SURCA

SHOWCASE FOR UNDERGRADUATE RESEARCH AND CREATIVE ACTIVITIES

April 2, 2018

SURCA.WSU.EDU

Office of
Undergraduate
Education
WASHINGTON STATE UNIVERSITY

SURCA 2018

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Schedule of Events

Monday, April 2, 2018

Posters: M.G. Carey Senior Ballroom, Compton Union Building (CUB)

Awards: CUB Auditorium (Room 177)

Noon – 2:00 pm	Student presenters hang their own posters
2:00 – 2:45 pm	Judging without student researchers present
2:45 – 3:45 pm	Judging with student researchers present
3:30 – 5:00 pm	Public viewing
5:00 – 5:45 pm	SURCA awards Ceremony (all welcome)
5:45 pm	Presenters remove posters and pick up judges' feedback sheets

SURCA 2018

Committee

Talea Anderson	WSU Libraries
Lydia Gerber	College of Arts and Sciences
Samantha Gizerian	College of Veterinary Medicine
Kaitlin Hennessy	Global Connections
Jeremy Lessman	College of Arts and Sciences
Beverly Makhani	WSU Undergraduate Education
Anne Peasley	WSU Undergraduate Education
Dee Posey	College of Arts and Sciences
Shelley Pressley	WSU Undergraduate Education
Daniel Rieck	WSU Undergraduate Education
Mary Sanchez Lanier	WSU Undergraduate Education
Andrei Smertenko	College of Agricultural, Human, and Natural Resource Sciences
LeeAnn Tibbals	Health Professions Student Center
Cindy Williams	WSU Undergraduate Education

SURCA 2018

Judges

SURCA thanks the more than 200 judges who donated their time and expertise to evaluate and give valuable feedback to student presenters. The diverse pool includes representatives from:

AECOM

Early Intervention Program, Latah County, ID

Geneshifters, LLC

Nez Perce Tribe

Schweitzer Engineering Laboratories, Inc.

TerraGraphics Environmental Engineering, Inc.

University of Idaho/Movement Studies

USDA Agricultural Research Service

USDA Forest Service/Rocky Mountain Research Station

WSU Faculty and Staff Members (current and retired)

WSU Postdocs

SURCA 2018

Judges Rubric

	ELEMENT	CRITERIA (**check ✓ an appropriate box in *<u>each row</u>***)	Excellent (4 points)	Very Good (3 pts.)	Good (2 pts.)	Partial (1 pts.)	Absent (0 pts.)	Total Points
Poster	**Presentation / Display** Visual presentation of project	Visually compelling and well organized display						
		Attention to detail (i.e., labels, spelling, font type/size)						
Project	**Novel Contribution / Innovative Thinking** Novel or unique idea, question, creative work or approach	Project contributes to or advances the field						
Presenter	**Project motivation and goals** Background and project objective or statement	Provides background motivation that inspired project						
		Identifies significance of project in context with other works						
		Clearly states thesis, hypothesis, idea or goal of project						
	Process / Method Discipline-specific approach to addressing the idea or project	Examines process/approach used in context of other work						
		Explains why the specific process/approach was chosen						
		Describes process or approach used to accomplish project						
	Product / Results A synthesis of what has been done or created to date	Effectively presents product or results completed *to date*						
		Illustrates significance and analyzes implications of product or results to date						
		Next steps, improvements, lessons learned, or future work						
	Oral Communication Oral presentation of the content of the project	Engages audience actively and effectively with confidence						
		Communicates skillfully about the full project						
		Answers inquiries knowledgeably						
		Exhibits a professional demeanor in appearance and communication						
	For total points: Calculate points in each row and column. Write grand total in the bottom-right box. (Maximum of 64 pts. possible.)	**Total Points**						

SURCA 2018

Sponsors

The SURCA Committee thanks these generous organizations, companies, and individuals for their thoughtful support of undergraduate researchers and this event. The awards for top presentations today are courtesy of:

Alturas Analytics, Inc.

BOEING

Robert H. (’77 Engineering and Honors) and Mary L. Rieck

WASHINGTON STATE OPPORTUNITY SCHOLARSHIP

Office of the Provost and Executive Vice President

SURCA 2018

Winners Announcement in *WSU News*

April 5, 2018

MEDIA: Shelley Pressley, director of the Office of Undergraduate Research, part of WSU Undergraduate Education, 509-335-1252, spressley@wsu.edu

Beverly Makhani, director of communications, WSU Undergraduate Education, 509-335-6679, makhani@wsu.edu

WSU undergraduates land 44 awards at SURCA 2018 research poster event April 2

PULLMAN, Wash.—Of the 256 Washington State University students accepted to present 213 posters at the seventh annual Showcase for Undergraduate Research and Creative Activities (SURCA) event April 2, 54 took home 44 awards for their top presentations across eight categories.

At this WSU-wide venue for students from all majors, there were 20 winners of 17 $300 crimson awards, the highest possible; 27 winners of 20 $200 gray awards, the second-highest; 6 winners of 6 $100 novice awards, for students with up to two semesters of research work and who show exceptional promise; and, 1 recipient of 1 $100 early career award, given to freshmen and sophomores only.

“The mentored research, scholarship, and creative activity presented by the students this year was, notably, of the highest caliber—perhaps the best we’ve ever seen at a SURCA event,” said **Mary Sanchez Lanier**, assistant vice provost. “We congratulate every award winner. Every presenter did a great job of creating a descriptive poster and explaining to judges and guests the details of their research.”

“Each presentation evidences the ‘new knowledge’ brought to one’s field and also reflects the personal and professional growth of every student participant,” said **Mary F. Wack**, vice provost for undergraduate education. “SURCA showcases the considerable contributions that our students make to WSU’s ‘Drive to 25’ effort to be among the top research institutions, and to provide a transformative educational experience to hundreds of students.”

Social Sciences has most awards plus winners

The Social Sciences category tied Engineering and Physical Sciences for capturing the most awards, with 9 each; but Social Sciences ultimately led the pack by having 13 winning students, one more than Engineering and Physical Sciences’ 12.

The Molecular, Cellular, and Chemical Biology category had 8 awards and 8 winners. Organismal, Population, Ecological, and Evolutionary Biology had 7 awards and 7 winners. Applied Sciences as well

as the Humanities categories both had 4 awards and 4 winners. Arts and Design had 2 awards and 5 winners. And, Computer Science, Mathematics, Statistics, and Information Sciences had 1 award and 1 winner.

The number of awards possible in each category is determined by the number of presenters in that category each year.

All presenters were evaluated by at least three judges, made up of faculty, staff, post-docs, and guest experts. More than 175 volunteers reviewed posters and listened to presentations, and assigned scores according to a rubric.

Sponsors of SURCA 2018 awards

Thanks to support from generous donors, nearly $10,000 was awarded to SURCA winners. Donors in 2018 include: Alturas Analytics; The Boeing Co.; alumnus Robert H. ('77 Engineering and Honors) and Mary L. Rieck, Cougar parents from Richland; The Washington State Opportunity Scholarship (WSOS) program; and, the WSU Office of the Provost and Executive Vice President.

"We are truly grateful for their continuing investment in our students," said **Shelley Pressley**, director of the Office of Undergraduate Research, part of WSU Undergraduate Education. "All have sponsored SURCA awards in one or more previous years."

At least two other programs at WSU will soon present their own awards to SURCA winners and/or presenters: The Louis Stokes Alliance for Minority Participation (LSAMP) and the WSU Emeritus Society.

SURCA 2018 winners

By SURCA category, in alpha order, the 2018 awardees, mentors, and research topics are:

Applied Sciences

Crimson Award (1): **Jessica Hartman**, mentor Arron Carter, on "Remote Sensing to Predict Wheat Agronomic Characteristics"

Gray Awards (2): **Rachel Wittenberg**, mentor Kathy Beerman, "The Effect of Food Preparation Methods on the Release of Iron from the Lucky Iron Fish® and Subsequent Iron Enrichment of Foods"; **Ashley Wright**, mentor Hang Liu, "The Influence of Enzymes on the Dissolution of Recycled Waste Cotton"

Novice Award (1): **Lucy Eggleston**, mentor Dave Crowder, "Interaction of Bumble Bee Communities on Small Farms"

Arts and Design

Crimson Award (1): **Shelby Ruiz**, mentor Judy Theodorson, "Giardini Scolpiti"

Gray Award (1): WSU Vancouver co-presenters **Katie Bowen, Mariah Gwin, Vanessa Rhodes, and Veronica Whitney**, mentors Dene Grigar and Nicholas Schiller, "Rebooting Electronic Literature: The Challenges of Creating an Open-Source Multimedia Tool for Data Collection and Dissemination"

Computer Science, Mathematics, Statistics, and Information Systems
Crimson Award (1): WSU Vancouver's **Robby Boney**, mentor Allison Coffin, "Is Hair Cell Regeneration Linked to Evolutionarily Changes within Protein Sequences?"

Engineering and Physical Sciences

Crimson Awards (3): **Michael Anderson**, mentor Brian Collins, "Effect of Electron Donor Position in Bilayer OSCs"; **Seth McPherson**, mentor Kelvin Lynn, "Production Strategies for Tailored Source Material Used in High Efficiency Solar Cells"; **Deshka Neill**, mentor Ming Xian, "Chemiluminescent 1,2-Dioxetane Probes for the Detection of Hydrogen Polysulfides"

Gray Awards (4): **Stephen Bone**, mentor Alla Kostyukova, "Engineering Glucose Oxidase for Efficient Ni-NTA Purification"; **Kenny Haak**, mentor Jeffrey McMahon, "Ground State Structures of Water-Ammonia Mixtures at High Pressures"; WSU Tri-Cities' **Catie Himes**, mentors Elsa Silva-Lopez, Allan Felsot, and Nelmi Devarie, "Development of an Analytical Method to Validate Pesticide Detection Limits in Saliva"; co-presenters **Mohammed Alzawad, Kaycee Faber, Raquel Murillo, and Sarah Schroeder**, mentor Nehal Abu-Lail, "Biofilm Growth of Multidrug-Resistant *Escherichia coli* during Exposure to Natural Antibiotics"

Novice Awards (2): **Alexa Antalan**, mentors Jinwen Zhang, Junna Xin, and Ran Li, "Preliminary Investigation of Waste Cooking Oil-Based Bio-asphalt and Reinforcement with Lignin-Based Epoxy"; and **Yoni Rodriguez**, mentor Von Walden, "Development of an Air Quality Sensor for Use in Teaching Introductory Environmental Engineering"

Humanities

Crimson Awards (2): **Blessing Adaramola**, mentor Olusola Adesope, "What are the Impacts of Corporate Social Responsibility (CSR) on Financial Performance of a Corporation Based on Its Size"; **Jazmine Ike-Lopez**, mentor Trevor Bond, "Digital Archiving of Tribal Histories at Washington State University"

Gray Awards (2): **Krista Brutman**, mentor Lydia Gerber, "Left-Over Women: Collectivist Feminism in Modern China"; **Garrett Snedeker**, mentor Jeffrey Savage, "Chiquinha Gonzaga (1847-1935): Brazilian Composer, Musician, and Catalyst for Social Change"

Molecular, Cellular, and Chemical Biology

Crimson Awards (3): **Grace Carrell**, mentor Alan Goodman, "*Drosophila melanogaster* are Used to Identify Novel Components of the Innate Immune Response to West Nile Virus"; **Thinh Kieu**, mentor Bertrand Tanner, "Omecamtiv Mecarbil: A Potential Therapeutic Agent for Heart Failure"; **Lindsey Morey**, mentor Michael Varnum, "Disruption of Cone Photoreceptor Cyclic Nucleotide-Gated Channels in Zebrafish Using CRISPR/Cas9 Genome Editing"

Gray Awards (4): **Pierce Claassen**, mentors Amanda Brinkworth and Rey Carabeo, "Monitoring Gene-Expression Dynamics of tarP During Chlamydial Development using Fast Fluorescent Timer"; **Bailey Frankovich**, mentor Joseph Harding, "The Use of a Subcutaneous Injection of NDX-1001 to Reverse Scopolamine-Induced Amnesia in Rats"; **Zachary Howard**, mentor Anders Omsland, " Progesterone Inhibits Replication of *Coxiella burnetii* in Nutrient Broth and During Infection of Cultured Cells";

Ryder Matanane, mentors Dmitri Tolkatchev and Alla Kostyukova, "Comparing Efficiency of Two Methods of Site-Directed Mutagenesis"

Novice Award (1): **Jillian Nordness**, mentor Meijun Zhu, "Thermal Inactivation and Survival of *Listeria monocytogenes* in Milk Powder and Surrogate Suitability of *Listeria innocua* and *Lactobacillus plantarum*"

Organismal, Population, Ecological, and Evolutionary Biology

Crimson Awards (3): **Madison Armstrong**, mentor Mark Dybdahl, "The Evolution of Plastic Expression as an Explanation of Invasion Success"; **Joseph Hall**, mentor David Lin, "Comparison of Bipedal Hopping Strategies of Kangaroo Rats on Solid Versus Granular Terrain"; **Collin Warrick**, mentor Ryan McLaughlin, "Effects of Prenatal Cannabis Vapor Exposure on Cognitive Flexibility"

Gray Awards (3): **Gerardo Herrera Birrueta**, mentor Wipawee Winuthayanon, "Estrogen Action in the Epithelial Cell of the Mouse Vagina Regulates Neutrophil Infiltration and Vaginal Tissue Integrity"; **Cassidy Peru**, mentor Chandra Jack, "The Modification of a Ministat to Measure Ammonia Production in Response to Altered Carbon Concentrations in Azotobacter Populations"; **Claire Popke**, mentor Raymond Evans, "What's in the Soil-Invasive Earthworms and Their Effect on Soil Organic Matter Beneath Indigenous and Non-Native Grasses"

Novice Award (1): **Kayla Beechinor**, mentor Michael Pumphrey, "Development of Fine Mapping Populations for Cloning Yield Contributing Genes in Wheat (*Triticum aestivum L.*)"

Social Sciences

Crimson Awards (3): **Emily Fogarty**, mentor J. Shannon Neibergs, "The Economic Effectiveness of Livestock Risk Protection"; **Lysandra Perez**, mentor Monica Johnson, "Latino/a College Student's Transition Experiences: Collectivism to an Individualistic Culture"; co-presenters **Jules Mugisha, Carla Salle, Brittany Srp, and Jamie Adams**, mentor Matthew Bumpus and Eleanor Dizon, "Parent-Student Conversations in Response to a Student Conduct Violation"

Gray Awards (4): **Justin Frow**, mentor Robert Fellows, "The Effects of Adverse Childhood Experiences on University Students"; **Nam Nguyen**, mentor Chad Gotch, "Development of a Survey to Investigate Study Abroad Destination Choice"; **Christina Strauch**, mentor Walter Scott, "Development of a New Self-Schema Measure: Examining Construct Validity and Reliability"; co-presenters **Nhu Huynh and Sewit Kidane**, mentor Maureen Schmitter-Edgecombe, "Night Out Task"

Novice Award (1): **Veronica Garcia**, mentor Anne Cox, "Examining Mindfulness and Body Image in the Context of Yoga"

Early Career Award (1): **William Millick**, mentor Lydia Gerber, "Considering Women in the Great Leap Forward"

For more information on SURCA 2018, visit https://SURCA.wsu.edu.

