual minorities from religiously affiliated schools and a matched sample (on the basis of age and gender) of 25 youth from nonreligious schools compiled from an online survey will be used to compare alcohol use and school belonging scores. Additionally, descriptive characteristics, such as demographics, will be compared between 475 LGB youth within the two groups to identify if there are differences in these characteristics. It is expected that comparing alcohol use and school belonging scores will demonstrate that attending a school with religious affiliation has an effect on these factors, though a specific direction of this effect is not predicted, based on the exploratory nature of this study.

Mentor: Bryan Cochran, Psychology

Rapid Evolution and Sequence Divergence at Tsga8 in Rodents

Kelsey Hom (#59)

A central goal in molecular biology is to understand the contribution of individual genes to organismal form and function. Increasingly, biologists are using evolutionary comparisons of DNA sequences across multiple species to gain general insights into the functional importance of genes. For example, the rapid accumulation of mutations that alter the protein sequence of a gene may indicate that it has been a target of positive natural selection and thus plays an important role in the survival or reproduction of an organism. Testes specific gene a8 (Tsga8) is a gene on the X chromosome in mice that is thought to be involved in chromatin condensation during a crucial stage of sperm development, and thus likely plays an important role in male fertility. It has been previously demonstrated that Tsga8 is one of the most rapidly evolving genes known, varying widely in the length and number of amino acid repeats among a few closely related species of mice. Though Tsga8 was initially only known in mice, a highly divergent form of Tsga8 has now been identified in rats. In this experiment I demonstrate through PCR amplification, sequencing and gene alignment that Tsga8 is also very rapidly evolving across several species of rats. Specifically, I expanded the genetic sampling of this gene to seven additional species of rat. It appears that the rat version of this gene demonstrates similar patterns of divergence, with some exceptions, as found in mice. This suggests that similar forces are driving the rapid evolution of this gene in diverse species of rodents. Though the exact function of Tsga8 awaits further experimentation, my data indicate that this gene has played a recurrent role in the evolution of male reproduction across mice and rats.

Mentor: Dr. Jeffrey Good, DBS

Investigating the Role of NADPH Oxidase in Ischemic Stroke Injury: An mRNA Knockdown Approach

Riley St. Clair (#61)

Ischemic stroke occurs when a blood vessel in the brain is blocked, depriving the affected area of oxygen and nutrients. This causes extensive cell death and tissue damage. As a result of ischemic injury, AMPA receptors (AMPARs), the major excitatory receptor in the brain, undergo a critical compositional switch becoming GluA2-lacking AMPARs. GluA2 is an essential component as it provides AMPARs the ability to be impermeable to calcium ions, protecting the cells from damage. The GluA2-lacking AMPARs, which are prevalent post-ischemia are permeable to calcium and, therefore, play a major role in mediating delayed cell death. In the current study, we are testing the hypothesis that the activation of an enzyme complex, NADPH oxidase, triggers the AMPAR compositional switch to GluA2-containing to GluA2-lacking AMPARs. mRNA knockdown is a technique that utilizes shRNA sequences, which destabilize and degrade specific mRNAs. By using this method, we can decrease the activity of the NADPH oxidase complex by decreasing the expression of a crucial component of this enzyme, p67phox. To do this, we utilize viruses as a delivery system to transport shRNA sequences into neuronal cells. Three shRNA sequences are currently being tested for their ability to infect cells and how effectively they decrease the activity of NADPH oxidase and knock down the protein levels of p67phox. Future studies will test the GluA2 subunit levels in cells subjected to ischemia to determine if inactivating NADPH oxidase mitigates the loss of GluA2 from AMPARs. We predict that, because NADPH oxidase will be inactive, the AMPAR switch will not occur. Our results will determine if NADPH oxidase does indeed play a role in the AMPAR switch and thus perpetuate tissue damage during stroke.

Mentor: Darrell Jackson, Biomedical and Pharmaceutical Sciences

Are Planned or Naturally-Occurring Cities More Sustainable?: A Comparison of Irvine, CA and Fremont, CA

Jill Stoeckl (#63)

Sustainability is the basis for creating a successful, long-lasting city as well as a healthy environment. A city's sustainability practices such as regulations and goals regarding smart-growth activities, transportation programs, energy and resource conservation, pollution prevention, land-use programs, and city beautification projects are what make that city continuously thrive. In order to determine whether planned or naturally-occurring cities provide a more suitable structure and atmosphere for sustainability, I compared the planned city of Irvine, California to the naturally-occurring, historical city of Fremont, California. I examined mainly government documents and websites created by the cities. The cities share a similar population, an economic reliance on local schools and technology, a closeness to major universities, and many similar sustainability practices. Both cities show an interest in their environmental impacts, creating plans and incentives for sustainable practices such as clean water, alternate energy, and green business. Irvine's city plan focused on the ease of living the community, creating multiple bike paths and a neighborhood setup that's easily navigated. The city of Fremont, though perhaps not as navigable as Irvine, focused just as much on getting community involvement on sustainable issues. Essentially, both cities seem to be actively trying to make their city more sustainable, at least environmentally, by getting the community involved. Fremont may have been better equipped to handle these environmental issues if it was a planned city and Irvine may have less of an environmental impact if it had taken sustainability more seriously from the start. However, it seems as though a city's sustainability rests not only on the ease of creating sustainability practices, but also on the community's active interest in creating a sustainable life.

Mentor: Jeffrey Gritzner, Geography

Socioeconomic Implications of Sea Level Rise in the Mekong River Delta, Vietnam

Margaret Matchett (#64)

Saline intrusion and soil acidification associated with sea level rise have become a threat to the food security and livelihoods of millions of farmers in low-lying coastal countries, such as those in the Mekong River Delta of southern Vietnam. The Mekong River Delta is home to over 17 million people, 80% of whom depend on rice production for survival. Known as Vietnam's "rice basket," 46% of all food produced in Vietnam is grown in the delta, however the area of land suitable for rice production becomes smaller with each millimeter of sea level rise. The objective of this research is to project arable land loss due to sea level rise and examine different adaptation and mitigation strategies of farmers in this region. Using ArcMap, I will model the potential land area lost due to sea level rise, for the seven most affected provinces in the delta and calculate potential loss of income for farmers affected. This will be based on current population density estimates in each province, as well as average elevation and location with respect to the South China Sea. I will analyze annual income of farmers, and those farmers' responses to changing environmental conditions. These responses range from experimenting with new strains of rice that are better able to cope with longer and more unpredictable flood seasons and increased salinity concentration, to converting rice paddies into shrimp farms, and efforts to reforest mangroves, to urban migration. It is important to understand the extent of the potential repercussions of sea level rise, so that we as humans can generate mitigation and adaptation strategies for these especially vulnerable areas with some sense of urgency. An understanding of these implications is vital to be able to prevent unnecessary food shortages and extreme poverty before it is too late.

Mentor: Laurie Yung, NRSM

Does Hybridization Effect Placental Morphology in Dwarf Hamsters?

Lindy Henry (#66)

New species form through a process called speciation. When a barrier to gene flow arises between two populations they begin to diverge. A common outcome of genetic divergence is reproductive isolation, a common example of which is hybrid inviability. This study was aimed at characterizing a subtle aspect of hybrid inviability that occurs during embryonic development. In mammals, a crucial part of the early stages of development is the transfer of nutrients directly from the mother to the embryo through a complex layered tissue called the placenta. Disruptions of placental form and function may result in abnormal growth or even developmental failure. Hybrids between two hamster species, Phodopus sungorus and P. campbelli, exhibit abnormal embryonic growth. When P. campbelli is the mother, the hybrids are smaller than both parental species, and when P. sungorus is the mother, the hybrids are so extremely overgrown it results in maternal death during birth. One possible contributing factor to these developmental problems of the hybrids is abnormal placental morphology. I used histological methods to obtain placental sections from both pure species and each reciprocal hybrid. Image analysis of these sections revealed no abnormalities of placenta layers in the male hybrids compared with the pure species. Qualitatively, placentas from female hybrids seem to show abnormal composition and morphology. These placental defects are likely to result in a reduction of placental function, hinder proper embryonic development, and contribute to the isolation of these closely related two species.

Mentor: Jeffrey M Good, OBE

Too Old to have a Baby?

Heather Fraley (#67)

Assisted reproductive technologies (ARTs) have made it medically possible to extend the age that a woman can become pregnant to well past the age of menopause. This poster explores postmenopausal pregnancy. Included are discussions of ARTs, some of the benefits and burdens of postmenopausal motherhood, what regulations should be put in place, and the ethical considerations behind the issue.