Showcase for Undergraduate Research and Creative Activities 2018

Entries Alphabetically by Presenter

Poster No.	Presenter	Category	Title of Abstract
152	**Jamie Adams** Mentor: Matthew Bumpus, Eleanor Dizon	Social Sciences	**Parent-Student Conversations in Response to a Student Conduct Violation**
157	**Blessing Adaramola** Mentor: Olusola Adesope	Humanities	**What are the Impacts of Corporate Social Responsibility (CSR) on Financial Performance of a Corporation Based on Its Size**
246	**Norah Alaqeel** Mentor: Raihan M Sharif	Social Sciences	**Perception**
29	**Yahya Aldoshan** Mentor: Su Ha	Engineering and Physical Sciences	**Adding Water to the Feed of Formic Acid Decomposition over MoC Catalyst on Graphite**
153	**Sean Alexander** Mentor: Mark Swanson	Organismal, Population, Ecological, and Evolutionary Biology	**Multiscale Analysis of Forest Neighborhood Characteristics of Different Size Classes of Pacific Yew Trees in an Old-growth Pseudotsuga-Tsuga Forest, Southern Washington Cascades**
26	**Amy Allen** Mentor: Amber Adams-Progar	Applied Sciences	**Effect of Human-Calf Interactions on Heifer and Cow Handling Ease**
114	**Mohammed Alzawad** Mentor: Nehal Abu-Lail	Engineering and Physical Sciences	**Biofilm Growth of Multidrug-Resistant *Escherichia coli* during Exposure to Natural Antibiotics**
168	**Michael Anderson** Mentor: Brian Collins	Engineering and Physical Sciences	**Effect of Electron Donor Position in Bilayer OSCs**

Poster No.	Presenter	Category	Title of Abstract
218	**Jenna Anderst** Mentor: Mark VanDam	Social Sciences	**Linguistic Type-frequency in Young Children With and Without Hearing Loss**
201	**Alexa Antalan** Mentor: Jinwen Zhang, Junna Xin, Ran Li	Engineering and Physical Sciences	**Preliminary Investigation of Waste Cooking Oil-based Bio-asphalt and Reinforcement with Lignin-based Epoxy**
230	**Amanda Antoch** Mentor: Maren Friesen, Emily McLachlan	Molecular, Cellular, and Chemical Biology	**Examination of the nodC Gene Region to Study the Evolution of Host Association between *Trifolium* and *Rhizobium leguminosarum***
183	**Madison Armstrong** Mentor: Mark Dybdahl	Organismal, Population, Ecological, and Evolutionary Biology	**The Evolution of Plastic Expression as an Explanation of Invasion Success**
247	**Spencer Barclay** Mentor: Kshitij Jerath	Engineering and Physical Sciences	**VR Controllers Integrated in Complex Emergent Dynamic Systems**
236	**Maria Barrera** Mentor: Masha Gartstein	Social Sciences	**Studying Infant Temperament: Effect of Maternal Pregnancy-related Anxiety**
107	**Katelyn Bartleson** Mentor: Ray Lee	Organismal, Population, Ecological, and Evolutionary Biology	**Using analysis of Whisker Stable Isotopes to Investigate Predation by California Sea Lions (*Zalophus californianus*) on Endangered Chinook Salmon (*Oncorhynchus tshawystcha*) at Bonneville Dam Fish Ladders**
102	**Madisyn Beaudoin** Mentor: Arron Carter, Amit Dhingra	Applied Sciences	**Portland to Philippines: Innovation of Soft White Wheat for Export Markets**
154	**Kayla Beechinor** Mentor: Michael Pumphrey	Organismal, Population, Ecological, and Evolutionary Biology	**Development of Fine Mapping Populations for Cloning Yield Contributing Genes in Wheat (*Triticum aestivum L.*)**

Poster No.	Presenter	Category	Title of Abstract
66	**Casey Beksinski** Mentor: Amber Adams-Progar	Organismal, Population, Ecological, and Evolutionary Biology	**Effects of Feeding Celmanax on Cow Colostrum Quality and Calf Growth**
64	**Alexandra Bennett** Mentor: Robert Krikac, Chioma Heim, Audrey Van Nuland	Arts and Design	**Cross Disciplinary Spatial Intervention - Psychology Advising Suite Redesign**
81	**Yemeserach Bishaw** Mentor: Bertrand Tanner	Molecular, Cellular, and Chemical Biology	**Muscle Tissue Structure and Remodeling in a Mouse Model of Limb Girdle Muscular Dystrophy 2i**
77	**Nimay Bolar** Mentor: Arda Gozen, Abhishek Gannarapu	Applied Sciences	**Intelli-Bra**
233	**Jordan Bolen** Mentor: Amanda Brinkworth, Rey Carabeo	Molecular, Cellular, and Chemical Biology	**Examining Changes in Real-time Euo Transcriptional Activity in *Chlamydia* using Fast Fluorescent Timer**
229	**Stephen Bone** Mentor: Alla Kostyukova	Engineering and Physical Sciences	**Engineering Glucose Oxidase for Efficient Ni-NTA Purification**
28	**Robby Boney** Mentor: Allison Coffin	Computer Science, Mathematics, Statistics, and Information Sciences	**Is Hair Cell Regeneration Linked To Evolutionarily Changes Within Protein Sequences?**
69	**Sarah Borgnes** Mentor: Alan Goodman	Molecular, Cellular, and Chemical Biology	***Coxiella burnetii* Pathogenesis in *Drosophila melanogaster***
244	**Katie Bowen** Mentor: Dene Grigar, Nicholas Schiller	Arts and Design	**Rebooting Electronic Literature: The Challenges of Creating an Open-source Multimedia Tool for Data Collection and Dissemination**

Poster No.	Presenter	Category	Title of Abstract
220	**Mark Brauer** Mentor: Howard Davis, Marie Mayes, Mark Clemens, Jr.	Engineering and Physical Sciences	**Radiation Effects on Electronics**
97	**Michael Brown** Mentor: Steven Saunders	Engineering and Physical Sciences	**Synthesis and Characterization of a Bio-mimicking Heterogeneous Palladium Nanoparticle Catalyst**
182	**Zachery Browne** Mentor: Cliff Berkman	Molecular, Cellular, and Chemical Biology	**Assessing Hydrogen Sulfide's Inhibition Profile on Prostate Specific Membrane-antigen (PSMA)**
65	**Julianna Brutman** Mentor: Jon Davis	Molecular, Cellular, and Chemical Biology	**Mapping Diet-induced Alternative Polyadenylation of Hypothalamic Transcripts in the Obese Rat**
80	**Krista Brutman** Mentor: Lydia Gerber	Humanities	**Left-Over Women: Collectivist Feminism in Modern China**
25	**Kelsey Byus** Mentor: Matthew Unangst	Social Sciences	**The Effects of Religious, Ethnic, and Political Unrest on Human Trafficking in Nigeria**
55	**Hannah Cameron** Mentor: Amber Adams-Progar	Applied Sciences	**Behavioral Interactions Between Dairy Cows and Wild Birds**
197	**Brenden Campbell** Mentor: Kara Whitman	Social Sciences	**Strategies and Effectiveness of Education and Outreach on PCB Awareness and Action in the Spokane River Basin**
185	**Andrew Cannon** Mentor: Jeffrey McMahon	Engineering and Physical Sciences	**Inside Ice Giants from First Principles**
87	**Nicole Carlson** Mentor: Erika Serrano, Asaph Cousins	Molecular, Cellular, and Chemical Biology	**PEPc Knockdown *Setaria viridis* Plants are Hungrier for CO2 than Wildtype**
217	**Grace Carrell** Mentor: Alan Goodman	Molecular, Cellular, and Chemical Biology	***Drosophila melanogaster* are Used to Identify Novel Components of the Innate Immune Response to West Nile virus**
8	**Elle Carroll** Mentor: Yujung Nam	Social Sciences	**Mending with Music**

Poster No.	Presenter	Category	Title of Abstract
17	**Monika Cewe** Mentor: Bernard Van Wie, Baran Arslan	Engineering and Physical Sciences	**Estimating the Growth Kinetics of Cytotoxic T lymphocytes used in Adoptive Immunotherapy of Cancer**
195	**Jenna Chapman** Mentor: Meghan Camp, Lisa Shipley	Organismal, Population, Ecological, and Evolutionary Biology	**Home Range Size Analysis of American Pikas at Craters of the Moon National Monument And Preserve**
117	**Marissa Chukwu** Mentor: KwanHee Kim	Molecular, Cellular, and Chemical Biology	**Retinoic Acid Receptor Alpha (RARA) in Male Germ Cells has Varied Roles during Spermatogenesis.**
227	**Grace Chung** Mentor: Carlos Suarez	Molecular, Cellular, and Chemical Biology	**Evaluating the Efficacy of Cell-mediated Immunity in the Control and Protection against Foot and Mouth Disease**
74	**Pierce Claassen** Mentor: Amanda Brinkworth, Rey Carabeo	Molecular, Cellular, and Chemical Biology	**Monitoring Gene-expression Dynamics of tarP During Chlamydial Development Using Fast Fluorescent Timer**
155	**McKynzie Clark** Mentor: Kara Whitman	Applied Sciences	**Assessment of Alternatives for Per- and Polyfluroalkyl Substances Found in Aqueous Film Forming Foam**
220	**Ebony Collins** Mentor: Howard Davis, Marie Mayes, Mark Clemens, Jr.	Engineering and Physical Sciences	**Radiation Effects on Electronics**
24	**Corey Connors** Mentor: Caren Goldberg	Organismal, Population, Ecological, and Evolutionary Biology	**Basking Behavior at Ponds of Post-Breeding Columbia Spotted Frogs (*Rana luteiventris*) in Relation to Environmental Conditions and Predator Presence (*Thamnophis sirtalis*)**
101	**Tommy Conway** Mentor: Clif Stratton	Social Sciences	**Colonial Past Sheds Light on Modern Strife in South Sudan**
108	**Macy Cornmesser** Mentor: Holly Neibergs	Organismal, Population, Ecological, and Evolutionary Biology	**Identification and Validation of Loci Associated with Bovine Respiratory Disease Susceptibility in Holstein Calves**

Poster No.	Presenter	Category	Title of Abstract
118	**Astrid Cortes** Mentor: Kathleen Fry	Humanities	**The 18th Century Pacific Northwest Fur Trade: Global Competition and Involvement of Indigenous Populations**
61	**Jordan Cresanti** Mentor: Clif Stratton	Humanities	**Farming Revamped by GMO's**
216	**Zachary Croft** Mentor: Brian Collins	Engineering and Physical Sciences	**Voltage Controlled Color-tuning of Printable Organic LED Pixels**
146	**Abigail Culver** Mentor: Kathleen Fry	Humanities	**Treatment of African Americans in the American West and Afro-Brazilians in Brazil Post-Slavery**
16	**Dustan Cwick** Mentor: Richard Zack	Computer Science, Mathematics, Statistics, and Information Sciences	**A Statistical Analysis of the Periodical Cicada (*Magicicada septendecim*) to demonstrate Mean, Median, and Bilateral symmetry within a Population**
13	**Rachel Davis** Mentor: Joann Dotson, Janessa Graves	Applied Sciences	**Cannabis as an Alternative Anticonvulsant Therapy for Pregnant Women with Seizure Disorders**
161	**Haley Delgado** Mentor: Amy Nusbaum, Paul Whitney, John Hinson	Social Sciences	**The Effects of ACES on Cognitive Control**
205	**Misganaw Demissie** Mentor: Lei Li	Engineering and Physical Sciences	**Prism_Array Integrated Smartphone Micro-plate Reader for Point-of-care Colorimetric Assays**
151	**Precelia Derricks** Mentor: Ken Faunce	Humanities	**Vietnam and the American Home Front**
60	**Grace Dickerson** Mentor: Shannon Neibergs	Applied Sciences	**Economics of Clinical and Sub-clinical Bovine Respiratory Disease in Feedlot Cattle**
126	**Samantha Dohrman** Mentor: Heather Watts, Ashley Robart	Organismal, Population, Ecological, and Evolutionary Biology	**The Effects of Food Restriction on Behavioral Indicators of Facultative Migration in Pine Siskins**

Poster No.	Presenter	Category	Title of Abstract
1	**Kacie Dominici** Mentor: Steven Fountain	Social Sciences	**Historical Curricula Reform: A Comparative Analysis of Montana, Oregon, and Washington State Initiatives**
55	**Isabella Duarte** Mentor: Amber Adams-Progar	Applied Sciences	**Behavioral Interactions Between Dairy Cows and Wild Birds**
64	**Priscilla Duong** Mentor: Robert Krikac, Chioma Heim, Audrey Van Nuland	Arts and Design	**Cross Disciplinary Spatial Intervention - Psychology Advising Suite Redesign**
150	**Victoria Dziekan** Mentor: Shelley Pressley	Engineering and Physical Sciences	**CO2 Flux Bias Correction Assessment in Eddy Covariance Towers Over Long Term Agricultural Sites**
84	**Lucy Eggleston** Mentor: Dave Crowder	Applied Sciences	**Interaction of Bumble Bee Communities on Small Farms**
208	**Mikayla Engstrom** Mentor: Steven Roberts	Molecular, Cellular, and Chemical Biology	**Determining the Effect Oncogene-induced Replication Stress has on APOBEC-mediated Mutagenesis**
114	**Kaycee Faber** Mentor: Nehal Abu-Lail	Engineering and Physical Sciences	**Biofilm Growth of Multidrug-Resistant *Escherichia coli* during Exposure to Natural Antibiotics**
194	**Sarah Fahr** Mentor: Michael Konkel	Molecular, Cellular, and Chemical Biology	***Campylobacter jejuni*: The Food-Borne Pathogen that Causes Severe Gastritis by Manipulating Human Intestinal Cells**
67	**Jordan Fernandez** Mentor: Zachariah Heiden	Engineering and Physical Sciences	**Synthesis and Reactivity of Molecular Fluorescent Pincer Complexes**
36	**Wyatt Fick** Mentor: Guodong Ding	Engineering and Physical Sciences	**Catalytic Conversion of Biomass to Methanol**
215	**Emily Fogarty** Mentor: J. Shannon Neibergs	Social Sciences	**The Economic Effectiveness of Livestock Risk Protection**
135	**Kaylee Fontes** Mentor: Julie Kmec	Social Sciences	**How Facebook Users Evaluate the Information They See**

Poster No.	Presenter	Category	Title of Abstract
143	**Paige Ford** Mentor: Nehal Abu-Lail	Molecular, Cellular, and Chemical Biology	**The Effects of Glucose Starvation on *Pseudomonas putida* Biofilm Growth on Silicon**
90	**Malia Frame** Mentor: Ian Burke, Rachel Zuger	Applied Sciences	**Mayweed Chamomile Growing Degree Day Model**
164	**Bailey Frankovich** Mentor: Joseph Harding	Molecular, Cellular, and Chemical Biology	**The Use of a Subcutaneous Injection of NDX-1001 to Reverse Scopolamine-induced Amnesia in Rats**
62	**Justin Frow** Mentor: Robert Fellows	Social Sciences	**The Effects of Adverse Childhood Experiences on University Students**
58	**Corydon Funk** Mentor: Naidu Rayapati	Organismal, Population, Ecological, and Evolutionary Biology	**Effect of Tobacco Ringspot Virus (TRSV) on Vine Growth and Wine Quality**
93	**Sierra Gallaway** Mentor: James Pru	Molecular, Cellular, and Chemical Biology	**PGRMC1 Enhances the Growth and Development of Triple-negative Breast Cancer**
184	**Veronica Garcia** Mentor: Anne Cox	Social Sciences	**Examining Mindfulness and Body Image in the Context of Yoga**
14	**Mary Anne Gebhart** Mentor: Chan Mi Hwang	Social Sciences	**Examining Functional, Expressive, and Aesthetic Consumer Needs for Maternity Hospital Gowns**
232	**Samantha Ginter** Mentor: Clifford Berkman	Engineering and Physical Sciences	**Substituent Effects on Diacyl Phosphate Scaffold as Beta-lactamase Inactivators**
19	**Cody Goodan** Mentor: Ken Faunce	Humanities	**Dogmatism: The Result of Inequality**
41	**Maddison Gostin** Mentor: Brendan Walker	Organismal, Population, Ecological, and Evolutionary Biology	**Negative Affective-like Cues and Escalated Alcohol Consumption in Mice**

Poster No.	Presenter	Category	Title of Abstract
83	**Samantha Gottlieb** Mentor: Cristina Wilson	Social Sciences	**A Cost-benefit Approach to Motivated Top-down Control**
147	**Kristian Gubsch** Mentor: Von Walden, Candis Claiborn	Engineering and Physical Sciences	**Building Smart Cities Technology to Monitor Spokane's Air Quality**
123	**Cory Gunson** Mentor: Peter Pfromm	Engineering and Physical Sciences	**An Iron Membrane Reactor to Synthesize Ammonia as an Energy Vector for Renewable Electricity**
189	**Zara Guzman** Mentor: Jan Boll, Christian Guzman	Engineering and Physical Sciences	**Investigating Palouse Region Streamwater Patterns with Sediment and Isotope Analysis**
244	**Mariah Gwin** Mentor: Dene Grigar, Nicholas Schiller	Arts and Design	**Rebooting Electronic Literature: The Challenges of Creating an Open-source Multimedia Tool for Data Collection and Dissemination**
174	**Kenny Haak** Mentor: Jeffrey McMahon	Engineering and Physical Sciences	**Ground State Structures of Water-Ammonia Mixtures at High Pressures**
32	**Joseph Hall** Mentor: David Lin	Organismal, Population, Ecological, and Evolutionary Biology	**Comparison of Bipedal Hopping Strategies of Kangaroo Rats on Solid versus Granular Terrain**
122	**Jessica Hartman** Mentor: Arron Carter	Applied Sciences	**Remote Sensing to Predict Wheat Agronomic Characteristics**
33	**Seth Hartman** Mentor: Anna Deighton, Mary Stohr	Social Sciences	**How the Legalization of Marijuana Has Impacted Law Enforcement**
160	**Gillian Hawkins** Mentor: Pete Jacoby	Applied Sciences	**Cabernet Sauvignon Berry Quality from Vines Irrigated through Direct Root Zone Irrigation**
72	**Brendan Hay** Mentor: Peter Pfromm	Engineering and Physical Sciences	**Facile Tailoring of Polymeric Gas Separation Membranes by Ion Exchange**

Poster No.	Presenter	Category	Title of Abstract
186	**Kaneesha Hemmerling** Mentor: Michelle Mousel	Molecular, Cellular, and Chemical Biology	**Association of TNXB with Milk Production in Dairy Sheep Breeds**
228	**Dalia Hernandez Farias** Mentor: Brenda Barrio, Ashley Boyd	Social Sciences	**Native American Curriculum: Examining Teacher Perception and Implementation in Washington State**
79	**Gerardo Herrera Birrueta** Mentor: Wipawee Winuthayanon	Organismal, Population, Ecological, and Evolutionary Biology	**Estrogen Action in the Epithelial Cell of the Mouse Vagina Regulates Neutrophil Infiltration and Vaginal Tissue Integrity**
162	**Sophia Hilsen** Mentor: Matthew Bumpus, Eleanor Dizon	Social Sciences	**Anticipating the Transition to University: Parents' Concerns and Values**
53	**Catie Himes** Mentor: Elsa Silva-Lopez, Allan Felsot, Nelmi Devarie	Engineering and Physical Sciences	**Development of an Analytical Method to Validate Pesticide Detection Limits in Saliva**
130	**Cody Holland** Mentor: Kevin Murphy	Applied Sciences	**Small Grain Breeding: Emphasis on Field Evaluations of Diverse Millet Species**
173	**Heidi Holubetz** Mentor: Stephanie Smith	Applied Sciences	**Development of New Canning Models for Home Food Preservation**
162	**Aaliyah Hong** Mentor: Matthew Bumpus, Eleanor Dizon	Social Sciences	**Anticipating the Transition to University: Parents' Concerns and Values**
99	**Zachary Howard** Mentor: Anders Omsland	Molecular, Cellular, and Chemical Biology	**Progesterone Inhibits Replication of *Coxiella burnetii* in Nutrient Broth and During Infection of Cultured Cells**
214	**Maya Howell** Mentor: Jessica Klein	Molecular, Cellular, and Chemical Biology	**Dissecting the Molecular Biology of the Understudied Bacterial Pathogen *Providencia alcalifaciens***

Poster No.	Presenter	Category	Title of Abstract
44	**Keena Hudson** Mentor: Chanmi Hwang	Arts and Design	**Size Inclusivity: A Content Analysis of Plus-Size Apparel Consumer Needs**
95	**Madeleine Hunter** Mentor: Ken Faunce	Social Sciences	**Arbitrary Detention in the United States**
136	**Nhu Huynh** Mentor: Maureen Schmitter-Edgecombe	Social Sciences	**Night Out Task**
54	**Jazmine Ike-Lopez** Mentor: Trevor Bond	Humanities	**Digital Archiving of Tribal histories at Washington State University**
38	**Alexis Jackson** Mentor: David Leonard	Social Sciences	**Incomprehensible Black Survivors; Rape, Rape Culture, and the Struggle for Visibility**
96	**Tymon James** Mentor: Cameron Peace	Applied Sciences	**Palouse Wild Cider Apple Breeding Program: Hands-on Learning at its Best**
2	**Hunter Jarrett** Mentor: Hua Tan	Engineering and Physical Sciences	**Development of High-Speed Sintering 3D Printer**
162	**Chen Jiang** Mentor: Matthew Bumpus, Eleanor Dizon	Social Sciences	**Anticipating the Transition to University: Parents' Concerns and Values**
162	**Kendall Johnson** Mentor: Matthew Bumpus, Eleanor Dizon	Social Sciences	**Anticipating the Transition to University: Parents' Concerns and Values**
113	**Patrick Johnson** Mentor: Amanda Brinkworth, Ray Carabeo	Molecular, Cellular, and Chemical Biology	**Real-time tarP Gene Expression Observed in *Chlamydia trachomatis* with the Fast Fluorescent Timer**
33	**Rachel Jones** Mentor: Anna Deighton, Mary Stohr	Social Sciences	**How the Legalization of Marijuana Has Impacted Law Enforcement**

Poster No.	Presenter	Category	Title of Abstract
76	**Rachel Kagan** Mentor: Arda Gozen	Engineering and Physical Sciences	**Tissue Engineering of 3D-Printed Articular Cartilage**
253	**Kitana Kaiphanliam** Mentor: Bernard Van Wie, Negar Beheshti Pour	Engineering and Physical Sciences	**Analyzing the Effects of Desktop Learning Modules (DLMs) on Student Comprehension of Fluid Mechanics and Heat Transfer Concepts**
199	**Samantha Kallinen** Mentor: Joanna Kelley, Andrew Storfer, Alexandra Fraik	Organismal, Population, Ecological, and Evolutionary Biology	**Validation of Candidate Genes Under Selection by the Environment Through Gene Expression Analyses in Tasmanian Devil Populations**
225	**Natalie Kallish** Mentor: Jesse Spohnholz, Jeffrey Sanders, David Bolingbroke	Social Sciences	**National Security and Nuclear Containment in the Cold War**
64	**Yeaji Kan** Mentor: Robert Krikac, Chioma Heim, Audrey Van Nuland	Arts and Design	**Cross Disciplinary Spatial Intervention - Psychology Advising Suite Redesign**
226	**Samantha Kaonis** Mentor: Roland Chen	Engineering and Physical Sciences	**A Study on Degradation Behavior of 3D Printed Gellan Gum Scaffolds**
82	**Brian Karlberg** Mentor: Nehal Abu-Lail	Engineering and Physical Sciences	**Mapping of the Conformational and Mechanical Properties of Bacterial Surface Biopolymers Using Atomic Force Microscopy (AFM)**
75	**Maadhanki Kasimanickam** Mentor: Raymond Quock	Organismal, Population, Ecological, and Evolutionary Biology	**Efficacy of Oxygen and/or High Atmospheric Pressure to Alleviate Morphine Withdrawal Syndrome**

Poster No.	Presenter	Category	Title of Abstract
94	**Sarah Kehr** Mentor: Omar Cornejo	Organismal, Population, Ecological, and Evolutionary Biology	**Exploring the Role of Selection on the Innate Immunity in the Malaria Vector, *Anopheles gambiae***
138	**Nora Kelley** Mentor: Clif Stratton	Humanities	**The Effects of Social Darwinism and The Eugenics Movement on the Politics of Modern Medicine**
52	**Lia Kellogg** Mentor: Michael Kahn, Katie Adolphsen	Molecular, Cellular, and Chemical Biology	**IseA Helps Legume Nodulation**
136	**Sewit Kidane** Mentor: Maureen Schmitter-Edgecombe	Social Sciences	**Night Out Task**
171	**Thinh Kieu** Mentor: Bertrand Tanner	Molecular, Cellular, and Chemical Biology	**Omecamtiv Mecarbil: A Potential Therapeutic Agent for Heart Failure**
200	**Terlona Knife** Mentor: Pamela Bettis	Social Sciences	**Hypersexualized Asexual Black Bodies and the Journey to Self Identification**
69	**Michael Knight** Mentor: Alan Goodman	Molecular, Cellular, and Chemical Biology	***Coxiella burnetii* Pathogenesis in *Drosophila melanogaster***
198	**Joanne Kunze** Mentor: Jon Davis	Molecular, Cellular, and Chemical Biology	**Cannabis-Induced Feeding Behavior: A Mechanistic View**
231	**Navjeet Lehal** Mentor: Walter Scott	Social Sciences	**Self-Efficacy, Negative Life Events, and Trauma Symptoms in American Indian Youth**
134	**Leandro Lessin** Mentor: Daniel Thornton	Organismal, Population, Ecological, and Evolutionary Biology	**Impact of Anthropogenic Activity on the Activity Patterns of Sympatric Mammals in Washington State**
9	**Kyler Little** Mentor: Mark Kuyzk, Elizabeth Bernhard	Computer Science, Mathematics, Statistics, and Information Sciences	**3-D Depth Reconstruction from Multiple Equally-Spaced Images**

Poster No.	Presenter	Category	Title of Abstract
89	**Megan Loman** Mentor: Christopher Barry	Social Sciences	**Aggression in Twitter Use**
33	**Izzy Luengas** Mentor: Anna Deighton, Mary Stohr	Social Sciences	**How the Legalization of Marijuana Has Impacted Law Enforcement**
149	**Ellen MacNary** Mentor: Tony Mertz	Molecular, Cellular, and Chemical Biology	**The Role of Shu-complex Members in APOBEC-induced Mutations**
49	**Bryce Magee** Mentor: Chris Connolly	Organismal, Population, Ecological, and Evolutionary Biology	**Physical Activity Perceptions and Behavior of Pregnant Women with Past Miscarriage and Infertility Experiences**
135	**Jessica Mannard** Mentor: Julie Kmec	Social Sciences	**How Facebook Users Evaluate the Information They See**
222	**Marina Martin** Mentor: Alan Goodman	Molecular, Cellular, and Chemical Biology	**Drosophila STING Mediates a Host Defense during *Listeria* Infection**
50	**Veronica Martin** Mentor: Amber Adams-Progar	Applied Sciences	**Does Colostrum Quality Influence Calf Cortisol Concentrations?**
92	**Nikolas Massa** Mentor: Ling Ma	Humanities	**More Than Mao: The Culpability of Other CCP Officials During the Great Chinese Famine**
202	**Ryder Matanane** Mentor: Dmitri Tolkatchev, Alla Kostyukova	Molecular, Cellular, and Chemical Biology	**Comparing Efficiency of Two Methods of Site-directed Mutagenesis**
127	**Keesha Matz** Mentor: Alan Goodman	Molecular, Cellular, and Chemical Biology	**Role of the Nipah Virus Fusion Protein and Glycoprotein on Innate Immune Responses**
6	**Teva Mayer** Mentor: Raymond Lee	Organismal, Population, Ecological, and Evolutionary Biology	**An Investigation of UV Cues Exhibited by *Macrodactyla doreensis* Anemones**

Poster No.	Presenter	Category	Title of Abstract
78	**Denzel McCray** Mentor: John Hinson, Paul Whitney	Social Sciences	**Information Overload: The Effect of Too Much Feedback on Probabilistic Decision Making**
78	**Maria McCray** Mentor: John Hinson, Paul Whitney	Social Sciences	**Information Overload: The Effect of Too Much Feedback on Probabilistic Decision Making**
31	**Ryan McLaughlin** Mentor: Anthony Nicola	Molecular, Cellular, and Chemical Biology	**Herpes Simplex Virus Entry into Primary Human Fibroblasts**
210	**Seth McPherson** Mentor: Kelvin Lynn	Engineering and Physical Sciences	**Production Strategies for Tailored Source Material Used in High Efficiency Solar Cells**
135	**Megan Messer** Mentor: Julie Kmec	Social Sciences	**How Facebook Users Evaluate the Information They See**
167	**Wynn Miller** Mentor: Kerry Hipps	Applied Sciences	**Determination of the Adsorption and Desorption Coefficients for Manganese (II) Phthalocyanines on a Gold Thin Film**
131	**William Millick** Mentor: Lydia Gerber	Social Sciences	**Considering Women in the Great Leap Forward**
26	**Miriam Montgomery** Mentor: Amber Adams-Progar	Applied Sciences	**Effect of Human-Calf Interactions on Heifer and Cow Handling Ease**
4	**Angeliqua Montoya** Mentor: Stephanie Porter	Organismal, Population, Ecological, and Evolutionary Biology	**Retention of the Symbiosis Island in a Mesorhizobium population**
110	**Jonathan Moore** Mentor: John McCloy	Engineering and Physical Sciences	**Magnetic Separation of Technetium from Low Level Waste by Greigite Sorption**
211	**Lindsey Morey** Mentor: Michael Varnum	Molecular, Cellular, and Chemical Biology	**Disruption of Cone Photoreceptor Cyclic Nucleotide-gated Channels in Zebrafish Using CRISPR/Cas9 Genome Editing**

Poster No.	Presenter	Category	Title of Abstract
152	**Jules Mugisha** Mentor: Matthew Bumpus, Eleanor Dizon	Social Sciences	**Parent-Student Conversations in Response to a Student Conduct Violation**
68	**Grace Murekatete** Mentor: camille Steber	Applied Sciences	**Improving Preharvest Sprouting Tolerance in Wheat**
114	**Raquel Murillo** Mentor: Nehal Abu-Lail	Engineering and Physical Sciences	**Biofilm Growth of Multidrug-Resistant *Escherichia coli* during Exposure to Natural Antibiotics**
139	**Rachelle Muzones** Mentor: Nehal Abu-Lail	Molecular, Cellular, and Chemical Biology	**The Effect of Nutraceuticals on the Histological Expression of Biomarkers of Engineered Articular Cartilage Tissue**
165	**Eric Navarro** Mentor: Erica Crespi	Organismal, Population, Ecological, and Evolutionary Biology	**Retention of Learning Through Life Stages in *Xenopus laevis***
45	**Deshka Neill** Mentor: Ming Xian	Engineering and Physical Sciences	**Chemiluminescent 1,2-Dioxetane Probes for the Detection of Hydrogen Polysulfides**
120	**Grant Nelson** Mentor: Amit Dhingra	Organismal, Population, Ecological, and Evolutionary Biology	**Identification of Vaccinium Hybrids Using SSR Markers**
163	**Samantha Nelson** Mentor: Lydia Gerber	Humanities	**Women in the Beijing Opera as Told Through the Novel *Farewell to My Concubine***
133	**Lars Neuenschwander** Mentor: Phuc Ha	Molecular, Cellular, and Chemical Biology	**The Accelerated Growth Effect of Subinhibitory Antibiotic Concentrations on Pathogenic Bacteria**
177	**Acacia Neveux** Mentor: Amber Adams-Progar	Organismal, Population, Ecological, and Evolutionary Biology	**The Effect of Colostrum Quality on Calf Heath and Pathogenic Transmission**

Poster No.	Presenter	Category	Title of Abstract
116	**Lambert Ngenzi** Mentor: Alex Fremier	Applied Sciences	**Quantifying the Accuracy of Landsat in Estimating Reservoir Water Surface Area**
86	**Nam Nguyen** Mentor: Chad Gotch	Social Sciences	**Development a Survey to Investigate Study Abroad Destination Choice**
46	**Nancy Nightingale** Mentor: Lydia Gerber	Humanities	**Assimilation and Model Minorities in Muslim China**
109	**Sean Nooney** Mentor: Clif Stratton	Social Sciences	**Conflict in the Congo: A Legacy of Empire, Tyranny and Kleptocracy**
170	**Jillian Nordness** Mentor: Meijun Zhu	Molecular, Cellular, and Chemical Biology	**Thermal Inactivation and Survival of *Listeria monocytogenes* in Milk Powder and Surrogate Suitability of *Listeria innocua* and *Lactobacillus plantarum***
126	**Madeleine O'Connor** Mentor: Heather Watts, Ashley Robart	Organismal, Population, Ecological, and Evolutionary Biology	**The Effects of Food Restriction on Behavioral Indicators of Facultative Migration in Pine Siskins**
30	**Emma Ostberg** Mentor: Clif Stratton	Humanities	**Doping in The Tour de France**
103	**Mackenzie Palafox** Mentor: Chuhua Jia	Engineering and Physical Sciences	**The Effect of Solvent Ratio in the Decarboxylation of Fatty Acid**
7	**Cory Palmieri** Mentor: David Field	Engineering and Physical Sciences	**High-speed Aluminum Friction Stir Welding and Its Mechanical Properties**
213	**Fatima Pantoja** Mentor: Somayeh Nassiri, Milena Rangelov	Engineering and Physical Sciences	**Using Relative Dielectric Constant for Time-dependent Non-destructive Estimation of Water Content in Mortar**
33	**Griffin Patrick** Mentor: Anna Deighton, Mary Stohr	Social Sciences	**How the Legalization of Marijuana Has Impacted Law Enforcement**

Poster No.	Presenter	Category	Title of Abstract
48	**Kylie Perez** Mentor: Sian Ritchie	Social Sciences	**What Makes Us Human?**
18	**Lysandra Perez** Mentor: Monica Johnson	Social Sciences	**Latino/a College Student's Transition Experiences: Collectivism to an Individualistic Culture**
187	**Cassidy Peru** Mentor: Chandra Jack	Organismal, Population, Ecological, and Evolutionary Biology	**The Modification of a Ministat to Measure Ammonia Production in Response to Altered Carbon Concentrations in *Azotobacter* Populations**
33	**Jessica Pletsch** Mentor: Anna Deighton, Mary Stohr	Social Sciences	**How the Legalization of Marijuana Has Impacted Law Enforcement**
106	**Abagail Poelstra** Mentor: Lydia Gerber	Humanities	**Supposedly Sexually Insatiable: A Comparison of Female Rulers And Their Sex Legends**
219	**Rebecca Polsin** Mentor: Milena Rangelov	Engineering and Physical Sciences	**Validation of the Empirical Models for Drying Shrinkage of Mortar**
203	**Claire Popke** Mentor: Raymond Evans	Organismal, Population, Ecological, and Evolutionary Biology	**What's in the Soil—Invasive Earthworms and their Effect on Soil Organic Matter Beneath Indigenous and Non-native Grasses**
40	**Devon Porter** Mentor: Clif Stratton	Social Sciences	**The Impacts of Transformation within Chilean Healthcare**
111	**Bailey Powers** Mentor: Matthew Unangst	Humanities	**Terrorism in Northern Africa**
244	**Vanessa Rhodes** Mentor: Dene Grigar, Nicholas Schiller	Arts and Design	**Rebooting Electronic Literature: The Challenges of Creating an Open-source Multimedia Tool for Data Collection and Dissemination**
64	**John Robancho** Mentor: Robert Krikac, Chioma Heim, Audrey Van Nuland	Arts and Design	**Cross Disciplinary Spatial Intervention - Psychology Advising Suite Redesign**