Mentor: Ivan Lorentzen, Scholars Program

PETSA (Personal Empowerment Through Self Awareness) meets REDCap (Research Electronic Data Capture): Assessment of a tutorial on sexual assault using web and paper surveys

Evan Hartmann (#69)

The purpose of this research project was to gather information on University of Montana student perception of the PETSA (Personal Empowerment Through Self Awareness) tutorial and to compare electronic and paper survey methods. To that end, we distributed 1000 surveys to students to large classes in several departments. Half of the surveys were phrased in first person (?I think?) and half were phrased in the third person (?Other students think?) in order to tease apart student?s personal opinions from what they believe their peers opinions are. Out of the original 1000 surveys, 109 were returned and 107 used in analysis. Generally, participants thought the information from PETSA was important, but didn?t feel that they or other students learned a lot from it. Results also indicated that the average participant does not feel safe from sexual violence but believes that other students feel safer than they do, and that knowing most students have taken the PETSA tutorial does not help them to feel safer.

Mentor: Yoonhee Jang, Psychology

Defeating the Social Desirability Bias in Child Abusers

Andrew Hinkle, Lindsey Jackson, and **Amanda Powers** (#71)

Various measures are used to detect child abuse; however, many of them are limited in validity by a social desirability bias. Abusers likely are motivated to "fake good." For example, the widely-used Child Abuse Potential Inventory (CAP) has high face validity, meaning it is fairly obvious what each question is measuring, thus making it easier to lie or "fake good." The CAP Lie Scale detects but does not counter this. To address this weakness, the Child Guidance Inventory (CGInv) presents respondents with specific child guidance scenarios involving problematic child behaviors and has them rate a set of responses to each scenario in which the undesirable answers are ambiguous. This inventory was derived from The Child Guidance Interview (CGI), an open-ended interview developed by this research team. It is intended to produce information about maladaptive practices in three categories originally identified by the Parenting as Social Context Questionnaire (PASCQ): Rejection, Chaos, and Coercion. Additionally, responses were subcategorized within each category. The goals of the present study were (1) to identify and remove responses that have high face validity and low inter-rater agreement and (2) to produce a prototypical inventory to be administered to parents. The prototype that resulted contained 15 scenarios and 115 responses. The inventory's effectiveness has yet to be tested.

Mentor: Paul Silverman, Psychology

SKIN TEMPERATURE DECREASES DURING MAXIMAL RUNNING IN COMPENSABLE ENVIRONMENTS

Kyle Cochrane, Tucker Squires, and **John Cuddy** (#75)

PURPOSE: Evaluate relationships between skin temperature, heart rate and core temperature during increases in interval running intensity. Specifically, the relationship between skin temperature and increased running speed was examined. METHODS: Study participants included 7 males and 3 females (22.9 ± 2.5 years, 177.9 ± 9.0 cm, 79.7 ± 13.9 kg, 25.1 ± 3.0 body mass index, 13.3 ± 5.8 % body fat, and 53.3 ± 8.3 VO2 ml/kg/min). Subjects completed a 75 minute trial, alternating between 10 minute run intervals (60, 70, 80, 90, and 100% of age-predicted heart rate max) and 5 minutes of walking between each interval. The trials were conducted on an outdoor 440 yard track with ambient temperatures ranging between 13-30°C. Heart rate, skin temperature, and rectal temperatures were monitored throughout the trials using wireless units. RESULTS: Skin temperature was lower during the 100% stage (running and walking temperatures averaged), compared to the 60, 70, 80, and 90% stages, main effect of time (32.8 ± 2.5 vs. 34.7 ± 1.5, 34.7 ± 1.6, 34.9 ± 1.3, 34.4 ± 1.5°C, respectively, $p<0.05$). Skin temperature was lower during the 90% stage compared to the 80% stage ($p<0.05$), and there was a trend for 90% being lower than 70% ($p=0.07$). Rectal temperature and heart rate showed increases throughout the protocol at all time points, main effect for time, $p<0.05$. CONCLUSION: During maximal running, a decrease in skin temperature was observed compared to submaximal intensities. The likely explanation for this is the increased convection from running faster, as well as the redistribution of blood flow to the working muscles. These findings suggest that maximal running results in a larger gradient for the body to dissipate excess heat across.

Mentor: John S. Cuddy, Health and Human Performance

Bergan, AM, Rumph, B, & Moody, VJ. Department of Health and Human Performance, The University of Montana, Missoula, MT

Amy Bergan (#81)

Bergan, AM, Rumph, B, & Moody, VJ. Department of Health and Human Performance, The University of Montana, Missoula, MT

Research suggests that heating tissue before exercise may improve sport performance. Ultrasound and pulsed short wave diathermy are two modalities that can be used to heat tissue in preparation for activities that may include vertical jump. However, few studies have specifically compared these deep heating modalities potential to improve performance. The goal of this study was to determine if there is a significant gain in vertical jump performance when using ultrasound or pulsed short wave diathermy prior to activity.

Our study included 6 healthy college aged students, 3 males and 3 females, who had no injury to a lower extremity within the past 6 months. The subjects agreed not to work out 24 hours before testing and each subject completed both tests conditions within a 48 hour period. Participants completed 3 trials of single leg vertical jump on their dominant leg using a Just Jump Mat prior to and immediately following each trial. For each trial, pulsed short wave diathermy and ultrasound treatments were administered over the belly of the gastrocnemius for 20 minutes to induce vigorous heating of the muscle tissue. Neither pulsed short wave diathermy, nor ultrasound improved the patients' vertical jump.

However there was a main effect for time whereby vertical jump performance decreased for both ultrasound and pulsed short wave diathermy. The results of this study suggest that the use of passive heating prior to activity does not improve single leg vertical jump. Passive heating may induce muscle relaxation and sedation, which subsequently hinders optimal performance. Therefore, it is important for clinicians to encourage athletes to perform a dynamic warm up after heating to maximize performance.

Mentor: Valerie Moody, HHP

Impacts of two invasive goldenrod (Solidago) species at home and away

Kimberly Ledger (#84)

Exotic plant invasions impose strong shifts in biotic interactions. These changes affect species abundance and distribution, driving changes in ecosystem function. A prominent change involves the remarkable capability of some invasive species to suppress native species. In this context, we investigated the stem density of a highly problematic invasive weed in Europe, giant goldenrod (Solidago gigantea), and compared it to the total plant species richness and native species diversity in plots located in both the northwestern United States and in Hungary. We found an increase in stem density of S. gigantea correlated to a significant decrease in total species diversity and native species diversity in Europe, but not in North America. We have initiated a similar field survey of Canada goldenrod (Solidago canadensis), another highly invasive weed in Europe, which will be completed during the summer of 2013. Preliminary results indicate that native plots are showing the same trend of total species richness as plots containing S. gigantea. We also compared the effect of S. gigantea and S. canadensis leachate on the germination and growth of co-occurring plant species native to North America and Europe. Solidago gigantea root leachate suppressed germination and growth of European species, but not North American species. With limited species tested, S. canadensis root leachate shows greater suppression of germination on European species than North American species, but does not show differences in the suppression of growth. A competition experiment investigating the competitive effects of entire S. canadensis plants on five co-occurring North American species and five co-occurring European species is currently underway. Initial results generally demonstrate a strong biogeographic context to exotic plant invasions and have the potential to reveal extremely significant ecological and evolutionary processes in communities.

Mentor: Dr. Ragan Callaway, Division of Biological Sciences

Pharmacy and Homelessness: The State of Pharmaceutical Care, Overcoming Barriers To Medication Therapy, and Serving Homeless Patients in Montana

KariLynn Dowling (#86)

Homelessness remains a prevalent problem in the United States, one that requires attention from all sectors within a community. Acting as one component of a multifaceted support system, pharmacists can play a crucial role in keeping homeless patients as healthy as possible while their lives are in transition. The purpose of this paper is to present pharmacists, pharmacy technicians, pharmacy students, and other health professionals with an explanation of the interaction between health and homelessness in the United States, an examination into the unique problems the homeless patient population faces in attaining pharmaceutical care, and a number of proposed solutions to these health care problems. Pharmaceutical care for the homeless is occasionally mentioned in literature for physicians, but few bodies of work exist dedicated solely to the pharmacy-homelessness interface. Literature from the past ten years was reviewed for information pertaining to the topic and that information was assembled for a pharmacy-based audience. In order to apply national issues to local organizations, three qualitative interviews were conducted in person or by phone with pharmacists at community health centers in Montana. A direct comparison of the three pharmacies was difficult at best, due to differences in operation and variation in the characteristics of the homeless populations in their cities. Rather, the services provided at each pharmacy and the challenges perceived in each patient population by the pharmacists were assessed to apply solutions that are individually suited to each community for optimization of care. The findings of this research can introduce health professionals who will interact with the homeless to a humanistic perspective that will mesh with their existing therapeutic knowledge, assisting in fostering the overall physical, mental, and social wellbeing of these patients.

Mentor: Kerry Haney, Pharmacy Practice

The Effect of Dosage on Speech Sound Disorder Therapy

Janeen Buss and **Morgan Malany** (#89)

The purpose of this study was to measure the dosage of therapy for speech sound disorders. Children with speech sound disorders have problems saying certain speech sounds. Dosage is the total amount of therapy provided and it can be broken down into five specific parts: dose, dose form, dose frequency, total intervention duration, and cumulative intervention intensity. This project looked specifically at dose, the number of teaching episodes per treatment session. This research is significant because findings from a literature review showed a lack of research pertaining to the collection of dosage data. We designed an original method to collect dose in treatment therapy sessions. For the methodology, we observed 16 therapy sessions of a 6-year-old boy with a severe speech sound disorder. For each treatment session, data related to dose were collected by tallying the number of clinician prompts and child responses. These data were analyzed to find relationships between assessments (given pre-treatment, mid-treatment, and post-treatment) and the amount of dosage. Results regarding the relationships and future implications for speech-language pathologists in practice will be discussed. We believe this research will be a stepping-stone for future research endeavors because speech-language pathologists will have a better understanding of how much dosage is needed for efficient and effective treatment of speech-sound disorders.

Mentor: Dr. Amy Glaspey, Communicative Sciences and Disorders

Analysis of sediments carried by a tropical intertidal sea cucumber, Holothuria inornata

Mark Jackson, Kara Nygaard, and **Areli Tejeda** (#90)

On the Pacific coast of Costa Rica, the sea cucumber Holothuria inornata is typically found covered by natural sediments acquired from its surroundings in the rocky intertidal zone. Very little is known about this behavior, and even the most basic data about how much and what kinds of sediments are carried are unknown. We examined the composition of substrate on individuals captured at San Miguel Biological Station in Cabo Blanco Absolute Reserve, Costa Rica in order to learn more about this understudied behavior.

We collected 30 individuals ranging from 94-193 mm in length at low tide from June- July 2012. At the time of capture, all sea cucumbers were entirely covered by sediments tightly adhered to the back of the animal. We removed the sediments from the back of each sea cucumber, dried the sediments, sorted them according to material, and weighed them. H. inornata at this location carried shell fragments, pebbles, sand, and other small items. The dry weight of sediments carried by an individual sea cucumber reached a maximum of 23.7 g. The mean composition BY WEIGHT of sediments, taking into account the three principal sediment types, was 45% shell, 30% pebble, and 25% sand, although individual compositions varied greatly (16.0-67.4% shell; 0.8-69.0% pebble; 11.4-69.1% sand). A simulation model showed that this degree of variation is not expected from random selection of sediment; the sea cucumbers exhibited individual selectivity.

Background sediment composition was assessed by random point sampling in the field. The composition of sediments in the field with 95% confidence intervals, taking into account the three principle sediment types, was 24% (19.74-28.81%) shell, 38% (33.02-43.26%) pebble, and 38% (33.02-43.26%) sand. The difference between environmental composition and average composition carried by sea cucumbers is further evidence that sea cucumbers may be exhibiting some degree of selectivity.

Mentor: L. Scott Mills, Department of Ecosystem and Conservation Sciences, Brian Wisenden, Department of Biosciences, and Diana Lieberman, Division of Science and Environmental Policy

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Dams Versus Conservation: The Politics of Scale in Southern Chile's Aysén Region

Elena Louder (#91)

HydroAysén is a controversial megaproject that aims to build five hydroelectric power plants in southern Chile's Aysén region. The proposed dams would generate up to 20% of the country's electricity. Most of this would be destined for transport to mining operations in the north, a pillar of the national export economy. The project was approved in 2011 but placed on hold in 2012 due to protests from environmental NGOs. HydroAysén is supported by the country's conservative president and many interests from Chile's business sector, but has received harsh criticism for its possible environmental effects. The project will flood national parks, reserves, wetlands, privately owned conservation areas, and may negatively affect local residents including small eco-tourism operators. Using the geographic tool of scale analysis, this paper takes a spatial look at the controversy. The research draws upon social theory, where scale is considered to be socially constructed, to interrogate the Chile case. Data about the case is drawn from news media and personal communications. Arguments for the project often cite Chile's national economic interests, while arguments against it often cite regional interests of the Aysén residents, and simultaneously global conservation and tourism goals. This paper will look at how arguments made at local, national and global scales interact, are pitted against each other, and align in surprising ways. This investigation may help inform how scales are created and navigated strategically by different environmental actors, and how this may affect the physical landscape in the Aysén.

Mentor: Keith Bosak, Geography

Exploring the Effects of Moist Heat Pack Duration on Shoulder Range of Motion

Samantha Riordan (#95)

Moist heat packs are commonly used by athletes prior to activity to increase superficial circulation, metabolism, and range of motion in specific muscle groups. Research indicates that moist heat packs must be applied for 30 minutes to raise tissue temperature at a depth of 1-2 centimeters. From a practical standpoint, it is widely known that the average treatment time for a moist heat pack is 15-20 minutes. Little research has explained the variability in duration of moist heat pack application and its potential impact on range of motion. The purpose of this study was to examine three different trials of moist heat pack application with varying times to determine its effect on shoulder range of motion. A convenience sample included 6 participants, 3 males and 3 females. They were all college aged, physically active, healthy individuals that had no previous injuries with their dominant shoulder. Each subject completed three durations of moist heat pack application to their dominant shoulder (10, 15, 20 minutes) within one week and 24 hours between each trial. Shoulder range of motion was measured before and after each trial. A 2x3 repeated measures ANOVA revealed no significance for increased shoulder external rotation ($p=0.330$), for horizontal adduction ($p=0.940$), internal rotation ($p=0.090$) or flexion ($p=0.271$). However, there was a main effect for time ($p=0.04$) for external rotation. It also revealed the range of motion of all groups decreased regardless of heat pack duration. The results from this study indicate that treatment times of 10-20 minutes are insufficient to increase range of motion. Greater treatment times (30 minutes) attain one to two centimeters of heating with superficial agents, this might affect ROM. Further research is necessary to determine appropriate treatment parameters of moist heat pack application when the clinical goal is to increase range of motion.

Mentor: Valerie Moody, Health and Human Performance

Monitoring the effects of agriculture on stream biota: small scale irrigation inputs elevate densities of indicator taxa of water quality impairment

milan vinks (#98)

Nutrient enrichment caused by human activities has long been recognized to have significant impacts on the health of aquatic ecosystems. Increases in aquatic nutrient levels typically stimulate the growth of benthic algae with subsequent increases in biological oxygen demand (BOD) and fluctuations in pH as a result of the increased biomass in decomposition. Benthic aquatic invertebrates are commonly used as indicators to assess and monitor these changes in water quality because they are abundant; they are easy to collect; they have life spans long enough to provide a record of environmental conditions; they are relatively sedentary and thus represent local conditions; they are sensitive to pollutants of various types; and they are a critical pathway for the transfer and use of energy in aquatic ecosystems. The purpose of this study is to measure and compare densities of sensitive macroinvertebrate taxa (Ephemeroptera, Plecoptera, Tricoptera or EPT taxa) at irrigation inputs and stream inputs on the Bitterroot River, near Stevenville, MT. Preliminary data from my initial sampling suggests that densities of Tricoptera and Plecoptera are significantly greater downstream of irrigation inputs in comparison to non-irrigation inputs. These data require further replication - I am now sampling downstream and upstream of 3 irrigation inputs and 3 stream inputs. Densities of sensitive EPT taxa at each site will be determined using standard taxonomic keys to the lowest practical level. I will compare the difference between upstream samples and downstream samples to determine whether there is significant variation between macroinvertebrate densities at natural stream inputs versus irrigation inputs. I will measure pH and dissolved oxygen at each site to determine water quality. I predict that, due to nutrient rich runoff from agriculture, macroinvertebrate densities will be greater at irrigation inputs and that these differences can be detected using sensitive EPT taxa as indicators.

Mentor: Laurie Marczak, College of Forestry and Conservation

METABOLIC AND ENERGY REQUIREMENTS FOR STAND UP PADDLEBOARDING

Matt McGady (#99)

PURPOSE: The purpose of this study was to determine the energy expenditure of stand up paddleboarding (SUP) and performance variations among board designs. METHODS: 24 male and female participants (23 + 6 yrs, 179 + 10 cm, 75 + 11 kg, 13 + 8% body fat) completed the study. In the laboratory, participants performed three stages of increasing intensity on an indoor paddleboard simulator, measuring heart rate, intensity (watts), and oxygen consumption, via a metabolic cart. Participants reported to the river for an initial field trial, which consisted of three time trials on a river (R), touring (T), and inflatable (I) paddleboard using a randomized crossover design. Time to complete the trials was measured, and heart rate was used to estimate oxygen consumption based on data from the laboratory. On a separate visit, participants performed a 5-minute steady-state trial on the river with a portable method for collecting expired gases.RESULTS: A significant relationship ($r^2=0.72$, $p<0.05$) existed between paddling intensity (Watts) and oxygen consumption during laboratory testing, $y=0.012x + 0.939$. Time to complete the trials was less for R and T boards compared to I board (6.0 + 1.3, 5.9 + 1.2, and 7.0 + 1.4, respectively, $p <0.05$). There was a significant relationship ($r^2=0.89$, $p<0.05$) between estimated and measured oxygen consumption, $y=0.9801x – 0.0429$. CONCLUSION: These data demonstrate that board design contributes to paddling speed during SUP. The energy demand of SUP is comparable to moderate rowing, canoeing, kayaking, and vigorous swimming. This substantiates paddleboarding as a viable form aerobic exercise.