Poster No.	Presenter	Category	Title of Abstract
204	**Kayleena Roberts** Mentor: Nancy Bell, Lynn Gordon, Guy Carden	Social Sciences	**Identifying Verbal Deceptive Cues within Interrogations of Serial Killers**
33	**William Roberts** Mentor: Anna Deighton, Mary Stohr	Social Sciences	**How the Legalization of Marijuana Has Impacted Law Enforcement**
156	**Patrick Robichaud** Mentor: Jennifer Adam	Engineering and Physical Sciences	**Creating an Erosion Vulnerability Map for the Columbia River Basin to Determine Reservoir Susceptibility to Sedimentation Before and After Wildfires**
33	**Zoe Robinson** Mentor: Anna Deighton, Mary Stohr	Social Sciences	**How the Legalization of Marijuana Has Impacted Law Enforcement**
129	**Yoni Rodriguez** Mentor: Von Walden	Engineering and Physical Sciences	**Development of an Air Quality Sensor for Use in Teaching Introductory Environmental Engineering**
137	**Matthew Roetcisoender** Mentor: Brian Lamb	Engineering and Physical Sciences	**Analysis of an Inverse Gaussian Plume Modeling Method for Estimating Methane Emissions from Underground Pipeline Leaks**
175	**Rachel Roloff** Mentor: Ashley Boyd	Humanities	**Young Adult Literature for Sixth Grade Classrooms: Culturally Responsive and Social Justice Pedagogy**
85	**Virginia Ross** Mentor: Brian Clowers, Peyton Nosbusch	Engineering and Physical Sciences	**Realizing Femtomolar Detection Limits: Optimizing Nicotine Metabolite Extraction from Mammal Plasma using Solid Phase Extraction and Liquid Chromatography-Mass Spectrometry**
35	**Shelby Ruiz** Mentor: Judy Theodorson	Arts and Design	**Giardini Scolpiti**
161	**David Saldivar** Mentor: Amy Nusbaum, Paul Whitney, John Hinson	Social Sciences	**The Effects of ACES on Cognitive Control**

Poster No.	Presenter	Category	Title of Abstract
152	**Carla Salle** Mentor: Matthew Bumpus, Eleanor Dizon	Social Sciences	**Parent-Student Conversations in Response to a Student Conduct Violation**
180	**Misumi Sano** Mentor: Jeremy Jewell	Molecular, Cellular, and Chemical Biology	**Extracellular ATP is an Essential Signaling Molecule Conserved from the Most Ancient Plants, Bryophytes**
192	**Allison Saur** Mentor: Mark VanDam	Social Sciences	**Expressive Language of Toddlers as Influenced by Siblings**
88	**Coleman Schnebly** Mentor: Amit Dhingra	Organismal, Population, Ecological, and Evolutionary Biology	**Evaluation of Apply Hybrid Selections for their Potential Use for Cider Production**
114	**Sarah Schroeder** Mentor: Nehal Abu-lail	Engineering and Physical Sciences	**Biofilm Growth of Multidrug-Resistant *Escherichia coli* during Exposure to Natural Antibiotics**
212	**Dane Schwartz** Mentor: Candis Carraway, Kari Sampson	Social Sciences	**Influencers of Undergraduate Students' Degree Choice**
27	**Collin Schweikl** Mentor: Robert Krikac	Arts and Design	**Revitalizing Rural Communities**
188	**Sarah Sherrod** Mentor: Melanie-Angela Neuilly	Social Sciences	**Experiential Learning and High Impact Practices in Undergraduate Education: A First Person Account of Undergraduate Research in Criminal Justice**
209	**Alisa Smith** Mentor: Bill Smith	Social Sciences	**Improving Maternal Healthcare for Syrian Refugee Women in Lebanon**
220	**Alisa Smith** Mentor: Howard Davis, Marie Mayes, Mark Clemens, Jr.	Engineering and Physical Sciences	**Radiation Effects on Electronics**
193	**Sterling Smith** Mentor: Phillip Marston	Engineering and Physical Sciences	**Investigation of Negative Group Velocity Harmonic Waves Associated with Backscattering of Ultrasound Off Submerged Cylindrical Shells**

Poster No.	Presenter	Category	Title of Abstract
243	**Garrett Snedeker** Mentor: Jeffrey Savage	Humanities	**Chiquinha Gonzaga (1847-1935): Brazilian Composer, Musician, and Catalyst for Social Change**
119	**Sandra Spearman** Mentor: Alexander Fremier	Engineering and Physical Sciences	**Total Suspended Sediment Influences the Rate of River Meander Migration**
3	**Alyssa Sperry** Mentor: Candice Goucher	Social Sciences	**The Covenant of Salt: The History of Salt Production and Consumption in Jamaica**
152	**Brittany Srp** Mentor: Matthew Bumpus, Eleanor Dizon	Social Sciences	**Parent-Student Conversations in Response to a Student Conduct Violation**
2	**Kyle Stenersen** Mentor: Hua Tan	Engineering and Physical Sciences	**Development of High-Speed Sintering 3D Printer**
49	**Gretchen Stolte** Mentor: Chris Connolly	Organismal, Population, Ecological, and Evolutionary Biology	**Physical Activity Perceptions and Behavior of Pregnant Women with Past Miscarriage and Infertility Experiences**
91	**Christina Strauch** Mentor: Walter Scott	Social Sciences	**Development of a New Self-Schema Measure: Examining Construct Validity and Reliability**
148	**Emaly Suarez** Mentor: Holly Neibergs	Organismal, Population, Ecological, and Evolutionary Biology	**Loci Associated with Pregnancy Loss in US Holstein Heifers using Imputed and Actual Genotypes of 777,962 Single Nucleotide Polymorphisms**
98	**Rylee Sullivan** Mentor: Ken Faunce	Humanities	**Organized Crime and the Six Billion Dollar a Year Industry**
63	**Matthew Sundheim** Mentor: Su Ha	Engineering and Physical Sciences	**Electric Field Effects on Ammonia Decomposition Over a Ni-Perovskite Catalyst**
132	**Nicole Takahashi** Mentor: Clif Stratton	Humanities	**The Anti-Nuclear Movement**

Poster No.	Presenter	Category	Title of Abstract
158	**Shi Tan** Mentor: Rita Fuchs	Molecular, Cellular, and Chemical Biology	**The Role of The Dorsal Hippocampus in Early-Stage Cocaine-Associated Memory Reconsolidation**
20	**Janelle Thomas** Mentor: Ryan McLaughlin	Organismal, Population, Ecological, and Evolutionary Biology	**Effects of Prenatal Cannabis Vapor Exposure on Anxiety-like Behavior**
140	**Jewel Toenges** Mentor: Holly Neibergs	Organismal, Population, Ecological, and Evolutionary Biology	**Identification of Loci Associated with Embryonic and Fetal Loss in Holstein Heifers**
39	**Alexis Torp** Mentor: Pete Jacoby, Xiaochi Ma	Organismal, Population, Ecological, and Evolutionary Biology	**Deficit Irrigation in Grapevines**
223	**Chasity Trammell** Mentor: Anthony Nicola	Molecular, Cellular, and Chemical Biology	**Effect of the Proteasome Inhibitor Bortezomib on Herpes Simplex Virus Infection of Primary Human Fibroblasts**
159	**Ana Trejo** Mentor: Jesse Brunner	Organismal, Population, Ecological, and Evolutionary Biology	**Reactivation of Quiescent Ranavirus Infections in Xenopus**
47	**Kyle Tucker** Mentor: Hanjo Hellmann	Molecular, Cellular, and Chemical Biology	**Investigating Functionality of Proteins Controlling Stability**
190	**Kyrah Turner** Mentor: Michael Konkel	Molecular, Cellular, and Chemical Biology	***Campylobacter jejuni* Adapts to Life in the Intestine**
37	**Mario Vega** Mentor: Clif Stratton	Humanities	**"An All-American Boy": The Story of Tom Haji and Rural Nisei During WWII**
41	**Jaimalynne Ventura** Mentor: Brendan Walker	Organismal, Population, Ecological, and Evolutionary Biology	**Negative Affective-like Cues and Escalated Alcohol Consumption in Mice**

Poster No.	Presenter	Category	Title of Abstract
176	**Karen Vo** Mentor: Jeffrey Jones	Molecular, Cellular, and Chemical Biology	**Understanding the Substrate-enzyme Interactions of Aldehyde Oxidase-catalyzed Reactions**
51	**Yasmeen Wafai** Mentor: Lisa Waananen Jones	Arts and Design	**Women of Wazzu**
100	**Alexandria Wahl** Mentor: Holly Neibergs	Organismal, Population, Ecological, and Evolutionary Biology	**Genome Wide Association Analysis of Miscarriage after d35 of Gestation in Holstein Heifers using the Illumina GGP50 BeadChip**
235	**Collin Warrick** Mentor: Ryan McLaughlin	Organismal, Population, Ecological, and Evolutionary Biology	**Effects of Prenatal Cannabis Vapor Exposure on Cognitive Flexibility**
244	**Veronica Whitney** Mentor: Dene Grigar, Nicholas Schiller	Arts and Design	**Rebooting Electronic Literature: The Challenges of Creating an Open-source Multimedia Tool for Data Collection and Dissemination**
15	**Adam Whittier** Mentor: Robert Franklin	Arts and Design	**Born Under A Dark Star: Telling a Story with Comics**
196	**Trenton Williams** Mentor: Dmitri Tolkatchev, Alla Kostyukova	Molecular, Cellular, and Chemical Biology	**Expression and Purification of Chimeric Tropomyosin Peptides for Binding Site Identification**
172	**Emma Wilsie** Mentor: Christopher Connolly	Social Sciences	**Don't Forget to Exercise: The Effects of Different Forms of Exercise on Memory**
169	**Elizabeth Wilson** Mentor: Clif Stratton	Humanities	**Yellow Fever: The Roots of Africa's Struggle with the Disease**
141	**Rachel Wittenberg** Mentor: Kathy Beerman	Applied Sciences	**The Effect of Food Preparation Methods on the Release of Iron from the Lucky Iron Fish® and Subsequent Iron Enrichment of Foods**

Poster No.	Presenter	Category	Title of Abstract
220	**Kevin Wolfrom** Mentor: Howard Davis, Marie Mayes, Mark Clemens, Jr.	Engineering and Physical Sciences	**Radiation Effects on Electronics**
234	**Jacob Woodbury** Mentor: Erika Offerdahl	Social Sciences	**Sorting It Out: An Investigation of Categorization Tasks as Supports for Learning and Transfer**
123	**Alexis Wright** Mentor: Peter Pfromm	Engineering and Physical Sciences	**An Iron Membrane Reactor to Synthesize Ammonia as an Energy Vector for Renewable Electricity**
142	**Ashley Wright** Mentor: Hang Liu	Applied Sciences	**The Influence of Enzymes on the Dissolution of Recycled Waste Cotton**
33	**Mantz Wyrick** Mentor: Anna Deighton, Mary Stohr	Social Sciences	**How the Legalization of Marijuana Has Impacted Law Enforcement**
191	**Jay-J Yarbrough-Jones** Mentor: Bertrand Tanner, Jennifer Eldridge	Organismal, Population, Ecological, and Evolutionary Biology	**Therapeutic Potential for Improving Mobility and Exercise Performance in a Mouse Model of Limb Girdle Muscular Dystrophy**
27	**Kelli Young** Mentor: Bob Krikac	Arts and Design	**Revitalizing Rural Communities**
221	**Teresa Zaragoza** Mentor: Simon Licen	Social Sciences	**Media Dialogue and Representation of Latinx Athletes in the Olympics**
112	**Hannah Zmuda** Mentor: Haluk Beyenal	Engineering and Physical Sciences	**The Effectiveness of an Electrochemical Scaffold Producing Hypochlorous Acid Against *Candida albicans* Fungal Biofilms**
33	**Maria Zuniga** Mentor: Anna Deighton, Mary Stohr	Social Sciences	**How the Legalization of Marijuana Has Impacted Law Enforcement**

Showcase for Undergraduate Research and Creative Activities 2018

Entries by Category

Applied Sciences

Poster No.	Presenter	Title of Abstract—Applied Sciences
26	**Amy Allen** Mentor: Amber Adams-Progar	**Effect of Human-Calf Interactions on Heifer and Cow Handling Ease**
102	**Madisyn Beaudoin** Mentor: Arron Carter, Amit Dhingra	**Portland to Philippines: Innovation of Soft White Wheat for Export Markets**
77	**Nimay Bolar** Mentor: Arda Gozen, Abhishek Gannarapu	**Intelli-Bra**
55	**Hannah Cameron** Mentor: Amber Adams-Progar	**Behavioral Interactions Between Dairy Cows and Wild Birds**
155	**McKynzie Clark** Mentor: Kara Whitman	**Assessment of Alternatives for Per- and Polyfluroalkyl Substances Found in Aqueous Film Forming Foam**
13	**Rachel Davis** Mentor: Joann Dotson, Janessa Graves	**Cannabis as an Alternative Anticonvulsant Therapy for Pregnant Women with Seizure Disorders**
60	**Grace Dickerson** Mentor: Shannon Neibergs	**Economics of Clinical and Sub-clinical Bovine Respiratory Disease in Feedlot Cattle**
55	**Isabella Duarte** Mentor: Amber Adams-Progar	**Behavioral Interactions Between Dairy Cows and Wild Birds**
84	**Lucy Eggleston** Mentor: Dave Crowder	**Interaction of Bumble Bee Communities on Small Farms**
90	**Malia Frame** Mentor: Ian Burke, Rachel Zuger	**Mayweed Chamomile Growing Degree Day Model**

Poster No.	Presenter	Title of Abstract—Applied Sciences
122	**Jessica Hartman** Mentor: Arron Carter	**Remote Sensing to Predict Wheat Agronomic Characteristics**
160	**Gillian Hawkins** Mentor: Pete Jacoby	**Cabernet Sauvignon Berry Quality from Vines Irrigated through Direct Root Zone Irrigation**
130	**Cody Holland** Mentor: Kevin Murphy	**Small Grain Breeding: Emphasis on Field Evaluations of Diverse Millet Species**
173	**Heidi Holubetz** Mentor: Stephanie Smith	**Development of New Canning Models for Home Food Preservation**
96	**Tymon James** Mentor: Cameron Peace	**Palouse Wild Cider Apple Breeding Program: Hands-on Learning at its Best**
50	**Veronica Martin** Mentor: Amber Adams-Progar	**Does Colostrum Quality Influence Calf Cortisol Concentrations?**
167	**Wynn Miller** Mentor: Kerry Hipps	**Determination of the Adsorption and Desorption Coefficients for Manganese (II) Phthalocyanines on a Gold Thin Film**
26	**Miriam Montgomery** Mentor: Amber Adams-Progar	**Effect of Human-Calf Interactions on Heifer and Cow Handling Ease**
68	**Grace Murekatete** Mentor: camille Steber	**Improving Preharvest Sprouting Tolerance in Wheat**
116	**Lambert Ngenzi** Mentor: Alex Fremier	**Quantifying the Accuracy of Landsat in Estimating Reservoir Water Surface Area**
141	**Rachel Wittenberg** Mentor: Kathy Beerman	**The Effect of Food Preparation Methods on the Release of Iron from the Lucky Iron Fish® and Subsequent Iron Enrichment of Foods**
142	**Ashley Wright** Mentor: Hang Liu	**The Influence of Enzymes on the Dissolution of Recycled Waste Cotton**

Arts and Design

Poster No.	Presenter	Title of Abstract—Arts and Design
64	**Alexandra Bennett** Mentor: Robert Krikac, Chioma Heim, Audrey Van Nuland	**Cross Disciplinary Spatial Intervention - Psychology Advising Suite Redesign**
244	**Katie Bowen** Mentor: Dene Grigar, Nicholas Schiller	**Rebooting Electronic Literature: The Challenges of Creating an Open-source Multimedia Tool for Data Collection and Dissemination**

Poster No.	Presenter	Title of Abstract—Arts and Design
64	**Priscilla Duong** Mentor: Robert Krikac, Chioma Heim, Audrey Van Nuland	**Cross Disciplinary Spatial Intervention - Psychology Advising Suite Redesign**
244	**Mariah Gwin** Mentor: Dene Grigar, Nicholas Schiller	**Rebooting Electronic Literature: The Challenges of Creating an Open-source Multimedia Tool for Data Collection and Dissemination**
44	**Keena Hudson** Mentor: Chanmi Hwang	**Size Inclusivity: A Content Analysis of Plus-Size Apparel Consumer Needs**
64	**Yeaji Kan** Mentor: Robert Krikac, Chioma Heim, Audrey Van Nuland	**Cross Disciplinary Spatial Intervention - Psychology Advising Suite Redesign**
244	**Vanessa Rhodes** Mentor: Dene Grigar, Nicholas Schiller	**Rebooting Electronic Literature: The Challenges of Creating an Open-source Multimedia Tool for Data Collection and Dissemination**
64	**John Robancho** Mentor: Robert Krikac, Chioma Heim, Audrey Van Nuland	**Cross Disciplinary Spatial Intervention - Psychology Advising Suite Redesign**
35	**Shelby Ruiz** Mentor: Judy Theodorson	**Giardini Scolpiti**
27	**Collin Schweikl** Mentor: Robert Krikac	**Revitalizing Rural Communities**
51	**Yasmeen Wafai** Mentor: Lisa Waananen Jones	**Women of Wazzu**
244	**Veronica Whitney** Mentor: Dene Grigar, Nicholas Schiller	**Rebooting Electronic Literature: The Challenges of Creating an Open-source Multimedia Tool for Data Collection and Dissemination**
15	**Adam Whittier** Mentor: Robert Franklin	**Born Under A Dark Star: Telling a Story with Comics**
27	**Kelli Young** Mentor: Bob Krikac	**Revitalizing Rural Communities**

Computer Science, Mathematics, Statistics, and Information Sciences

Poster No.	Presenter	Title of Abstract
28	**Robby Boney** Mentor: Allison Coffin	**Is Hair Cell Regeneration Linked To Evolutionarily Changes Within Protein Sequences?**
16	**Dustan Cwick** Mentor: Richard Zack	**A Statistical Analysis of the Periodical Cicada (*Magicicada septendecim*) to demonstrate Mean, Median, and Bilateral symmetry within a Population**
9	**Kyler Little** Mentor: Mark Kuyzk, Elizabeth Bernhard	**3-D Depth Reconstruction from Multiple Equally-Spaced Images**

Engineering and Physical Sciences

Poster No.	Presenter	Title of Abstract—Engineering and Physical Sciences
29	**Yahya Aldoshan** Mentor: Su Ha	**Adding Water to the Feed of Formic Acid Decomposition over MoC Catalyst on Graphite**
114	**Mohammed Alzawad** Mentor: Nehal Abu-Lail	**Biofilm Growth of Multidrug-Resistant *Escherichia coli* during Exposure to Natural Antibiotics**
168	**Michael Anderson** Mentor: Brian Collins	**Effect of Electron Donor Position in Bilayer OSCs**
201	**Alexa Antalan** Mentor: Jinwen Zhang, Junna Xin, Ran Li	**Preliminary Investigation of Waste Cooking Oil-based Bio-asphalt and Reinforcement with Lignin-based Epoxy**
247	**Spencer Barclay** Mentor: Kshitij Jerath	**VR Controllers Integrated in Complex Emergent Dynamic Systems**
229	**Stephen Bone** Mentor: Alla Kostyukova	**Engineering Glucose Oxidase for Efficient Ni-NTA Purification**
220	**Mark Brauer** Mentor: Howard Davis, Marie Mayes, Mark Clemens, Jr.	**Radiation Effects on Electronics**
97	**Michael Brown** Mentor: Steven Saunders	**Synthesis and Characterization of a Bio-mimicking Heterogeneous Palladium Nanoparticle Catalyst**
185	**Andrew Cannon** Mentor: Jeffrey McMahon	**Inside Ice Giants from First Principles**

Poster No.	Presenter	Title of Abstract—Engineering and Physical Sciences
17	**Monika Cewe** Mentor: Bernard Van Wie, Baran Arslan	**Estimating the Growth Kinetics of Cytotoxic T lymphocytes used in Adoptive Immunotherapy of Cancer**
220	**Ebony Collins** Mentor: Howard Davis, Marie Mayes, Mark Clemens, Jr.	**Radiation Effects on Electronics**
216	**Zachary Croft** Mentor: Brian Collins	**Voltage Controlled Color-tuning of Printable Organic LED Pixels**
205	**Misganaw Demissie** Mentor: Lei Li	**Prism_Array Integrated Smartphone Micro-plate Reader for Point-of-care Colorimetric Assays**
150	**Victoria Dziekan** Mentor: Shelley Pressley	**CO2 Flux Bias Correction Assessment in Eddy Covariance Towers Over Long Term Agricultural Sites**
114	**Kaycee Faber** Mentor: Nehal Abu-Lail	**Biofilm Growth of Multidrug-Resistant *Escherichia coli* during Exposure to Natural Antibiotics**
67	**Jordan Fernandez** Mentor: Zachariah Heiden	**Synthesis and Reactivity of Molecular Fluorescent Pincer Complexes**
36	**Wyatt Fick** Mentor: Guodong Ding	**Catalytic Conversion of Biomass to Methanol**
232	**Samantha Ginter** Mentor: Clifford Berkman	**Substituent Effects on Diacyl Phosphate Scaffold as Beta-lactamase Inactivators**
147	**Kristian Gubsch** Mentor: Von Walden, Candis Claiborn	**Building Smart Cities Technology to Monitor Spokane's Air Quality**
123	**Cory Gunson** Mentor: Peter Pfromm	**An Iron Membrane Reactor to Synthesize Ammonia as an Energy Vector for Renewable Electricity**
189	**Zara Guzman** Mentor: Jan Boll, Christian Guzman	**Investigating Palouse Region Streamwater Patterns with Sediment and Isotope Analysis**
174	**Kenny Haak** Mentor: Jeffrey McMahon	**Ground State Structures of Water-Ammonia Mixtures at High Pressures**
72	**Brendan Hay** Mentor: Peter Pfromm	**Facile Tailoring of Polymeric Gas Separation Membranes by Ion Exchange**
53	**Catie Himes** Mentor: Elsa Silva-Lopez, Allan Felsot, Nelmi Devarie	**Development of an Analytical Method to Validate Pesticide Detection Limits in Saliva**

Poster No.	Presenter	Title of Abstract—Engineering and Physical Sciences
2	**Hunter Jarrett** Mentor: Hua Tan	**Development of High-Speed Sintering 3D Printer**
76	**Rachel Kagan** Mentor: Arda Gozen	**Tissue Engineering of 3D-Printed Articular Cartilage**
253	**Kitana Kaiphanliam** Mentor: Bernard Van Wie, Negar Beheshti Pour	**Analyzing the Effects of Desktop Learning Modules (DLMs) on Student Comprehension of Fluid Mechanics and Heat Transfer Concepts**
226	**Samantha Kaonis** Mentor: Roland Chen	**A Study on Degradation Behavior of 3D Printed Gellan Gum Scaffolds**
82	**Brian Karlberg** Mentor: Nehal Abu-Lail	**Mapping of the Conformational and Mechanical Properties of Bacterial Surface Biopolymers Using Atomic Force Microscopy (AFM)**
210	**Seth McPherson** Mentor: Kelvin Lynn	**Production Strategies for Tailored Source Material Used in High Efficiency Solar Cells**
110	**Jonathan Moore** Mentor: John McCloy	**Magnetic Separation of Technetium from Low Level Waste by Greigite Sorption**
114	**Raquel Murillo** Mentor: Nehal Abu-Lail	**Biofilm Growth of Multidrug-Resistant *Escherichia coli* during Exposure to Natural Antibiotics**
45	**Deshka Neill** Mentor: Ming Xian	**Chemiluminescent 1,2-Dioxetane Probes for the Detection of Hydrogen Polysulfides**
103	**Mackenzie Palafox** Mentor: Chuhua Jia	**The Effect of Solvent Ratio in the Decarboxylation of Fatty Acid**
7	**Cory Palmieri** Mentor: David Field	**High-speed Aluminum Friction Stir Welding and Its Mechanical Properties**
213	**Fatima Pantoja** Mentor: Somayeh Nassiri, Milena Rangelov	**Using Relative Dielectric Constant for Time-dependent Non-destructive Estimation of Water Content in Mortar**
219	**Rebecca Polsin** Mentor: Milena Rangelov	**Validation of the Empirical Models for Drying Shrinkage of Mortar**
156	**Patrick Robichaud** Mentor: Jennifer Adam	**Creating an Erosion Vulnerability Map for the Columbia River Basin to Determine Reservoir Susceptibility to Sedimentation Before and After Wildfires**
129	**Yoni Rodriguez** Mentor: Von Walden	**Development of an Air Quality Sensor for Use in Teaching Introductory Environmental Engineering**
137	**Matthew Roetcisoender** Mentor: Brian Lamb	**Analysis of an Inverse Gaussian Plume Modeling Method for Estimating Methane Emissions from Underground Pipeline Leaks**

Poster No.	Presenter	Title of Abstract—Engineering and Physical Sciences
85	**Virginia Ross** Mentor: Brian Clowers, Peyton Nosbusch	**Realizing Femtomolar Detection Limits: Optimizing Nicotine Metabolite Extraction from Mammal Plasma using Solid Phase Extraction and Liquid Chromatography-Mass Spectrometry**
114	**Sarah Schroeder** Mentor: Nehal Abu-lail	**Biofilm Growth of Multidrug-Resistant *Escherichia coli* during Exposure to Natural Antibiotics**
220	**Alisa Smith** Mentor: Howard Davis, Marie Mayes, Mark Clemens, Jr.	**Radiation Effects on Electronics**
193	**Sterling Smith** Mentor: Phillip Marston	**Investigation of Negative Group Velocity Harmonic Waves Associated with Backscattering of Ultrasound Off Submerged Cylindrical Shells**
119	**Sandra Spearman** Mentor: Alexander Fremier	**Total Suspended Sediment Influences the Rate of River Meander Migration**
2	**Kyle Stenersen** Mentor: Hua Tan	**Development of High-Speed Sintering 3D Printer**
63	**Matthew Sundheim** Mentor: Su Ha	**Electric Field Effects on Ammonia Decomposition Over a Ni-Perovskite Catalyst**
220	**Kevin Wolfrom** Mentor: Howard Davis, Marie Mayes, Mark Clemens, Jr.	**Radiation Effects on Electronics**
123	**Alexis Wright** Mentor: Peter Pfromm	**An Iron Membrane Reactor to Synthesize Ammonia as an Energy Vector for Renewable Electricity**
112	**Hannah Zmuda** Mentor: Haluk Beyenal	**The Effectiveness of an Electrochemical Scaffold Producing Hypochlorous Acid Against *Candida albicans* Fungal Biofilms**

Humanities

Poster No.	Presenter	Title of Abstract—Humanities
157	**Blessing Adaramola** Mentor: Olusola Adesope	**What are the Impacts of Corporate Social Responsibility (CSR) on Financial Performance of a Corporation Based on Its Size**
80	**Krista Brutman** Mentor: Lydia Gerber	**Left-Over Women: Collectivist Feminism in Modern China**
118	**Astrid Cortes** Mentor: Kathleen Fry	**The 18th Century Pacific Northwest Fur Trade: Global Competition and Involvement of Indigenous Populations**

Poster No.	Presenter	Title of Abstract—Humanities
61	**Jordan Cresanti** Mentor: Clif Stratton	**Farming Revamped by GMO's**
146	**Abigail Culver** Mentor: Kathleen Fry	**Treatment of African Americans in the American West and Afro-Brazilians in Brazil Post-Slavery**
151	**Precelia Derricks** Mentor: Ken Faunce	**Vietnam and the American Home Front**
19	**Cody Goodan** Mentor: Ken Faunce	**Dogmatism: The Result of Inequality**
54	**Jazmine Ike-Lopez** Mentor: Trevor Bond	**Digital Archiving of Tribal histories at Washington State University**
138	**Nora Kelley** Mentor: Clif Stratton	**The Effects of Social Darwinism and The Eugenics Movement on the Politics of Modern Medicine**
92	**Nikolas Massa** Mentor: Ling Ma	**More Than Mao: The Culpability of Other CCP Officials During the Great Chinese Famine**
163	**Samantha Nelson** Mentor: Lydia Gerber	**Women in the Beijing Opera as Told Through the Novel *Farewell to My Concubine***
46	**Nancy Nightingale** Mentor: Lydia Gerber	**Assimilation and Model Minorities in Muslim China**
30	**Emma Ostberg** Mentor: Clif Stratton	**Doping in The Tour de France**
106	**Abagail Poelstra** Mentor: Lydia Gerber	**Supposedly Sexually Insatiable: A Comparison of Female Rulers And Their Sex Legends**
111	**Bailey Powers** Mentor: Matthew Unangst	**Terrorism in Northern Africa**
175	**Rachel Roloff** Mentor: Ashley Boyd	**Young Adult Literature for Sixth Grade Classrooms: Culturally Responsive and Social Justice Pedagogy**
243	**Garrett Snedeker** Mentor: Jeffrey Savage	**Chiquinha Gonzaga (1847-1935): Brazilian Composer, Musician, and Catalyst for Social Change**
98	**Rylee Sullivan** Mentor: Ken Faunce	**Organized Crime and the Six Billion Dollar a Year Industry**
132	**Nicole Takahashi** Mentor: Clif Stratton	**The Anti-Nuclear Movement**
37	**Mario Vega** Mentor: Clif Stratton	**"An All-American Boy": The Story of Tom Haji and Rural Nisei During WWII**
169	**Elizabeth Wilson** Mentor: Clif Stratton	**Yellow Fever: The Roots of Africa's Struggle with the Disease**

Molecular, Cellular, and Chemical Biology

Poster No.	Presenter	Title of Abstract—Molecular, Cellular, and Chemical Biology
230	**Amanda Antoch** Mentor: Maren Friesen, Emily McLachlan	**Examination of the nodC Gene Region to Study the Evolution of Host Association between *Trifolium* and *Rhizobium leguminosarum***
81	**Yemeserach Bishaw** Mentor: Bertrand Tanner	**Muscle Tissue Structure and Remodeling in a Mouse Model of Limb Girdle Muscular Dystrophy 2i**
233	**Jordan Bolen** Mentor: Amanda Brinkworth, Rey Carabeo	**Examining Changes in Real-time Euo Transcriptional Activity in *Chlamydia* using Fast Fluorescent Timer**
69	**Sarah Borgnes** Mentor: Alan Goodman	***Coxiella burnetii* Pathogenesis in *Drosophila melanogaster***
182	**Zachery Browne** Mentor: Cliff Berkman	**Assessing Hydrogen Sulfide's Inhibition Profile on Prostate Specific Membrane-antigen (PSMA)**
65	**Julianna Brutman** Mentor: Jon Davis	**Mapping Diet-induced Alternative Polyadenylation of Hypothalamic Transcripts in the Obese Rat**
87	**Nicole Carlson** Mentor: Erika Serrano, Asaph Cousins	**PEPc Knockdown *Setaria viridis* Plants are Hungrier for CO2 than Wildtype**
217	**Grace Carrell** Mentor: Alan Goodman	***Drosophila melanogaster* are Used to Identify Novel Components of the Innate Immune Response to West Nile virus**
117	**Marissa Chukwu** Mentor: KwanHee Kim	**Retinoic Acid Receptor Alpha (RARA) in Male Germ Cells has Varied Roles during Spermatogenesis.**
227	**Grace Chung** Mentor: Carlos Suarez	**Evaluating the Efficacy of Cell-mediated Immunity in the Control and Protection against Foot and Mouth Disease**
74	**Pierce Claassen** Mentor: Amanda Brinkworth, Rey Carabeo	**Monitoring Gene-expression Dynamics of tarP During Chlamydial Development Using Fast Fluorescent Timer**
208	**Mikayla Engstrom** Mentor: Steven Roberts	**Determining the Effect Oncogene-induced Replication Stress has on APOBEC-mediated Mutagenesis**
194	**Sarah Fahr** Mentor: Michael Konkel	***Campylobacter jejuni*: The Food-Borne Pathogen that Causes Severe Gastritis by Manipulating Human Intestinal Cells**
143	**Paige Ford** Mentor: Nehal Abu-Lail	**The Effects of Glucose Starvation on *Pseudomonas putida* Biofilm Growth on Silicon**
164	**Bailey Frankovich** Mentor: Joseph Harding	**The Use of a Subcutaneous Injection of NDX-1001 to Reverse Scopolamine-induced Amnesia in Rats**
93	**Sierra Gallaway** Mentor: James Pru	**PGRMC1 Enhances the Growth and Development of Triple-negative Breast Cancer**

Poster No.	Presenter	Title of Abstract—Molecular, Cellular, and Chemical Biology
186	**Kaneesha Hemmerling** Mentor: Michelle Mousel	**Association of TNXB with Milk Production in Dairy Sheep Breeds**
99	**Zachary Howard** Mentor: Anders Omsland	**Progesterone Inhibits Replication of *Coxiella burnetii* in Nutrient Broth and During Infection of Cultured Cells**
214	**Maya Howell** Mentor: Jessica Klein	**Dissecting the Molecular Biology of the Understudied Bacterial Pathogen *Providencia alcalifaciens***
113	**Patrick Johnson** Mentor: Amanda Brinkworth, Ray Carabeo	**Real-time tarP Gene Expression Observed in *Chlamydia trachomatis* with the Fast Fluorescent Timer**
52	**Lia Kellogg** Mentor: Michael Kahn, Katie Adolphsen	**IseA Helps Legume Nodulation**
171	**Thinh Kieu** Mentor: Bertrand Tanner	**Omecamtiv Mecarbil: A Potential Therapeutic Agent for Heart Failure**
69	**Michael Knight** Mentor: Alan Goodman	***Coxiella burnetii* Pathogenesis in *Drosophila melanogaster***
198	**Joanne Kunze** Mentor: Jon Davis	**Cannabis-Induced Feeding Behavior: A Mechanistic View**
149	**Ellen MacNary** Mentor: Tony Mertz	**The Role of Shu-complex Members in APOBEC-induced Mutations**
222	**Marina Martin** Mentor: Alan Goodman	**Drosophila STING Mediates a Host Defense during *Listeria* Infection**
202	**Ryder Matanane** Mentor: Dmitri Tolkatchev, Alla Kostyukova	**Comparing Efficiency of Two Methods of Site-directed Mutagenesis**
127	**Keesha Matz** Mentor: Alan Goodman	**Role of the Nipah Virus Fusion Protein and Glycoprotein on Innate Immune Responses**
31	**Ryan McLaughlin** Mentor: Anthony Nicola	**Herpes Simplex Virus Entry into Primary Human Fibroblasts**
211	**Lindsey Morey** Mentor: Michael Varnum	**Disruption of Cone Photoreceptor Cyclic Nucleotide-gated Channels in Zebrafish Using CRISPR/Cas9 Genome Editing**
139	**Rachelle Muzones** Mentor: Nehal Abu-Lail	**The Effect of Nutraceuticals on the Histological Expression of Biomarkers of Engineered Articular Cartilage Tissue**
133	**Lars Neuenschwander** Mentor: Phuc Ha	**The Accelerated Growth Effect of Subinhibitory Antibiotic Concentrations on Pathogenic Bacteria**