Mentor: John Cuddy, Exercise Science

The Secret Language of Birds

Sophia Jensen (#102)

Predation is a major selective force for most organisms. This selective force has yielded numerous anti-predator behaviors. In birds, the threat of predation has produced the shared use of alarm calls which they use to warn each other about near-by predators; the most pertinent being raptors. Recent studies have shown that avian alarm calls contain a plethora of information that can encode for threat level, species, behavior and location of a predator. Through these studies, researchers have discovered that birds are very good at visually discriminating different kinds of raptors. This allows birds to infer threat level because there is a strong relationship between threat level and the relative size of the avian predator vs it's prey; small prey have small predators while large prey have large predators. However there is very little known about the ability to discriminate between raptors acoustically. To fill this gap in our understanding, I experimentally tested whether birds can distinguish between different raptors based solely on acoustic cues. Using hidden speakers, I played the calls of different raptors to both Black-capped chickadees and Steller's Jays and recorded both their acoustical and behavioral responses. These analyses so far have implications that birds can recognize the calls of potential predators, and even more interesting that these distinctions are used to infer threat level and actually influence their behavioral responses.

Mentor: Erick Greene, Ecological/Organismal Biology

Questioning the Role of Turn Sequences within the Protein Folding Code

Alexandra Heyneman (#104)

Amino acids are important organic compounds used as the fundamental building blocks of proteins: the extensive toolkit of the cell. Amino acids encode three-dimensional structure to define stability, folding, activity, and function of proteins. Our focus is the two-helix bundle needle proteins in the pathogenic bacterium Shigella flexneri. Type 3 secretion systems in gram-negative bacteria species cause the following diseases: typhoid fever, food poisoning, and gastroenteritis. This folding code introduces structural biases into an amino acid sequence, which defines the final protein structure. Synonymous research conducted begins with a stable fold and varying sequence to determine sequence diversity for a fold, while our method is the opposite. We composed a simple amino acid sequence mainly of alanine (polyAK), which is known to form alpha-helical secondary structure but has no long range contacts. This model peptide was altered by introduction of four more amino acids known to shape the peptide into a turn taken from the needle protein (PSDP). This sequence should create a two-helix bundle protein with long range contacts in silico. We use Monte Carlo computational simulations which determine favorable structures from given sequence to investigate peptide diversity. We probed our peptides over the temperature range 280 to 460 K. The results showed a transition from a compact globule to an expanded coil with increasing temperature for both peptides. The radius of gyration was used to examine compactness. Helical structure was also reviewed. Our results show the compact globule is significantly stabilized by PSDP addition. The polyAK peptide is more expanded at higher temperatures than the PSDP peptide. Thus, a turn can bias the conformation of polypeptides to a compact, globular structure. Future work will include laboratory investigations featuring these model peptides. Knowledge gained will be applied to understand the folding code in type 3 secretion systems.

Mentor: Bruce Bowler, Biochemistry

Can't Get No Job Satisfaction: Setting as an Indicator of Current and Desired Roles of School Psychologists

Madison Evans and **Axel Yount** (#105)

Children in rural areas face greater academic, mental health, and behavioral difficulties than children in urban areas (Lenardson et al., 2010; Moore et al., 2005). School psychologists provide support to children in these areas through assessment, intervention, and consultation services (Reschly, 2000). Little research, however, has been done on the roles of school psychologists in rural areas. Current research shows that rural school psychologists face unique challenges including less experience, a lack of resources, and professional isolation (Clopton & Knesting, 2006; McLeskey, et al., 1983). These challenges could reasonably impact job satisfaction, which is one understudied area in rural school psychology. The goal of this research study is to examine differences in job satisfaction between rural, suburban, and urban school psychologists in the Pacific Northwest and Rocky Mountain regions of the United States.

An online survey was completed by 217 school psychologists in rural (n = 94), suburban (n = 94), and urban (n = 29) areas in the Pacific Northwest and Rocky Mountain region. Participants answered demographic questions as well as questions pertaining to their current and desired roles and responsibilities as school psychologists. In this mixed-methods study, quantitative data will be analyzed using Chi-square analyses while qualitative data will be analyzed using thematic coding.

This presentation will increase awareness of the challenges faced by school psychologist in rural areas like Montana. We hope to identify ways that rural school psychologists can increase their job satisfaction and provide more effective academic and mental health services to Montanan children.

Mentor: Anisa Goforth, School Psychology

Firn Densification in the Percolation Zone of Western Greenland

Arlan Dirkson (#106)

The contribution to sea level rise by the Greenland Ice Sheet (GrIS) is controlled by surface mass balance (accumulation and ablation) and dynamical discharge. Ablation and dynamical discharge can increase sea level by introducing this mass into the oceans as fresh water. In the accumulation zone of a glacier, where annual snowfall exceeds melt, the densification of snow that has survived a melt season (firn), contributes to surface elevation changes without loss of mass. This complicates mass balance assessment since a change in surface elevation doesn't directly translate to a change in mass for the ice sheet. The densification process is well understood for "dry snow zones" where seasonal surface melt is absent; however, lower in the accumulation zone, densification processes are complicated by seasonal melt water which penetrates down into the firn and refreezes. Refreezing melt water can enhance densification by redistributing mass and by releasing heat when transitioning from a liquid to a frozen state. This study (a work in progress) addresses what depths these occur and how much heat is generated through the analysis of firn temperature data collected from ten sites along a 90 km transect through the percolation zone of western Greenland. Comparing a partial differential equation that describes how temperature diffuses in the absence of refreezing with temperature data that includes these events, a residual heat value which represents the total amount of heat that results from at least three distinct types of refreezing events is calculated. One of these types of refreezing events is addressed using measured temperature data to find anomalies unique to this event type. The likelihood for refreezing in specific depth ranges below the surface is represented by a probability density function that will later be used to constrain a firn densification model.

Mentor: Joel Harper, Geosciences

Quantitative Fitting of transport model parameters to experimental profiles

Erica Hadden (#109)

The HELCAT experiment is a cylindrical device in New Mexico that is being studied to better understand the interactions between turbulence and flows in an ionized argon gas. The Plasma Group at the University of Montana has developed a numerical transport model to simulate radial transport of heat and particles in the HELCAT experiment. In this work, the results of a quantitative comparison of experimental data and computational results from the 1D transport code are presented. While some of the input parameters to the transport code are measured in the experiment (such as the magnetic field strength), others are not measured and need to be constrained by comparison with experimental results. My work has been a computational effort to develop a method of determining which input parameters to the transport code result in the smallest differences with experimental results. This work presents a Python code that performs an optimization of the transport code input parameters in order to fit experimental measurements using a least squares fitting routine.

Mentor: Andrew Ware, Physics

The Effects of Plasma Current In the Worlds Largest Stelarator

Erica Hadden (#115)

This project explores plasma currents and there effect on plasma equilibrium for the application of nuclear fusion devices. Plasma is an energetic, ionized, electrically charged, state of matter. Nuclear fusion is the process of combining lighter atoms into heavier atoms with the potential to produce large amounts of energy. It can occur when plasmas reach high temperatures and densities. A source of inspiration for nuclear fusion in plasma devices comes from the sun, which is made of plasma and is powered by fusion. We focus on Wendelstien 7-X (W7-X), which is an advanced plasma containment device currently being built in Greifswald, Germany. Because plasma is made up of charged particles, it is very conductive. In order to make a more stable plasma, one design criteria for W7-X was to minimize plasma current. Some residual plasma current will still exist however. The goal of this project is to explore the effect of this current on the plasma equilibrium, by use of various computational codes. Plasma equilibrium is achieved through a balance of forces. In this work, equilibria are calculated for the W7-X coil configuration at a range of plasma pressure values with the assumption of zero plasma current. The residual plasma current has been calculated for each. An optimization is underway to recalculate the equilibria with the effect of the predicted plasma current included. The impact of both finite pressure and residual plasma currents on the magnetic structure in the edge will then be examined.

Mentor: Andrew Ware, Physics

Bloody Happy: Designing for a National New Play

Fiona McNeil (#118)

Happy is a new play written by Robert Caisley, that presents to us how vicious, or even jealous, we can be toward individuals who seem to be happy about everything in their lives, all faults included. Alfred and his wife Melinda go to visit Eduardo and meet the new woman in his life, but as the night goes on, everyone's ideas of happiness begin to deteriorate. As the assistant Costume Designer and the Makeup Designer for the play, I worked closely with assistant professor Laura Alvarez to develop looks for all the characters. The designs are made not only to be convincing for how the characters act within the play, but also help show relationships between each of them, and even portray details of the characters that are not mentioned within the script. The process starts with the script, including analysis and charting of the characters and their actions, then moves into research fitting into the design concept and setting, then after decisions have been made on the designs, we move into construction or purchase of the garments for each costume. At the end of the process, everything is ready for the show to go on.