Poster No.	Presenter	Title of Abstract—Molecular, Cellular, and Chemical Biology
170	**Jillian Nordness** Mentor: Meijun Zhu	**Thermal Inactivation and Survival of *Listeria monocytogenes* in Milk Powder and Surrogate Suitability of *Listeria innocua* and *Lactobacillus plantarum***
180	**Misumi Sano** Mentor: Jeremy Jewell	**Extracellular ATP is an Essential Signaling Molecule Conserved from the Most Ancient Plants, Bryophytes**
158	**Shi Tan** Mentor: Rita Fuchs	**The Role of The Dorsal Hippocampus in Early-Stage Cocaine-Associated Memory Reconsolidation**
223	**Chasity Trammell** Mentor: Anthony Nicola	**Effect of the Proteasome Inhibitor Bortezomib on Herpes Simplex Virus Infection of Primary Human Fibroblasts**
47	**Kyle Tucker** Mentor: Hanjo Hellmann	**Investigating Functionality of Proteins Controlling Stability**
190	**Kyrah Turner** Mentor: Michael Konkel	***Campylobacter jejuni* Adapts to Life in the Intestine**
176	**Karen Vo** Mentor: Jeffrey Jones	**Understanding the Substrate-enzyme Interactions of Aldehyde Oxidase-catalyzed Reactions**
196	**Trenton Williams** Mentor: Dmitri Tolkatchev, Alla Kostyukova	**Expression and Purification of Chimeric Tropomyosin Peptides for Binding Site Identification**

Organismal, Population, Ecological, and Evolutionary Biology

Poster No.	Presenter	Title of Abstract—Organismal, Population, Ecological, and Evolutionary Biology
153	**Sean Alexander** Mentor: Mark Swanson	**Multiscale Analysis of Forest Neighborhood Characteristics of Different Size Classes of Pacific Yew Trees in an Old-growth Pseudotsuga-Tsuga Forest, Southern Washington Cascades**
183	**Madison Armstrong** Mentor: Mark Dybdahl	**The Evolution of Plastic Expression as an Explanation of Invasion Success**
107	**Katelyn Bartleson** Mentor: Ray Lee	**Using analysis of Whisker Stable Isotopes to Investigate Predation by California Sea Lions (*Zalophus californianus*) on Endangered Chinook Salmon (*Oncorhynchus tshawystcha*) at Bonneville Dam Fish Ladders**
154	**Kayla Beechinor** Mentor: Michael Pumphrey	**Development of Fine Mapping Populations for Cloning Yield Contributing Genes in Wheat (*Triticum aestivum L.*)**
66	**Casey Beksinski** Mentor: Amber Adams-Progar	**Effects of Feeding Celmanax on Cow Colostrum Quality and Calf Growth**

Poster No.	Presenter	Title of Abstract—Organismal, Population, Ecological, and Evolutionary Biology
195	**Jenna Chapman** Mentor: Meghan Camp, Lisa Shipley	**Home Range Size Analysis of American Pikas at Craters of the Moon National Monument And Preserve**
24	**Corey Connors** Mentor: Caren Goldberg	**Basking Behavior at Ponds of Post-Breeding Columbia Spotted Frogs (*Rana luteiventris*) in Relation to Environmental Conditions and Predator Presence (*Thamnophis sirtalis*)**
108	**Macy Cornmesser** Mentor: Holly Neibergs	**Identification and Validation of Loci Associated with Bovine Respiratory Disease Susceptibility in Holstein Calves**
126	**Samantha Dohrman** Mentor: Heather Watts, Ashley Robart	**The Effects of Food Restriction on Behavioral Indicators of Facultative Migration in Pine Siskins**
58	**Corydon Funk** Mentor: Naidu Rayapati	**Effect of Tobacco Ringspot Virus (TRSV) on Vine Growth and Wine Quality**
41	**Maddison Gostin** Mentor: Brendan Walker	**Negative Affective-like Cues and Escalated Alcohol Consumption in Mice**
32	**Joseph Hall** Mentor: David Lin	**Comparison of Bipedal Hopping Strategies of Kangaroo Rats on Solid versus Granular Terrain**
79	**Gerardo Herrera Birrueta** Mentor: Wipawee Winuthayanon	**Estrogen Action in the Epithelial Cell of the Mouse Vagina Regulates Neutrophil Infiltration and Vaginal Tissue Integrity**
199	**Samantha Kallinen** Mentor: Joanna Kelley, Andrew Storfer, Alexandra Fraik	**Validation of Candidate Genes Under Selection by the Environment Through Gene Expression Analyses in Tasmanian Devil Populations**
75	**Maadhanki Kasimanickam** Mentor: Raymond Quock	**Efficacy of Oxygen and/or High Atmospheric Pressure to Alleviate Morphine Withdrawal Syndrome**
94	**Sarah Kehr** Mentor: Omar Cornejo	**Exploring the Role of Selection on the Innate Immunity in the Malaria Vector, *Anopheles gambiae***
134	**Leandro Lessin** Mentor: Daniel Thornton	**Impact of Anthropogenic Activity on the Activity Patterns of Sympatric Mammals in Washington State**
49	**Bryce Magee** Mentor: Chris Connolly	**Physical Activity Perceptions and Behavior of Pregnant Women with Past Miscarriage and Infertility Experiences**
6	**Teva Mayer** Mentor: Raymond Lee	**An Investigation of UV Cues Exhibited by *Macrodactyla doreensis* Anemones**

Poster No.	Presenter	Title of Abstract—Organismal, Population, Ecological, and Evolutionary Biology
4	**Angeliqua Montoya** Mentor: Stephanie Porter	**Retention of the Symbiosis Island in a Mesorhizobium population**
165	**Eric Navarro** Mentor: Erica Crespi	**Retention of Learning Through Life Stages in *Xenopus laevis***
120	**Grant Nelson** Mentor: Amit Dhingra	**Identification of Vaccinium Hybrids Using SSR Markers**
177	**Acacia Neveux** Mentor: Amber Adams-Progar	**The Effect of Colostrum Quality on Calf Heath and Pathogenic Transmission**
126	**Madeleine O'Connor** Mentor: Heather Watts, Ashley Robart	**The Effects of Food Restriction on Behavioral Indicators of Facultative Migration in Pine Siskins**
187	**Cassidy Peru** Mentor: Chandra Jack	**The Modification of a Ministat to Measure Ammonia Production in Response to Altered Carbon Concentrations in *Azotobacter* Populations**
203	**Claire Popke** Mentor: Raymond Evans	**What's in the Soil—Invasive Earthworms and their Effect on Soil Organic Matter Beneath Indigenous and Non-native Grasses**
88	**Coleman Schnebly** Mentor: Amit Dhingra	**Evaluation of Apply Hybrid Selections for their Potential Use for Cider Production**
49	**Gretchen Stolte** Mentor: Chris Connolly	**Physical Activity Perceptions and Behavior of Pregnant Women with Past Miscarriage and Infertility Experiences**
148	**Emaly Suarez** Mentor: Holly Neibergs	**Loci Associated with Pregnancy Loss in US Holstein Heifers using Imputed and Actual Genotypes of 777,962 Single Nucleotide Polymorphisms**
20	**Janelle Thomas** Mentor: Ryan McLaughlin	**Effects of Prenatal Cannabis Vapor Exposure on Anxiety-like Behavior**
140	**Jewel Toenges** Mentor: Holly Neibergs	**Identification of Loci Associated with Embryonic and Fetal Loss in Holstein Heifers**
39	**Alexis Torp** Mentor: Pete Jacoby, Xiaochi Ma	**Deficit Irrigation in Grapevines**
159	**Ana Trejo** Mentor: Jesse Brunner	**Reactivation of Quiescent Ranavirus Infections in Xenopus**
41	**Jaimalynne Ventura** Mentor: Brendan Walker	**Negative Affective-like Cues and Escalated Alcohol Consumption in Mice**

Poster No.	Presenter	Title of Abstract—Organismal, Population, Ecological, and Evolutionary Biology
100	**Alexandria Wahl** Mentor: Holly Neibergs	**Genome Wide Association Analysis of Miscarriage after d35 of Gestation in Holstein Heifers using the Illumina GGP50 BeadChip**
235	**Collin Warrick** Mentor: Ryan McLaughlin	**Effects of Prenatal Cannabis Vapor Exposure on Cognitive Flexibility**
191	**Jay-J Yarbrough-Jones** Mentor: Bertrand Tanner, Jennifer Eldridge	**Therapeutic Potential for Improving Mobility and Exercise Performance in a Mouse Model of Limb Girdle Muscular Dystrophy**

Social Sciences

Poster No.	Presenter	Title of Abstract—Social Sciences
152	**Jamie Adams** Mentor: Matthew Bumpus, Eleanor Dizon	**Parent-Student Conversations in Response to a Student Conduct Violation**
246	**Norah Alaqeel** Mentor: Raihan M Sharif	**Perception**
218	**Jenna Anderst** Mentor: Mark VanDam	**Linguistic Type-frequency in Young Children With and Without Hearing Loss**
236	**Maria Barrera** Mentor: Masha Gartstein	**Studying Infant Temperament: Effect of Maternal Pregnancy-related Anxiety**
25	**Kelsey Byus** Mentor: Matthew Unangst	**The Effects of Religious, Ethnic, and Political Unrest on Human Trafficking in Nigeria**
197	**Brenden Campbell** Mentor: Kara Whitman	**Strategies and Effectiveness of Education and Outreach on PCB Awareness and Action in the Spokane River Basin**
8	**Elle Carroll** Mentor: Yujung Nam	**Mending with Music**
101	**Tommy Conway** Mentor: Clif Stratton	**Colonial Past Sheds Light on Modern Strife in South Sudan**
161	**Haley Delgado** Mentor: Amy Nusbaum, Paul Whitney, John Hinson	**The Effects of ACES on Cognitive Control**

Poster No.	Presenter	Title of Abstract—Social Sciences
1	**Kacie Dominici** Mentor: Steven Fountain	**Historical Curricula Reform: A Comparative Analysis of Montana, Oregon, and Washington State Initiatives**
215	**Emily Fogarty** Mentor: J. Shannon Neibergs	**The Economic Effectiveness of Livestock Risk Protection**
135	**Kaylee Fontes** Mentor: Julie Kmec	**How Facebook Users Evaluate the Information They See**
62	**Justin Frow** Mentor: Robert Fellows	**The Effects of Adverse Childhood Experiences on University Students**
184	**Veronica Garcia** Mentor: Anne Cox	**Examining Mindfulness and Body Image in the Context of Yoga**
14	**Mary Anne Gebhart** Mentor: Chan Mi Hwang	**Examining Functional, Expressive, and Aesthetic Consumer Needs for Maternity Hospital Gowns**
83	**Samantha Gottlieb** Mentor: Cristina Wilson	**A Cost-benefit Approach to Motivated Top-down Control**
33	**Seth Hartman** Mentor: Anna Deighton, Mary Stohr	**How the Legalization of Marijuana Has Impacted Law Enforcement**
228	**Dalia Hernandez Farias** Mentor: Brenda Barrio, Ashley Boyd	**Native American Curriculum: Examining Teacher Perception and Implementation in Washington State**
162	**Sophia Hilsen** Mentor: Matthew Bumpus, Eleanor Dizon	**Anticipating the Transition to University: Parents' Concerns and Values**
162	**Aaliyah Hong** Mentor: Matthew Bumpus, Eleanor Dizon	**Anticipating the Transition to University: Parents' Concerns and Values**
95	**Madeleine Hunter** Mentor: Ken Faunce	**Arbitrary Detention in the United States**
136	**Nhu Huynh** Mentor: Maureen Schmitter-Edgecombe	**Night Out Task**
38	**Alexis Jackson** Mentor: David Leonard	**Incomprehensible Black Survivors; Rape, Rape Culture, and the Struggle for Visibility**
162	**Chen Jiang** Mentor: Matthew Bumpus, Eleanor Dizon	**Anticipating the Transition to University: Parents' Concerns and Values**

Poster No.	Presenter	Title of Abstract—Social Sciences
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33	**Rachel Jones** Mentor: Anna Deighton, Mary Stohr	**How the Legalization of Marijuana Has Impacted Law Enforcement**
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Showcase for Undergraduate Research and Creative Activities 2018

Abstracts

Poster # 1

Historical Curricula Reform: A Comparative Analysis of Montana, Oregon, and Washington State Initiatives

Presented by: Kacie Dominici

Mentor: Steven Fountain **Campus:** Vancouver

Major: History

Category: Social Sciences

This research project details and analyses the modern historical curricula reform initiatives in Montana, Oregon, and Washington State. Previous research into the Washington State Senate Bill 5433, the mandate to add Native American perspectives to the K-12 curriculum, laid the groundwork for this project. The implications of this reform are extensive; Native and non-Native students, their families, and their communities benefit in many vital ways. However, the reform is complicated and requires the development of problem-solving methodologies and extensive multi-cultural communication. This research seeks to build a roadmap, based upon the successes and complications of these three western states, to offer considerations as the reform begins to extend nationwide. Both Native and non-Native perspectives are explored and integrated to produce a strategic, multi-disciplinary approach to new reform initiatives. Educators and state officials also weigh in on the real-world application of the reform in classroom settings and state agencies. This research is important to universities, school districts, teachers, students, and families as the states of the Pacific Northwest lead the way to integrating diverse cultural perspectives and histories into the way we teach American history.

Poster # 2

Development of High-Speed Sintering 3D Printer

Presented by: Hunter Jarrett, Kyle Stenersen

Mentor: Hua Tan **Campus:** Vancouver

Major: Mechanical Engineering

Category: Engineering and Physical Sciences

Co-authors: Peter Rylander, Chris Stanly, Michael Toomey

Our research is to study the potentially revolutionary technology of inkjet-assisted high-speed sintering (HSS) 3D printing process. HSS printing implements an inkjet print head to deposit radiant heat absorbent inks in a desired pattern on a bed of powder (polymer or possibly even metal), then infrared lamps are used to apply heat, sintering only the powder that was printed on. By repeating this process with additional layers of powder an entire complex geometry can be constructed.

The objectives of this research project are two-fold: First the team sought to design, build, and control a small scale HSS 3D printer of its own. Next the goal is to investigate the variables involved in the process and develop process parameterization that will prove valuable to the advancement of the technology.

Currently, the team has successfully constructed a functioning prototype printer that can autonomously produce simple 3D printed polymer bars. Realization of this has involved developing an understanding and sufficient design of several complicated components, key to the process. For example, a printer structure had to be designed that could support printing components and maintain critical build chamber temperatures. Additionally, a traditional inkjet printhead had to be retrofitted and controlled to allow for precise deposition of the IR absorbent ink. Another key element was the incorporation of a controllable infrared lamp to provide sufficient sintering energy for printing. Perhaps most importantly was the implementation of microcontrollers and the corresponding code to manipulate all the different printer elements and automate them as a cohesive unit.

Although refinement of the final printer product is still in progress, the team has initiated the second stage of the project by conducting some material testing on the parts printed up to date. The preliminary data acquired from these tests indicate tensile strengths approximately half of predicted, confirming the need for refinement of the machine and process. In the future, the team will focus on improving the printer to a state where it can produce parts of expected quality and strength. From which point the team can truly begin investigating process parameterization.

Poster # 3

The Covenant of Salt: The History of Salt Production and Consumption in Jamaica

Presented by: Alyssa Sperry

Mentor: Candice Goucher **Campus:** Vancouver

Major: Anthropology, History

Category: Social Sciences

This project explores the history of salt production and use in Jamaica based on multidisciplinary research that analyzes the parallel connections of slave ownership, sugar plantation growth, and salt production, with methods of examining geographic surveys, exploration of the island, and archival research. Specifically, my work illustrates that salt was produced locally as a key commodity for dietary and economic purposes, closely linked to slavery and Caribbean sugar plantations, during the Atlantic slave trade era (15^{th} -19^{th} centuries). This project extends the importance of commodity research on the role of sugar initiated by Sidney Mintz, suggesting that salt was equally critical in its underpinnings of the trade in foodstuffs. Salt became critical in maintaining the slave trade, through its role in food production and the economic trade of people and goods. The "covenant" of salt refers to the colonial commitment to expand salt and the extreme efforts taken to gain access to the valuable commodity. My work also analyzes the evolution of the salt industry after emancipation in 1834, by examining contemporary large and small-scale salt production and the potential market for artisan salts based on Jamaican salt's chemical make-up in comparisons to other top selling salts known for their mineral composites. Despite salt's changing meanings, this project demonstrates that salt maintained its importance as a dietary and economic commodity, as global conquest took place.