Mentor: Laura Alvarez, Theatre

Determining reservoir- and basin-scale stratigraphic architectures of the Bartlesville Sandstone from well log data

Eric Lavering (#119)

The Bartlesville Sandstone in Oklahoma has been reported to represent the clastic sedimentary filling of a Pennsylvanian-aged incised valley. Since drilling began in 1897, this formation has been perforated with thousands of oil wells, from which many electronic well logs and initial production documents still exist. By compiling, correlating, and analyzing this geophysical data, this project aims to better understand the regional and local stratigraphic architecture of the Bartlesville Sandstone. Results from this work can be used as an analog for predicting the sedimentary characteristics of incised valley sequences elsewhere. The large-scale heterogeneity of incised valleys is controlled by changes in accommodation and sediment supply. Establishing a regional sequence stratigraphic framework for the Bartlesville Sandstone is the best way to study these changes. Characteristic gamma ray, bulk density, and resistivity signals in well logs were used to correlate and define erosional and flooding surfaces throughout the study area. These surfaces were interpreted to represent the lower and upper bounds of the formation. Between these two markers, the slightly more inconspicuous boundary separating the upper and lower Bartlesville was identified by interpreting further trends in these well logs.

After defining the upper and lower boundaries of the Bartlesville, the total thickness of the formation was examined by creating an isopach map for the study area. This map shows that the Bartlesville has a thick axis and thin margins, which is evidence supporting its interpretation as an incised valley.

In addition to defining the overall thickness and extent of this formation, smaller-scale features were also explored. The upper Bartlesville was interpreted to consist mainly of isolated sand bodies. Using the electrical logs and driller's documents, individual sand bodies were located and correlated when possible to further understand the evolution of the valley system.

Mentor: Marc Hendrix, Geosciences

Self-Identification with the Diagnosis of ADHD and its Relationship to Performance on Self-Report and Objective Measures

Brook Clark and **Hannah Wadsworth** (#121)

Purpose
Research has shown that how strongly one identifies with a stereotype can impact performance on cognitive tests. The goal of the present study was to investigate the relationship between the level of identification with a diagnosis of ADHD and performance on self-report and objective measures commonly used in the diagnosis of ADHD.

Methods
Participants were 21 college-age adults with a prior ADHD diagnosis. Each participant's level of identification with their diagnosis of ADHD was determined using a single question Likert-type self-identification scale. Participants were also administered the Conners' Continuous Performance Task (CPT-II) and the Barkley Adult ADHD Rating Scale-IV (BAARS-IV) sections 1-3.

Originality
To date, no other research has examined "diagnosis identification" and its relationship with performance on self-report and objective measures. One might expect to find a relationship between how much someone identifies with a diagnosis of ADHD and his/her performance on an objective measure used to assess for ADHD, however, this was not the case. No significant correlation was found between scores on the self-identification scale and performance on the objective measure.

Significance
These results demonstrate the importance of considering to what extent someone identifies with their ADHD diagnosis. An individual's degree of identification with the diagnosis of ADHD may not correlate with that individual's performance on an objective measure, or may serve to inflate self-report scores. These results suggest that no single assessment tool should be used in isolation when making an initial diagnosis of ADHD. Further investigation into the role of "diagnosis identification" and how that may impact self-report and objective test results is needed.

Mentor: Stuart Hall, PhD, Psychology

Purification and analysis of pH indicators for more accurate pH measurements.

Emma Jaqueth (#122)

For years scientists have been using pH indicators and spectrophotometric systems to determine the pH of natural waters. Impurities in these pH indicators were thought to be unimportant until a recent paper was published (Liu et al. 2011) that indicated impurities create pH errors. Our lab's primary focus is to measure the pH of natural waters through this technique so we began purifying meta-Cresol Purple (mCP) indicator salts using reverse phase HPLC and Flash chromatography systems. The purified indicator optical properties were then determined. After it was determined the our purified indicator gives more accurate pH measurements we began to develop different methods to purify the indicators Bromocresol Purple (BCP) and Phenol Red (PR). PR is similar to mCP with respect to the wavelengths at which the indicators absorb light but it is much more soluble than mCP, which makes PR desirable for spectrophotometric measurements. I am currently taking measurements on a Cary 300 Spectrophotometer to calculate the molar absorptivities of the purified PR in its acid and base form at 5°C intervals from 5-30°C. Once the molar absorptivities are obtained we will be able to use purified PR in pH measurements and compare these calculations to the purified mCP and the impure PR pH measurements. By providing a method of purification with the data to readily use the purified indicators, future studies of the pH of natural waters will be more accurate.

Liu, Patsavas and Byrne, 2011, Purification and Characterization of meta_Cresol Purple for Spectrophotometric Seawater pH Measurements , Environmental Science and Technology, 45, 4862-4868

Mentor: Michael DeGrandpre, Chemistry

Proteinase K's effect on C. elegans and C. burnetii

Lance Watson (#123)

The objectives of my study examined the effects of the enzyme proteinase K, and how it affects the viability of a wild type strain of Caenorhabditis elegans and a red-fluorescently tagged strain of Coxiella burnetii. The research that was conducted including developing a large sample of C. elegans grown on Nematode Growth Media and fed a strain of E. coli (OP50). In duplicate form, four samples of 10 nematodes were "picked" from the media plates using platinum wire, and transported into Worm Lysis buffer (WLB) solution. Another sample contained only Coxiella, which was then serially diluted to 104, 103, and 102 cell concentrations. At this point a low concentration of Proteinase K was added to all viles except for one of each to account for a negative control, and the mixture was then incubated at 60'C for 1 hour on a dry bath. The Coxiella samples were then spun down using a centrifuge at 10,000 rcf for 10 minutes, resuspended with PBS-S, and plated on Coxiella growth media to account for viable colony forming units. C. elegans were centrifuged at 700rcf for 10 minutes, and resuspended in M9 salt solution. Then placed on OP50 enriched media, to examine viability, and while another was transferred to glass slides for viability under a microscope. The Pilot experiment concluded that Proteinase K in low concentrations is efficient at disrupting the cell membrane of C. elegans, while not disrupting the membranes of Coxiella. The significance of these findings will allow for pure isolation of Coxiella from the gastrointestinal tract of C. elegans for future research looking at vector transmission of Coxiella between nematodes.

Mentor: Lance Watson, The College of Arts and Sciences

Determining Exoplanet Detection Capability of the Minerva Observatory

Chantanelle Nava (#124)

One of the most profound questions of modern science facing humankind is whether or not we are alone in the universe. Our first step toward answering this question is detecting and characterizing rocky, Earth-like planets with conditions capable of sustaining life. Results from the NASA Kepler mission indicate that our galaxy of an estimated 200 billion stars contains hundreds of millions of other Earths to be discovered. We look specifically to Earth-like exoplanets orbiting in the habitable zone, the annulus around a star in which temperatures can support liquid water, for the first signs of life-sustaining potential. Minerva is a dedicated observatory of four 0.7-meter telescopes designed to detect these Earth-like exoplanets. It is essential to determine Minerva's planet detection sensitivity as a function of orbital parameters for potential exoplanets. I am currently exploring Minerva's capabilities using an original program written in IDL. I select a mass, host-star mass, and orbital parameters for a hypothetical planet and calculate its expected orbital line-of-sight velocity curve. I then add statistical noise to the curve using residuals of data collected from HARPS, an exoplanet detection project of comparable precision to that of Minerva. I feed this final simulated velocity curve to Minerva's planet detection software to assess whether or not it recovers the originally selected planet mass and orbital parameters. Determining Minerva's planet detection capability informs the project's target selection and helps us understand the instrumental biases influencing Minerva exoplanet discoveries. Minerva is a collaboration among the University of Montana, the California Institute of Technology, and Pennsylvania State University.

Mentor: Dr. Nate McCrady, Physics

Determining Sunscreen Efficacy in the Ultraviolet Range

Wesley Harmon, Daniel Lehman, Allison Mueller, Chantanelle Nava, and **Jonathan Wagner** (#125)

The Grizspect team has designed and constructed an ultraviolet solar spectrograph to investigate the efficacy of active ingredients found in chemical and physical sunscreens for blocking UV-A (320-400nm) and UV-B (290-320nm) light. Incoming sunlight is collimated and reflected onto an aluminum-coated diffraction grating. We place an ultraviolet-sensitive camera in the 280 to 400 nanometer range of diffracted light to measure and record the intensity of light incident at each wavelength, constructing a transmission spectrum. Sunscreen is then applied in a uniform layer onto a fused silica slide and placed at the initial aperture of the instrument. We examine spectra filtered by each of the four sunscreens and one control, consisting of the silica slide alone. The results of our experiment reveal which active ingredients most effectively filter UV-A, UV-B and UV-C light, as well as ultraviolet light as a whole. With an SPF rating system that is minimally regulated, our findings are essential for holding sunscreen distributors accountable in their advertising claims. The Grizspect team is competing in the National Student Solar Spectrograph Competition at Montana State University in May for their instrumental design, construction, and data acquisition.

Mentor: Dr. Nate McCrady, Physics and Astronomy

An Improved Configuration for Logging Trucks in Montana

James Dyke Jr. (#127)

My goal is to increase the versatilty of the logging truck on a daily basis while maintaining revenue and reducing possible injuries for the owner(s)/operator of the truck. Historically in Montana logging trucks hauled larger diameter logs, shorter distances than they do today.The current conventional logging truck is a 5-axle stinger-steer truck and trailer system that has some limitations. Todays markets are more varied,with the size and sometimes length of logs varying from job to job. This research looks into a different configuration of a logging truck. My proposed configuration utilizes fixed bunks with increased area compared to current bunk designs on the stinger-steer systems. The concept also involves a long straight truck chassis with 7-axles and no trailer.

Increased bunk area for the proposed design is calculated by geometric sums. Long vehicle tail swing is analyzed by an equation developed by Physics Forums and displayed graphically for this project proposal. Revenue analysis is based on haul rates established for the industry with the increased revenue possibilities displayed for consideration. Furthermore, eliminating stake extensions and the logging trailer of the common stinger-steer configuration should eliminate slipping and falling injuries from climbing up on logging truck rigging. The possible injury reductions will be displayed in charts for comparison. Finally, improved highway operating safety for this vehicle proposal can be demonstrated from data compiled of vehicle accidents for the Federal Highway Administration. When all parameters for the transport of logs on logging trucks are considered this proposed design should demonstrate improvements over the stinger-steer logging truck system.

Mentor: Beth Dodson, college of Forestry and Conservation

Trace fossil assemblages and significant surfaces in Upper Cretaceous sediments in central Montana as indicators of environmental conditions and depositional setting.

Jenn Torres (#128)

Trace fossil assemblages and sedimentary features were studied to establish environmental conditions and depositional setting using a 122 meter continuous core through the lower half of the Eagle Formation, the entire Telegraph Creek Formation, and the upper most part of the Niobrara Formation from the Billings area. In central Montana the Late Cretaceous Niobrara and overlying Telegraph Creek formations consist primarily of poorly exposed mudstones. Above the Telegraph Creek Formation is the Eagle Formation, which is dominated by cliff-forming sandstones. The environmental conditions such as salinity and water depth are poorly constrained, particularly so in the Telegraph Creek Formation. The 122 meters of core was described in detail, with features including lithology, primary sedimentary structures, trace fossils, and bioturbation intensity and frequency. Trace fossil assemblages indicate that the upper part of the Niobrara Formation was deposited in a deeper water marine setting while the overlying Telegraph Creek Formation was deposited in shallower water with decreased marine influence. High bioturbation intensity in these formations indicates relatively low sedimentation rates. The contact between the Telegraph Creek Formation and the overlying lower part of the Eagle Formation is gradational, indicating that these formations are part of the same genetically related regressive depositional package. In addition, it was possible to identify in the core two stratigraphically significant surfaces (a transgressive ravinement surface and a sequence boundary) that had been identified in previous outcrop studies of the Eagle Formation. By examining core it was possible to determine environmental and depositional conditions of these formations, particularly in the mudrocks, that could not be deduced from outcrop exposures alone. In addition, this is the first time that stratigraphically significant surfaces have been identified in core that can be directly tied to Eagle Formation outcrop exposures in central Montana.

Mentor: Jim Staub, Geosciences

Neurological and Genetic Origins: Language and Religion

Stephanie Christensen (#129)

The origins of language and religion are difficult to ascertain. Language remains elusive due to the lack of any direct evidence of its origin, requiring indirect study through various methods. Religion's presence depends upon the pre-existence of language; simply put, language and religion are unable to exist without conscious thought. Throughout my research project, I focus on examining the origins of language and religion from a biological perspective. My study focuses on both in relation to neurology and genetics. Utilizing information from peer reviewed journals as well as published scientific studies, I investigate aspects of the brain and various genes connected to language and religion. My research suggests genetics and neurology play a role in determining the presence of language and religion. Through evolutionary adaptation and genetic mutation, the brain allows for the manifestation of language and by association the evolution of religion.

Mentor: Ivan Lorentzen, Scholars Program

Exploring the Experiences of Transgender College Students

Robert Enoch, Sean Jeffrey, Sarah Olafson, and **Sally Rau** (#132)

This study hopes to examine the experiences of students (18 years and older) attending the University of Montana who self-identify as transgender or gender-variant. Though research on this topic is limited, studies have concluded that this community typically lacks support in many aspects of campus life. Findings have voiced concern about a shortage of allies among faculty and staff, not having sufficient access to physical and mental health services, and not having appropriate campus facilities, such as restrooms and locker rooms (Beemyn, 2003; McKinney, 2005). This study aims to build upon current literature by exploring both positive and negative aspects of these students' experiences. Five research participants are currently being recruited from student and community-based LGBT organizations. After agreeing to participate, individuals will be asked a series of semi-structured interview questions exploring their experiences, including access to appropriate campus facilities, interactions with faculty and students, involvement in the LGBT community, and interactions with the administration. A phenomenological qualitative analysis will be employed to reveal core themes describing the experiences of these students. These findings may aid administrative officials in better understanding the needs of transgender students so they can actively work towards promoting an inclusive campus environment.

Mentor: Bryan Cochran, Ph.D., Psychology

Estrangement in Russian Cinema

Brinna Boettger (#143)

Russian director Andrei Zvyagintsev's Elena is a brilliant display of artistry and narrative. The film centers on the film's heroine Elena, who is caught between the upper and lower classes and her first and second families. The film attends to the complexity of morality in a Russian context while simultaneously entertaining a cross-cultural viewership with issues of family dynamics and class struggle. In 2011 Elena received the Prix du Jury prize, perhaps the third most prestigious commendation in cinema, at the Cannes Film Festival.

Despite the critical appeal of the film and its appeal to international audiences, there is something very unnerving about Zvyagintsev's film. Elena is uncomfortable to watch. At no time during the film is the viewer able to lapse into the happy, dumb complacency of scopophilia and mindlessly escape into the consequence-free universe of the screen. Zyagintsev responds to the cinematic tropes that have conditioned modern viewership with the excited austerity of a Russian formalist, and Elena is allowed to point to itself and declare, "art."

The assertion that Elena is a production of art, strictly in the formalist sense, demands a clarification of the definition of art. According to Russian formalism, formal elements comprise the axiology of art. Moreover, that axiology is not established with undue consideration of character development or thematic conclusions. Formalism requires a shift in emphasis from an objective analysis to a subjective experience. Articulated by Victor Shklovsky in "Art as Technique," art as form places a necessary emphasis on the viewer's (the subject's) perception of the object.

Mentor: Clint Walker, Russian Language

Assessing Maladaptive Parenting Through the Use of Follow-up Questions to Counter Attempts to "Fake Good"

Emily Copeland, Rachel Helmer, Mallory Hogan, Lindsey Jackson, Sara Markuson, and **Lauren Poss** (#145)

Previous research has shown that abusive parents tend to overestimate their young children's competence and use relatively maladaptive parental practices even when not engaging in abuse. The Child Guidance Interview (CGI) is being developed to identify such beliefs and practices in order to distinguish child abusers from non-abusers. The CGI is an open-ended interview in which hypothetical child guidance scenarios are presented and parents must propose responses. One feature is the use of follow-up questions intended to encourage parents to respond outside of their "comfort zones" and to reduce the likelihood of "faking good." Parents are asked how they would respond initially and then what they would do if the initial responses were ineffective. We examined four developmental norm scenarios (potty training, bathtub safety, dinner manners, and need for a comfort blanket) and one disobedience scenario (store tantrum). Data from 76 parents (archival clinical and volunteer participants) were coded as superior, satisfactory, or unsatisfactory using manuals developed by previous members of this team. Successive responses to follow-up questions were compared to determined whether follow up questions increase the likelihood of eliciting maladaptive responses.

Mentor: Paul Silverman, Psychology

Geochemical Analysis of the Marginal Facies of the Bear Gulch Limestone, central Montana

Robert Rader and **Amy Singer** (#154)

There are a limited number of late Mississippian age deposits with soft bodied preservation like the Bear Gulch Limestone (BGL) in central Montana to study the End Mississippian mass extinction, the Serpukhovian Biodiversity Crisis. Understanding units like the BGL might illuminate this important time period, and expand our understanding of current global climate change.