Poster # 4

Retention of the Symbiosis Island in a Mesorhizobium population

Presented by: Angeliqua Montoya

Mentor: Stephanie Porter **Campus:** Vancouver

Major: Biology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Emily Helliwell, Amanda Khosravifar

The symbiotic association between rhizobium soil bacteria and leguminous plants is ecologically and agriculturally significant, and is a powerful model of mutualism. Rhizobia can fix atmospheric nitrogen into a usable form within root nodules for a plant partner in exchange for photosynthetic carbohydrates. In the genus *Mesorhizobium*, the genes required for initiating and maintaining symbiosis with a host, are clustered on a Symbiosis Island (SI) that is integrated into the bacterial chromosome. Researchers have revealed that the SI may be ejected from the bacterial genome in a single mutation activated by a population density response, and loss of the SI transforms a cooperative strain into a commensal or antagonist that is no longer able to engage in nitrogen-fixing symbiosis with a host plant. This research investigates *Mesorhizobium* strains that were collected from *Acmispon wrangelianus* root nodules in California. Genome sequencing revealed that some strains lacked a SI despite being housed within root nodules, prompting the question of whether the loss of the SI we observe in some wild strains is a laboratory artifact due to our culturing methods. To evaluate whether the SI within *Mesorhizobium* strains is stable or subject to loss under the culture conditions used, we selected eight SI+ strains and four SI- strains as negative controls to undergo successive rounds of culturing mimicking conditions under which strains were isolated and cultured prior to genome sequencing. These cultures were plated for single colonies to use as template DNA in a PCR assay consisting of *NodA* and *16S* primer sets, to test for island presence or absence, and the 16S rRNA locus on the main *Mesorhizobium* chromosome was used as a control. Results of 25 isolated colonies per strain show no symbiosis island loss after 4 weeks of serial transfer [~45-170 generations], and these findings suggest that the SI negative strains we found in nodules from the field are not artifacts of our culture and conditions. This also supports that strains that lack the SI may inhabit nodules in the host plant in nature, sparking further research questions about loss or gain of cooperative genes in wild *Mesorhizobium* populations.

Poster # 6

An Investigation of UV Cues Exhibited by *Macrodactyla doreensis* Anemones

Presented by: Teva Mayer

Mentor: Raymond Lee **Campus:** Pullman

Major: Zoology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Colorful and attractive patterning is exhibited by a multitude of organisms to facilitate mutualistic interactions, and while humans can observe some of these patterns, many animal visual systems exceed our limited vision and spectral sensitivity. Ultraviolet absorption and reflectance in flowers, for example, are seen as "landing spots" and "nectar tunnel guide" patterns for pollinators. Investigations regarding UV reflectance and fluorescence in anemones have revealed several species capable of similar patterning. The symbiotic relationship as illustrated between the anemone and the anemonefish, more commonly known as the clownfish, is one of obligate mutualism. Anemonefish choice of anemone host is known to be influenced by health and chemical cues. Given new studies, which confirm the ability of tropical fish to register ultraviolet light, it is also possible that UV signals factor into anemonefish-anemone host selection. If this is the case, studies can begin in which UV reflectance is manipulated or anemonefish host-choice preferences are tested. This research proposes that tropical anemones reflect patterns in UV wavelengths, possibly for host attraction. A Nikon D70 camera with a UV compatible lens was used to take still images of various sized and aged Macrodactyla doreensis, also known as Long Tentacle Anemone, from every angle. These images were rendered in the UV spectrum and their reflectance was quantified through the use of ImageJ software. Host choice directed by potential UV patterning is significant in understanding the complexities of anemonefish, anemone, and anemone algae symbiosis, which share a highly evolved relationship that occupies several levels of behavioral and metabolic connectivity. Such research is integral to protecting threatened tropical reef ecosystems and microhabitats where highly evolved relationships may have low resilience to environmental change.

Poster # 7

High-speed Aluminum Friction Stir Welding and Its Mechanical Properties

Presented by: Cory Palmieri

Mentor: David Field **Campus:** Pullman

Major: Mechanical Engineering

Category: Engineering and Physical Sciences

Co-authors: Jingyi Zhang

High-Speed Aluminum Friction Stir Welding (FSW) is a process that lowers the expense of the welding process and produces weld structures with superior mechanical performance. To further help reduce the expenses of the FSW process, the lower end piece of the weld will be analyzed for further usage. The presence of an exit hole at the end of the weld from which the probe was withdrawn is often quoted as a disadvantage. The end piece of the weld is typically overlooked for its potential that might be included within a design. A proposed consideration with the end pieces is to develop a method to recycle this part to another component of a design. To better understand this important industrial process, the properties of the weld must be fully characterized. Using the Scanning Electron Microscope (SEM) and Vickers Hardness Tester, this study further clarifies the formation and resulting properties of the piece. The end pieces of the weld could be useful in applications as indicated by microstructure and strength. It would benefit companies by providing a green resolution to material waste and be financially instrumental as the recycled pieces would contribute to a design.

Poster # 8

Mending with Music

Presented by: Elle Carroll

Mentor: Yujung Nam **Campus:** Pullman

Major: Social Sciences: General Studies

Category: Social Sciences

Under the guidance of Dr. Yujung Nam, I collected evidence on people's individual experience with the usage of music and when made to think about it, if it could be considered therapeutic. There were a few different viewpoints, but the two main ideas were that music can be therapeutic when self-administered or when administered in legitimate therapy sessions. My hypothesis for the project was to reach the conclusion through a wide array of data, that when music is listened to, it will be therapeutic because whether administered in legitimate therapy sessions or on an individual level, music can heal people. I collected data by using a survey with a wide variety of questions based around listening to music to determine an outcome to this hypothesis. This survey was used to make people consciously think about how they use music and how music affects them.

Poster # 9

3-D Depth Reconstruction from Multiple Equally-spaced Images

Presented by: Kyler Little

Mentor: Mark Kuyzk, Elizabeth Bernhard **Campus:** Pullman

Major: Computer Science, Mathematics

Category: Computer Science, Mathematics, Statistics, and Information Sciences

Introduction: The focus of this research project was to create an imaging system that produces a scaled topographical map of any real-life object, and to quantitatively determine the limits of such a system.

Method: Because of the physics behind the thin-lens equation, we know that at a certain distance from a lens (i.e. the focal length), whatever is at that distance is in focus. So, if we're able to determine when a pixel of an image is in focus, then we already have a distance associated with it: the focal length. Therefore, we can vary a camera's height at a measureable rate, take images at a specified frequency, and record the distances for which a pixel is in focus. In the end, these distances and their corresponding physical location coordinates can be stitched together to produce a scaled topographical map of the object. In order to determine when a pixel is in focus, a twist on the Variance of the Laplacian method was implemented. In order to resolve discrepancies between the changing fields of view (caused by the moving camera), resizing and smart-cropping techniques were applied.

Results: Firstly, it was determined that varying the resizing and smart-cropping features had a negligible impact on the output of the program. Secondly, the system was able to recover shape and approximate depth accurately.

Conclusion: The first result implies that no apparent physical limit exists to prevent such a technique from working proficiently, but the second result means that more work is needed. Specifically, future research should:

(i) account for the curvature of the lens to more accurately determine location coordinates,

(ii) experiment with other focus detection methods,

(iii) utilize a much higher quality camera (still with fixed focal length), and

(iv) improve computational efficiency / manage dependencies better.

Poster # 13

Cannabis as an Alternative Anticonvulsant Therapy for Pregnant Women with Seizure Disorders

Presented by: Rachel Davis

Mentor: Joann Dotson, Janessa Graves **Campus:** Spokane

Major: Nursing (BSN)

Category: Applied Sciences

Seizure disorders are a prevalent and growing concern for adults in the United States. It is estimated that there are three million adults living with an active seizure disorder, one million of which are women of childbearing age. Pregnant women with a seizure disorder prove to be a difficult population to treat. The majority of antiepileptic drugs (AEDs) used in the treatment of seizure disorders have well documented teratogenic risks, both in terms of congenital malformations and/or neurodevelopmental abnormalities. Pregnant women with seizure disorders face the dilemma of deciding whether to continue their medication despite the risks posed to a developing fetus, discontinue their medication and suffer an increase in seizures, or trial alternative methods of seizure management. Cannabis has been used in the management of seizure disorders documented back several thousands of years. Recent evidence indicates that it is particularly efficacious in the management of treatment-resistant epilepsies, conditions which have historically been treated with a cocktail of the more teratogenic AEDs. In utero exposure to cannabis has been linked to neurodevelopmental abnormalities in a dose-dependent manner, though to date has not been linked with major congenital anomalies. The purpose of this project is twofold. First, to examine if the benefits of using cannabis as an anticonvulsant during pregnancy outweighs the potential negative birth outcomes of AED use during pregnancy when both methods of management are sufficient in controlling the mother's seizures. Second, to highlight deficits in the data which are necessary in developing practice guidelines surrounding the use of cannabis as an alternative anticonvulsant therapy for pregnant women with a seizure disorder.

Poster # 14

Examining Functional, Expressive, and Aesthetic Consumer Needs for Maternity Hospital Gowns

Presented by: Mary Anne Gebhart

Mentor: Chan Mi Hwang **Campus:** Pullman

Major: Apparel, Merchandising, Design & Textiles

Category: Social Sciences

Co-authors:

There is great dissatisfaction with maternity hospital gowns among laboring and postpartum women. The current designs are physically and emotionally uncomfortable, not functional, and revealing throughout different stages of labor, which dehumanizes patients. Therefore, the purpose of this study was to examine consumer needs and conduct market analysis to propose design options for maternity hospital gowns. Specific research questions include a) what are functional, expressive, and aesthetic needs for maternity hospital gowns? and b) what are pros and cons of design attributes for current maternity gowns?

Functional, Expressive, and Aesthetic (FEA) consumer needs design framework was adopted for this study to improve patients birthing experience throughout different stages of labor. The FEA framework suggests that all three dimensions should be taken into consideration while addressing consumer wants and needs for functional design (Lamb & Kallal, 1992). The framework was originally developed to examine functional clothing for consumers with special needs and was proposed for multipurpose intentions in apparel design.

To answer the research questions, an online survey with both closed and open-ended questions was conducted with a convenience sampling method. A total of 46 women from the Pacific Northwest participated in the survey. The results showed that functional needs include comfort, mobility, hassle-free breastfeeding, and easy skin-to-skin contact with the newborn. Aesthetic needs include pleasing colors and cut while expressive needs include modesty and self-esteem. Modesty, especially was one of the most important factors for the laboring and post-partum women as more than 50% had unexpected guests or medical personnel during their labor. In terms of discomfort of current gowns, the participants indicated that fabric felt itchy and rough, the back opening was too revealing, neckline was too high, and feeding was difficult making the entire gown physically and psychologically uncomfortable. Based on the results, the FEA needs are translated into technical design attributes and the project further proposed new design options for maternity gowns.

Poster # 15

Born Under A Dark Star: Telling a Story with Comics

Presented by: Adam Whittier

Mentor: Robert Franklin **Campus:** Tri-Cities

Major: Digital Technology and Culture

Category: Arts and Design

Background:

In the spring of 2016, I presented a paper at the RCI conference in Pullman. When I mentioned to one of the graduate students that I drew cartoons, he told me that there were multiple comics collections in the Holland & Terrell Libraries' archives. Intrigued, I worked with Robert Franklin (who had catalogued these comics) to bring some of this work to WSU Tri-Cities. In April of 2017, I curated an art show of these works, called *A Life Underground: Exploring WSU's Alternative Comix Collection*. Of the two collections we pulled from, one was established by Steve Willis (a cartoonist and former WSU librarian), and the other by the family of the late Lynn Hansen (a comics collector). Steve attended the show's opening, and hinted that he would love to tell us Lynn's story. Through interviews and documents provided by Steve, I am working on a comic book about Lynn Hansen's life and death, which will be 28 pages long and feature original drawings, correspondence, and photos.

Deliverables:

The comic will still be in progress during the conference, so I will present a poster on the research- and comics-making process. The poster will detail how one takes information and distills it into comics form in-general, and how that played out in this project specifically. It will also include images from the art show, rough drawings and scripted pages from the comic, original research documents, and finished artwork examples.

Significance:

As a Digital Technology and Culture student, I am very interested in forms of communication, visual art, and areas where the two overlap. The small-press comics scene that Steve and Lynn were a part of relates to all of these. By telling this story visually with comics, I am able to both explore and pay tribute to an exciting and constantly-evolving medium.

Poster # 16

A Statistical Analysis of the Periodical Cicada (*Magicicada septendecim*) to demonstrate Mean, Median, and Bilateral symmetry within a Population

Presented by: Dustan Cwick

Mentor: Richard Zack **Campus:** Pullman

Major: Materials Science and Engineering

Category: Computer Science, Mathematics, Statistics, and Information Sciences

We took 1,500 measurements from an Ohio population of the periodical cicada (*Magicicada septendecim*) to find mean and median calculations. These were used to develop empirical rule (mean) which, are shown with histographs. Box and whisker plots (median) demonstrate a different examination of this population. We examined the bilateral symmetry of the cicada with measurements of eye diameter and wing length from both left and right sides of the insect. We also measured the width of the thoracic plate and the distance between the eyes to develop a base line for how accurate measurements were while using a digital caliper. We measured a total of 50 insects and six different characteristics of interest, for a total of 300 measurements. To reduce human error, 5 measurements for each body part were averaged and consolidated to 1 point on the graphs. Hence, 1,500 measurements were reduced to 300 in order to compile a more accurate representation of the population data, while reducing errors. The graphs shed some light on the skewness or normality of each of the samples: left eye diameter, right eye diameter, left wing length, right wing length, width of the thoracic plate, and the distance between the eyes. Similarly, the box and whisker plots and histograms show the visual aspect statistics, making it easier to understand than strict numerical data.

Poster # 17

Estimating the Growth Kinetics of Cytotoxic T lymphocytes used in Adoptive Immunotherapy of Cancer

Presented by: Monika Cewe

Mentor: Bernard Van Wie, Baran Arslan **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Co-authors: Gaber Abdellrazeq, Bill Davis, Mahmoud Elnaggar

This research is consistent with the forefront of cancer therapy with providing therapeutic T cells, which have been proven to destroy cancer cells to effectively treat cancer by identifying and destroying target cancer cells in malignant tumors. One of the major hurdles in cytotoxic T lymphocytes (CTL) cancer immunotherapy is to regulate T cell production, therefore therapy consists of growing large number of T cells in vitro and then administering the cells to a patient. One of the major drawbacks in CTL cancer immunotherapy is to regulate T cell production to be able to grow large number of T cells in vitro and then administering the cells to a patient. In order to maximize the growth, a kinetic model will be used to estimate the growth rate dependence on the concentration of substrates such as glucose and metabolites including lactate and ammonium ion is needed. It is well known that increasing lactate and ammonium ion concentrations not only affect the growth rate but also result in lower pH, which further slows down the cell proliferation. Yet, there has not been enough research on the kinetic modeling of CTLs' growth. The main goal of this study is to develop a kinetic model of CTLs isolated from an animal model for a high population density. This will be achieved by determining the rate of formation of secreted waste products such as ammonium and lactate and the consumption rate of glucose in the cell culture medium. Once all factors are known, a kinetic model will be developed for CTLs to be able to maximize their growth in vitro.

Poster # 18

Latino/a College Student's Transition Experiences: Collectivism to an Individualistic Culture

Presented by: Lysandra Perez

Mentor: Monica Johnson **Campus:** Pullman

Major: Psychology, Sociology

Category: Social Sciences

Despite rising educational attainment, Latino/as remain least likely to complete bachelor's degrees. Latino/a student's face many challenges and barriers in their educational careers, including encountering different institutional cultures. This study examines the new challenges Latino/a students, often from collectivistic backgrounds, experience when transitioning to an individualistic college campus setting at a predominantly white institution. Results suggests there are cultural transition experiences that exist which influence first generation Latino/a student's experiences in college. The study informs the design of additional workshops in existing TRIO programs to help students find strategies in acculturating to an individualistic cultural environment.

Poster # 19

Dogmatism: The Result of Inequality

Presented by: Cody Goodan

Mentor: Ken Faunce **Campus:** Pullman

Major: Chemistry

Category: Humanities

Dogmatism has historically been seen in a negative light. In World War II, Nazi soldiers followed Adolf Hitler almost fanatically, and at the turn of the 20th century leading contributors to science held steadfast to their beliefs in classical physics, unwilling to change, which stunted scientific advancement. However, the connotation to the word holds far too much meaning. Simply, dogmatism is bred through past experience and the words from respected individuals. Through fear-mongering and hyperbole, Hitler gained the support of his soldiers, while the failed experiments and lack of scientific fluidity of the well-respected researchers kept scientific advances from being accepted. Dogmatism may not always be founded in pure logic, but there are reasons that spur each dogmatist toward their beliefs. The experiences and stories of each dogmatist have formed into assumptions that they subconsciously bring into future encounters. While there are many sources from which these assumptions can form, one of the most potent is inequality. While inequality itself stems from a certain amount of dogmatic nature from the oppressing party, the poor experiences felt by the victims of inequality can shape some dangerous assumptions that do not realistically allow for progression from the low point at which both parties reside. Given where these assumptions stem from, one cannot fault the holder for having them. The problem with dogmatism is not simply the fact that people hold strongly to certain beliefs. Rather, the danger presents itself based on what the people do with those beliefs. The connotation of dogmatism finds its foundation on the idea that people take these beliefs and act on them in a negative fashion. What is uncommonly seen historically but is necessary for societal progression is the recognition of these assumptions and acting accordingly to them. While simply not holding assumptions would be ideal, it is extremely improbable that anyone with any experiences would not subconsciously develop certain assumptions in the future. Rather, people need to accept that these assumptions will be in play and recognize when they are tainting potential societal changes.