Geochemical techniques never before applied to the BGL, have provided data that can be used reconstruct the paleoenironment of this fossil-bearing formation. The BGL holds an abundance of well-preserved soft-body fossils from the late Mississippian, including carbon films of organs, worms, and fish. The depositional setting is a restricted marine basin containing five biologic and lithological facies. The marginal facies within the study area is composed of three meters of dark brown fissile laminae.

During the summer of 2012 a 220 cm2 area of 50 successive layers of the marginal facies was excavated. The fossils in each layer were compared to literature for species identification. Of the 50 samples, ten fossil bearing samples were selected for geochemical and mineralogical analysis. The samples were ground to 150 microns and examined using X-ray diffraction (XRD), coulometry, and the ferrozine method. XRD provides basic analysis of the mineralogy, used to assist in lithology identification. Coulometry measures total organic carbon content (TOC). TOC is used to assess the potential for petroleum and productivity of the basin. The TOC ranged from 0.72 to 4.17%. The ferrozine method provides data for the determination of the depositional setting. Our initial research has provided a series of methods that can be adapted for the study of additional BGL facies.

Mentor: George Stanley, Geosciences

Native Trout Conservation and Watershed Restoration: A response to Climate Change in the Greater Yellowstone Ecosystem.

Zachary Brown (#157)

Changes in temperature are occurring in the Greater Yellowstone Ecosystem and are expected to accelerate in the coming century. Over the past two decades scientists have observed an increasingly diminished snowpack, rivers peaking earlier in the spring, more extreme and frequent wildfires, and shifts in vegetation as the climate has warmed. Perhaps most vulnerable to this warming trend are the region's aquatic habitats and species.

In 2011, I helped publish a report focused on how Greater Yellowstone's native trout – Yellowstone, westslope, Bonneville and Colorado River cutthroat – are threatened by climate change, and more importantly, what can be done.

The premise is that degraded, fragmented and highly stressed watersheds and native trout populations are more vulnerable to the effects of rapid climate change. For example, an overgrazed stream with little riparian vegetation to provide shade and wide, shallow sections will warm more quickly as temperatures increase, possibly pushing resident trout over their thermal threshold. Conversely, healthy, connected habitats and robust, well-distributed trout populations are much more likely to persist. Thus, efforts to restore degraded watersheds in conjunction with native trout conservation can be a promising adaptation strategy. (Adaptation refers to actions designed to reduce the risk or vulnerability of natural systems to the impacts of climate change.)

This report also describes close to 40 potential projects that if completed would lower water temperatures, enhance water quality and quantity, improve riparian habitat conditions and expand cutthroat trout populations. While the challenge is daunting, there are already many agencies, landowners, watershed groups and conservation organizations in the trenches doing meaningful work. Scaling up and accelerating collective efforts can make a big difference for Yellowstone's cherished rivers and native trout.

Mentor: Craig Stafford, Wildlife Biology

School Based Behavioral Intervention Systems in the Northwest Region

Bridget Gibbons and **Katie Thom** (#165)

Social and emotional supports in school are essential in aiding appropriate student behaviors. The presence and consistency of PBIS(Positive Behavioral Interventions & Supports) and other social/emotional support programs across school districts, along with school based mental health staff needs are being looked at through this research. Variables include: the level of PBIS being implemented, behavioral expectations/reinforcements and ways of handling behavioral problems, presence of social skills curriculum, and outcome measures. Quantitative data is currently being collected through phone interviews on randomly selected schools in the northwest region, and descriptive analysis will be completed after collection completion.

Mentor: Cameo Borntrager, Psychology, and Greg Machek, Psychology

Visualizing Communication - Pattern Recognition on the Enron E-mail Corpus

Scott Halstvedt (#166)

Despite the rapid pace of computer hardware advancement in recent years, little has changed in the methodology of viewing and processing large, complicated sets of information. E-mail inboxes are an excellent example; the human brain has difficulty parsing patterns and relationships in any data represented as a raw list, and the principal axis of email (time received) is particularly unhelpful. This remains the prevailing layout, however, simply because there is too much dimensional structure to choose a single meaningful attribute of the messages to arrange by. An efficient way to overcome such a situation is through multidimensional analysis: by combining multiple features into one, we map the email onto a lower-dimensional manifold for navigation and visualization. We seek to arrange the data into distinct categories or clusters based on the reduced representation, and compare such an approach to a recent Dirichlet-based method.

This project analyzes a representative subset of the approximately 500,000 emails encompassing 150 users from the Federal Energy Regulatory Commission's investigation into the Enron Corporation. The research applies and compares a set of commonly used pattern recognition techniques to discover topical clusters in the corpus of unstructured text. As in the literature, each document is represented as a unigram bag-of-words feature vector on a (most-common) subset of the terms included in all messages. To perform dimensionality reduction, we apply and compare the traditional linear methods of Principal Components Analysis (PCA) and Multidimensional Scaling (MDS), using each representation to perform k-means clustering on the messages. The resulting data is further dimensionality-reduced and visualized for accessible comparison. We also create a generative Latent Dirichlet Allocation (LDA) topic model based on the unigram features, a recent innovation in the literature, and show its performance versus the dimensionality-reduction/clustering based methods.

Mentor: Douglas Raiford, Computer Science

Applying Quasi-Digital Seismic Data Obtained from Paper Seismic Traces to Analyze the Geology of Flathead Valley, MT, USA.

Evan Hanson (#169)

Flathead Lake is located in southern Flathead Valley in northwest Montana. Flathead Valley and its southern extension, the Mission Valley, are both tectonic half-grabens that are part of the seismically-active northern Basin and Range province. Being located in the center of an active seismic zone, the sediments under Flathead Lake contain a great archive of the historic and pre-historic seismic activity.
To unravel this seismic archive, I analyzed a set of seismic reflection data that was acquired in the 1970s and 80s. The seismic surveys were conducted on the lake, their goal to map the major normal fault structures that define the basin and to map the lacustrine and glacial deposits. At this time, data were collected on paper traces using analog instruments, rendering an interpretation of the subsurface difficult and inaccurate.

With the advent of more sophisticated computer technology and software, however, I was able to digitize this paper data set and interpret it in a fully digital environment. The process I utilized takes image scans of the paper traces and translates them quasi-seismic digital traces. Applying geophysical processing methods, such as band-pass filtering, further yields traces with an oscillatory character similar to that of real seismic traces. Spatial referencing for the traces was determined by recovering survey line endpoints using GIS, and the UTM coordinates were added as metadata. A small subset of lines was imported into a 3-D computer environment, something that could never have been done with only analog data.

This workflow process enabled me to identify and remove noise features, which was not possible using manual methods and may have contributed to some error in previous interpretations of the data. I was also able to interpret the timing, magnitude, and location of the Flathead Lake subsurface faults and compare my findings to the previous literature.

Mentor: Dr. Marc Hendrix, Geoscience

Motorcycle Medics
Kelsey McCall (#171)

A tragic history of violent civil war in Somalia has resulted in widespread migration into western Kenya. In response, Kenya has developed mass refugee camps, such as Dadaab, to provide a safe haven for refugees. For those who choose to flee Somalia, protection from the war is not immediate because conflict and limited resources are common on the long road to safety. Upon arrival, services are limited and suffering because of the vast amount of people in need without adequate volunteers and supplies available.

My project shows the role of women in refugee camps and assesses medical services provided and necessary to increase reproductive and maternal care within Dadaab refugee camp. My research was conducted from testimonies of current refugees, documentaries that focus on daily camp life, and an interview with the coordinator of Kateri Park, which is a community center that assists Somali and other refugees in Portland, OR. From this research I found projects that currently exist from NGO's and non-profit organizations. The next phase of research I conducted looked into best practices for creating successful projects, supply costs, and curriculum development.

My initial project Motorcycle Medics is an original idea that potentially benefits mainly women in one of the most desperate global situations. The mobile hospital motorcycle structure utilizes internal space for preventative reproductive and maternal health supplies, medical screenings, and prenatal care. The external sides of the structure are chalkboards to teach, reproductive and maternal health awareness, practice, and skills.

Mentor: Peter Koehn, Political Science

A 3-D Visualization of pH Titrations: Equivalence Point Cliffs, Dilution Ramps and Buffer Plateaus
Daniel Barry (#172)

Daniel D. Barry (Garon Smith and Md. Mainul Hossain)

Acid/base chemistry is one of the most fundamental types of chemical reactions. 3-D surfaces have been generated to visualize how pH behaves during titration and dilution procedures. The surfaces are constructed by plotting computed pH values above a composition grid that has volume of base added in one direction and overall system dilution on the other. What emerge are surficial features that correspond to acid/base behavior in aqueous solutions. Equivalence point breaks become cliffs that pinch out with dilution. Buffer effects become plateaus. Dilution alone generates 45o ramps. A nice result of this visualization technique is that the limitations of the simplified Henderson-Hasselbalch equation can be seen by noting the conditions over which a plateau remains relatively flat. Because dissociation is driven by dilution, the surfaces can demonstrate when the solution of a weak acid becomes indistinguishable from that of a strong acid. Surfaces are presented for hydrochloric acid, HCl (a strong acid); acetic acid, CH3COOH (a weak monoprotic acid); oxalic acid, HOOCCOOH (a weak diprotic acid) and L-histidine hydrochloride, C6H9N3O2 . HCl (a weak triprotic acid).

Mentor: Garon Smith, Chenistry and Biochemistry

EFFECTS OF PAIN INTERFERENCE ON USE OF COMLEMENTARY THERAPY IN FIBROMYALGIA

Sandra Skogley (#174)

Abstract
Background: Fibromyalgia is a chronic widespread pain disorder of neuroendocrine/neurotransmitter deregulation that amplifies pain experiences. Physical exertion that comes with normal daily routines exacerbates symptoms, causing fear of participation. Complimentary or alternative medicine (CAM) includes massage, acupuncture, chiropractic, yoga, tai chi and cognitive behavior therapy. The purpose of this study was to predict the use of CAM from pain interference and pain intensity of community dwelling people with fibromyalgia.

Methods: Research participants were 73 individuals randomly recruited from five zip codes in Missoula who reported being diagnosed with fibromyalgia. They completed a mail based survey from a larger study on pain and participation. We used logistic regression analysis to examine the hypothesized relationships between variables.

Results: These cross sectional results show that CAM was used by 69.9% of the fibromyalgia participants and that pain interference was a significant predictor of CAM use. The odds ratio adjusted for age, gender and income indicated that for each unit increase in pain interference (range 9-45) there was an 8.7% increase in the likelihood that people used CAM. The model accounted for 36.8% of the variance in the use of CAM.

Conclusion: The findings indicate that as interference in daily activities from pain increases the use of CAM is more likely. Further research might investigate the effectiveness of various CAM for use with fibromyalgia.

Mentor: Craig Ravesloot, Rural Institute on Disability

A comparison of adolescents' ability to infer vocabulary meaning under two reading conditions

Jenny-Lynne Peterson (#175)

Learning new vocabulary once a child reaches adolescence is largely dependent on wide reading. Students who are already struggling with vocabulary comprehension will be less likely than their typically developing peers to learn new words through reading when the surrounding text is also unfamiliar. Perhaps providing students with multiple types of contextual support (graphic and textual) will facilitate bridging that comprehension gap. To examine this, the investigator will compare vocabulary comprehension of adolescents under two different contextual reading conditions. The subjects (n=30) will read a passage from a classic novel and will then read another passage from the graphic novel adaptation of that novel. Vocabulary words from the passages (several from each reading condition) will be identified as unfamiliar to the subjects prior to reading these passages. After reading each passage, each subject will complete a brief vocabulary probe testing his or her ability to infer the meaning from the context of the passage. Subjects will be divided into two groups and the reading conditions will be counterbalanced to minimize specific vocabulary word effects. The investigator hypothesizes that the meanings of more vocabulary words will be correctly inferred when presented under the graphic novel condition than under the text only condition. Differences in subjects' abilities to infer the correct meanings of the selected vocabulary words under each reading condition will be analyzed and discussed. Implications for differential reading instruction for struggling adolescent readers will be addressed.

Mentor: Dr. Ginger Collins, Communicative Sciences and Disorders

Quantifying Error In Regional Climate Models Using Data Assimilation

Katie Monaco (#178)

Predictions of the amount of hydrologic quantities such as precipitation are important because they provide the foundation for design of water resource management strategies. Regional climate models are used to make predictions of these quantities, but how well can they estimate the actual amount for a given area? Data Assimilation fuses ground observations with model data, yielding a more accurate estimate of the true state of a process. Using a computer algebra system to perform statistical calculations on model data and conveying the results in the context of a Geographical Information System, this correction can be applied to any type of model prediction, given there exists ground measurements of the quantity of interest. This study finds the amount of error, in the form of a correction, on model data by incorporating precipitation measurements collected at six Snotel stations within the Bitterroot Range in Southwest Montana. The correction calculated is a quantification of the amount of error in the prior probability distribution of predicted values. The corrected model is a reflection of the ability of Snotel stations to capture the amount of precipitation in the surrounding area. The corrected model in this study shows the model underestimated average daily precipitation in the high-relief topography of the Bitterroot Range, in the western section of the study area, and a negligible correction in the Bitterroot Valley and a portion of the Sapphire Range in the Northeast section of the study area. The results of data assimilation enhance the information from regional climate models, and provide insight on the influence of ground observations so a more accurate prediction can be made.

Mentor: Marco Maneta, Geoscience

Halogen Bonding

George Neuhaus (#179)

Halogen bonds are non-covalent attractive interactions between halogens that are covalently bound to organic structures, and Lewis bases (species with areas of high electron density). This attraction is caused by an electron-deficient group that is covalently bound to a halogen. This electron deficiency results in an area of weak positive charge, on the halogen opposite to the covalent bond. It is this positive area, called the σ-hole, that attracts the electrons of the Lewis base, pulling them away from an electrophilic site, and causing it to react faster. The location of the σ-hole puts restrictions on the halogen bond such that the bond R—X⋯B, (R = electron withdrawing group, X = Halogen, B = Lewis base) must be 180°. Prof. Orion B. Berryman designed a family of catalysts that fulfills these requirements by placing two halogens on a scaffold that enables this geometry. The research highlighted herein is the synthesis of a catalyst derivative designed to enhance the catalyst solubility in organic solvents by incorporating tertiary-butyl groups on the structure. The synthesis involves subjecting 4-t-butylaniline through a five step process adding bromine and iodine to the ortho-positions and removes the amine by deamination. This dihalogenated species will then be attached to imidazole by a copper catalyzed N-arylation. Two of these arms will be attached to the meta-positions of a benzene ring by Suzuki-Miyaura cross couplings to create the back bone of the catalyst. Finally, both of the imidazoles will be iodinated and alkylated with MeOTf to activate the catalysts. Once the catalyst is synthesized, binding constants will be measured with carbonyl substrates and the catalyst will be tested with carbonyl reactions. Because these new organocatalysts are designed to be compatible with a large scope of substrates, especially carbonyl compounds, they could potentially improve known reactions and make new reactions possible.

Mentor: Orion Berryman, Chemistry & Biochemistry

Does the Internet Represent a Threat to the Security of Symptom Validity Tests?

Sarah Lawley and **Tory Kimpton** (#180)

Objective: Previous research has shown that there is a variable amount of information on Internet sites about symptom validity tests (SVTs) that threaten the security and validity of these measures. However, this work was conducted a number of years ago (Bauer & McCaffrey, 2006; Ruiz, Drake, Glass, Marcotte, & van Gorp, 2002). Given the continued advances in technology and Internet services, the goal of the present study was to examine the current level of threat to SVT security posed by Internet sites.

Methods: Internet searches using Google were performed for two SVTs: Word Memory Test (WMT) and the Computerized Assessment of Response Bias (CARB.) The name of each test was entered into the search engine and the first 25 links were examined. The websites were classified into four levels of test security threat: No Threat, Low Threat, Moderate Threat, or High Threat using criteria consistent with previous research.

Results: For the WMT, 24% of the sites were determined to be No Threat, 36% were Low Threat, 28% were Moderate Threat, and 12% were High Threat. For the CARB, 24% of the sites were determined to be No Threat, 20% were Low Threat, 48% were Moderate Threat, and 12% were High Threat.
Conclusions: Compared to previous research, these data indicate an alarming increase in the number of Internet sites that contain content that threatens the test security of the SVTs investigated. For the WMT, increases were found at every level of threat severity. For the CARB, a troubling percentage of sites that threatened test security where also found. There were interesting differences between the two measures in terms of the severity of threat. Specifically, 40% of the results were of moderate or high threat for the WMT, while 60% were of moderate or high threat for the CARB.

Mentor: Stuart Hall, Ph.D., Neuropsychology Program

Mathematical Modeling: A Neuroscience Case Study

Patrick Funk (#181)

As has been shown in recent research with by the Kavanaugh lab (Leary 2011), glutamate transporters play an important role in glutamate diffusion and signaling in the brain. The details of how the transportation process operates across spatial and temporal scales are still unknown, however. My research is in the application of computer models to help illuminate this phenomenon. By coupling dynamic models and using non-linear regression tools, I am gaining insight into the rate parameters of a multi-step, multi-molecule binding and transportation process. By combining a theoretical model from previous studies with the ability to use modern parameter fitting tools, the earlier models can be verified or improved. Additionally, this modeling process allows for the integration of multiple data sets to inform one model, which has previously been extremely challenging for these types of reactions. The presentation of this research will consist of two components: the interpretation of model results and the study of the modeling process in general. While clearly the model results are extremely important, the process of modeling real data as an undergraduate has been a good application of classroom techniques. As a mathematics major, this component is equally important to furthering my education and research skills.

Mentor: Michael Kavanaugh, Biomedical and pharmeceutical sciences