Poster # 20

Effects of Prenatal Cannabis Vapor Exposure on Anxiety-like Behavior

Presented by: Janelle Thomas

Mentor: Ryan McLaughlin **Campus:** Pullman

Major: Animal Sciences

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors:

Cannabis is the most commonly used illicit substance among one of the most vulnerable populations for neurodevelopment- pregnant women; however, the long-term risks to offspring remain largely unknown. With recreational cannabis laws now in effect sprinkling across the country, concerns arise that prenatal cannabis exposure could increase dramatically in the coming years. We must begin to understand the impact of maternal cannabis exposure on emotional behavior, and more specifically the response stress in the environment in subsequent offspring.

We investigated whether chronic exposure to vaporized cannabis in utero influenced the predominance of anxiety-like behavior in male and female offspring. Female dams were passively exposed to vaporized cannabis extract (400 mg/mL; 1 puff every 2 minutes for 1 hour, twice daily) or vehicle vapor throughout mating and gestation. A cohort of adult offspring from these dams were tested for anxiety-like behavior in the elevated plus maze (EPM) and novelty-suppressed feeding (NSF) tests. In the EPM, a 'T-shaped' maze maintained two exposed and two closed arms. The subjects were monitored via video camera, and total time spent exploring the exposed arms of the maze in contrast to the closed arms were compared amongst the groups. In the NSF test, several familiar peanut butter chips were placed in the center of a novel open field at the beginning of the test session. Each subject was placed in the novelty field individually, recorded via video camera. The latency to approach and time required to eat the peanut butter chips was recorded.

Preliminary results showed prenatal cannabis exposure individuals spent more time in the open arms, indicative of reduced anxiety-like behavior. There was a tendency for cannabis-exposed male rats to show an increased latency to approach and eat the peanut butter chips, while cannabis-exposed female rats showed more curiosity and reduced latency to approach/eat the familiar chips.

These data indicate that prenatal cannabis exposure facilitates exploration of anxiogenic environments in adulthood, possibly in a sex-specific manner. However, these data are still preliminary (n=4-6/group/sex), and ongoing studies are aimed at replicating and extending these findings to provide adequate analysis of potential sex differences in these endpoints.

Poster # 24

Basking Behavior at Ponds of Post-Breeding Columbia Spotted Frogs (*Rana luteiventris*) in Relation to Environmental Conditions and Predator Presence (*Thamnophis sirtalis*)

Presented by: Corey Connors

Mentor: Caren Goldberg **Campus:** Pullman

Major: Wildlife Ecology and Conservation Sciences

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Travis Seaborn

Animal behaviors vary by season to maximize individual survival. I studied seasonal patterns of basking behavior in the Columbia spotted frog (*Rana luteiventris*) in relation to a common predator (*Thamnophis sirtalis*), the common garter snake. To explore this relationship, I conducted hourly surveys of two ponds at Virgil Phillips Farm near Moscow, Idaho. I recorded the number of adult and juvenile frogs found, number of snakes present, air temperature, humidity, and water temperature over the course of 70 days starting May 22 and ending July 30, 2017. Breeding of *R. luteiventris* occurs in March through April and these surveys started in late May when tadpoles were beginning the growth season and ended shortly after juvenile dispersal. Surveys were conducted once an hour, at the beginning of the hour, starting at 9:00 am, for a minimum of nine surveys per day. Each survey lasted about 15 minutes depending on how many individuals were present. Within each day, the number of adult frogs observed decreased as temperatures and presence of snakes increased (R^2 values = 0.43 and 0.26, respectively, p-values $\leq$ 0.0001). The number of snakes observed increased as air temperatures increased (R^2 = 0.24, p-value = 0.0002) and decreased with increasing humidity (R^2 = 0.23, p-value = 0.0001) within each day. The number of snakes observed increased over the time of the study, with peak numbers seen during juvenile frog metamorphosis and dispersal (R^2 = 0.48, p-value = 0.0001). There was a positive relationship between the number of juveniles and the number of snakes observed (R^2 = 0.34, p-value = 0.0001) for each survey. A larger proportion of adult and juvenile frogs were active during the morning surveys (R^2 = 0.07 and 0.13 respectively, p-value $\leq$ 0.0001) while snakes were proportionally more active during the afternoon surveys (R^2 = 0.03, p-value = 0.0001). I speculate that the patterns I saw resulted from each organism trying to maximize their survival. For example, adult frog activity decreased as snake presence increased to avoid predation while snake presence increased with juvenile presence because the juveniles provide a food source for the snakes.

Poster # 25

The Effects of Religious, Ethnic, and Political Unrest on Human Trafficking in Nigeria

Presented by: Kelsey Byus

Mentor: Matthew Unangst **Campus:** Pullman

Major: Nursing (RN to BSN)

Category: Social Sciences

The goal of my research was to uncover a historical timeline of Nigerian events and influential moments to the country's past that created the growing epidemic of human trafficking seen today in this West African country. Civil unrest over religious fundamentalism in Nigeria from 1914 to present day has led to political and ethnic divisions between the north and south regions of Nigeria. These divisions have created violent radical groups that have influenced the issue of human trafficking in Nigeria through the kidnapping of women and children to be used as sex slaves and child soldiers.

My research uncovered the lasting effects of the British indirect rule bestowed upon the Nigerian people before they gained their independence. Through the use of indirect rule the British were able to create a great divide between the Muslims and Christians of the nation. Later on in history this divide has proven to be the underlying root of the country's many issues. Throughout the nation's history many constitutions have been created and later destroyed by military coups such as the coup d'état which later led to a civil war amongst the northern and southern groups (the Igbo and Hausa-Fulani peoples); and overall extreme governmental dysfunction.

The fight for Sharia Law in the north and Christianity in the south along with influences from various political and religious groups has negatively impacted and led to the growing issue of human trafficking. My research is credited from scholarly books and journal articles found in the WSU library system. My research began by uncovering the general history of the country beginning with Nigeria starting as a Republic under British rule and then gaining their independence. It continued with research on the many pitfalls that came from governing a new nation and ending at the modern day struggles seen with dominating radical islamic groups. My research began to show a pattern of civil unrest amongst the Nigerian people stemming from religion, which coincidentally is what the Boko Haram movement stemmed from. This therefore has lead to the major issue at hand- human trafficking.

Poster # 26

Effect of Human-Calf Interactions on Heifer and Cow Handling Ease

Presented by: Amy Allen, Miriam Montgomery

Mentor: Amber Adams-Progar **Campus:** Pullman

Major: Animal Sciences

Category: Applied Sciences

Washington State Department of Labor and Industries reports that approximately 33% of workers' compensation claims on Washington dairies involve cattle, costing nearly $2.2 million. Most cattle-related injuries can be prevented if handlers receive proper training, but this training mostly focuses only on handling adult cows. Therefore, this poses the question of whether excessive or insufficient handling of dairy calves impacts their ease of handling later in life.

The objectives of this study were to: 1) measure the frequency and type of handling pre-weaned calves receive and 2) determine if human-calf interactions during pre-weaning influence heifer and cow handling ease. Pre-weaned heifer calves from two herds (herd 1: n = 9; herd 2: n = 20) were observed for the first and last week of the pre-weaning period. Human-calf interactions were recorded via video cameras. Observations included the duration and number of interactions. Nine pens of weaned calves (herd 1: n = 3; herd 2: n = 6) were tested for handling ease, and the number of calves that slipped, walked, and approached the handler were recorded by direct observation. An approach test was conducted on lactating cows (herd 1: n = 2; herd 2: n = 3) to record the number of approach, headbutt, and initial contact behaviors.

An interaction for the duration of human-calf interactions was detected between a calf's age and its herd ($P = 0.006$). Calf age or herd did not influence the number of human-calf interactions that occurred. In the weaned pens, walking behavior was negatively correlated with approach behavior ($P < 0.0001$) and approach behavior was positively correlated with slipping ($P = 0.02$). Calves in herd 2 walked more often ($P = 0.03$) and approached less often ($P < 0.0001$) than calves in herd 1. Overall, approach behavior in lactating cows was positively correlated with initial contact ($P = 0.02$) and tended to positively correlate with headbutting behavior ($P = 0.09$). No differences between herds were detected for approach, initial contact, or headbutting cow behavior. The results from this study suggest that calf handing should be considered when developing dairy employee cattle handling training programs.

Poster # 27

Revitalizing Rural Communities

Presented by: Collin Schweikl, Kelli Nicole Young

Mentor: Robert Krikac **Campus:** Pullman

Major: Landscape Architecture

Category: Arts and Design

Co-authors: Kelli Nicole Young

Rural environments, agricultural lands, towns, and communities are in increasing need of the design industry[1]. Issues in rural areas are increasing as people migrate toward urban centers for jobs and larger amenities, in turn destabilizing rural communities[2]. Solutions to these issues surrounding the lack of amenities in rural areas are countless, however, implementation is rare[3]. The issue becomes; how can we increase rate of implementation of the Rural Revitalization Design projects that are so important to the economic and agricultural stability of these communities?

This research focuses on engaging small communities in Revitalization Design projects in order to solve issues related to the desirability of living in said communities. To approach such a broad set of issues, 3 design projects were facilitated over the period of 1 year: the Sauk Suiattle Reservation Expansion project, the College Place Downtown Design Standards and Guidelines project, and the Mattawa Community Center project. The goal of each project is implementation; which means gaining community backing, and assisting the town in acquiring funding (usually in the form of grants from the State of Washington). Engaging the community members in the design process increases the probability for project implementation; because by collecting community members' insight, we gain community backing in a meaningful way[4]. To build these relationships we create workshops to engage the community members during each stage of the design process: concept development, schematic design, and design development. For example, a concept development workshop might include breaking the group in to teams that are tasked with ideation of different parts of a project, each group has a student scribe to sketch and record ideas that can be transcribed into organized data that drive potential schematic design solutions.

The success of each of these projects, and the relationships built between each of the three rural communities and the design industry community lead us to the conclusion that community engagement is the ideal methodology for Rural Revitalization Project implementation.

Poster # 28

Is Hair Cell Regeneration Linked To Evolutionarily Changes Within Protein Sequences?

Presented by: Robby Boney

Mentor: Allison Coffin **Campus:** Vancouver

Major: Computer Science

Category: Computer Science, Mathematics, Statistics, and Information Sciences

Co-authors: Matt Lambert, Rahul Ram, Phillip M. Uribe

Sensory hair cells, critical for hearing, are vulnerable to multiple damaging agents, such as noise and drugs. In humans, hair cell loss is permanent because mammals cannot regenerate lost hair cells, leading to permanent hearing impairment. In contrast, non-mammalian vertebrates exhibit robust regeneration. We set out to characterize amino acid-level differences between regenerating and non-regenerating species, thereby identifying similar protein sequences in regenerators that are not present or altered in mammals and may contribute to differential regenerative capacity. In this study, we queried NCBI for 6032 proteins that have previously been identified as expressed during regeneration in larval zebrafish neuromast supporting cells. Using reciprocal best BLAST hits we identified 3250 proteins as having true orthologs across at most 68 species (20 regenerating species (RS), 48 non-regenerating species (NRS)). Multiple sequence alignments were generated for all associated true orthologs. We then determined the amount of allowable amino acids per aligned site for regenerating and non-regenerating species and calculated the difference between the two groups. We then determined the average difference value per protein and normalized to protein length to calculate the standard deviation of our entire dataset. Using two times standard deviation as a threshold we identified protein sites that exhibit stringent amino acid selection in RS compared to NRS. We then analyzed these conserved sites to determine the overall proportion of each protein that had a large percentage of these stringently selected sites. From this query, gar1 and col6a1 had the highest percentage of stringently selected sites and interestingly have no known role in hair cell regeneration. These results suggest that this method may identify novel genes that are critical for hair cell regeneration.

Poster # 29

Adding Water to the Feed of Formic Acid Decomposition over MoC Catalyst on Graphite

Presented by: Yahya Aldoshan

Mentor: Su Ha **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Co-authors: Jake Gray

Electric field assisted catalysis is an emerging technique for catalytic optimization. In order to make accurate predictions about the effects of an electric field on catalytic processes, formic acid decomposition is used as a model reaction. This is an ideal reaction, because it only has two simple reaction pathways: dehydrogenation ($HCOOH \rightarrow H_2 + CO_2$) and dehydration ($HCOOH \rightarrow H_2O + CO$). Understanding the details of this mechanism is significant so that future researchers can make wise decisions on catalyst optimization during electric field reforming. Therefore, the catalytic decomposition of formic acid was investigated using 2 nm MoC particles supported on graphene as a catalyst. MoC nanoparticles were compared to commercial Mo_2C. In order to verify a key mechanistic step of the reaction, various amounts of water (40, 50, 60, 70, 80, and 90 vol.%) were added to the feed over 0.50 mg of catalyst. Temperature programmed reaction using real-time gas analysis mass spectroscopy was used for these tests by heating the catalyst from 150 °C to 500 °C at a ramp rate of 10 °C/min. These experiments showed that the onset temperature of the reaction decreased in a linear fashion by approximately 100 °C as more water was added to the feed. This data indicates that a controversial key mechanistic step—the rotation of bidentate formate to monodentate formate on the surface—is very likely. This verifies that the reaction is highly dependent on molecular orientation of rate-limiting species, and that the use of an electric field should play a significant role in facilitating the reaction.

Poster # 30

Doping in The Tour de France

Presented by: Emma Ostberg

Mentor: Clif Stratton **Campus:** Pullman

Major: Nursing (BSN)

Category: Humanities

In this project, I argue that advancements in amphetamine development during WWII contribute to the use of performance enhancing drugs within the highly competitive cycling race, the Tour De France today. Due to the rapid push for drug advancements in the 1940s, widely recognized doping methods such as poor drug test conduct, winning-at-all cost attitudes, and athletic fame have come to the attention in the battle of drugs and cycling. WWII propaganda contributes to my argument in that amphetamines were encouraged in combat due to their function boosting effects that impacted fighter pilots during long hours on the job. With increased availability of new steroids, athletes began to seek out drugs to increase their performance. Back then, minimal research had been conducted on the synthetic drugs, so there was no telling what effects amphetamines had on the system. This rapid incline in drug use spread through the competitive French cycling community like wildfire. Cyclists were willing to do anything to be at the top of the racing tier. Famous cyclist Jacques Anquetil openly spoke on behalf of his stimulant usage throughout the extent of his racing career. 5 time Tour de France winner, Anquetil was a high achiever. According to secondary sources Ray Tricker and David Cook, “we honor the winners and ignore the losers.” Typically, successful racers got away with doping due to their athletic fame. Eventually, this had disastrous effects. French cyclist Tommy Simpson died in the middle of the Tour de France in 1967 and was caught with steroids in his system. Drug testing, which began in 1968, had no beneficial effect on racers. Procedures were poor, cyclists cheated on tests by using urine that was not theirs, and typically only race winners were drug tested which did not represent the entire race population who doped. Looking at the contemporary issue regarding European drug doping, clearly the battle is ongoing. Popular names like Lance Armstrong prove that steroid usage is still on the rise. The steroids once deployed to soldiers in the 1940s have gradually progressed to drug abuse in the Tour de France today.

Poster # 31

Herpes Simplex Virus Entry into Primary Human Fibroblasts

Presented by: Ryan McLaughlin

Mentor: Anthony Nicola **Campus:** Pullman

Major: Biochemistry, Microbiology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Anthony V. Nicola, Suzanne M. Pritchard

Herpes simplex virus (HSV) is a ubiquitous human pathogen responsible for significant disease burden worldwide. HSV infection of some cultured cells, such as Vero (African green monkey kidney) cells, occurs via a pH-neutral fusion with the cell surface. Here we report that HSV enters primary human foreskin fibroblasts (HFFs) by a pH-dependent pathway upon exposure of the virus to the low pH environment of the host cell endosome. HFFs were cultured in Dulbecco's modified Eagle's medium supplemented with 10% fetal bovine serum. Incubation of HFFs with the weak base ammonium chloride or the ionophore monensin, both of which elevate the normally low pH of organelles, blocked HSV entry in a beta-galactosidase reporter assay. Inhibition was dose-dependent, and maximum inhibition was approximately 50%. Parallel experiments were performed with Vero cells, and as expected, HSV entry into Vero cells was not inhibited by the pH-altering agents. To ensure that cytotoxicity is not responsible for the obtained results, we plan to use a lactate dehydrogenase release assay to determine whether the inhibitory concentrations of ammonium chloride or monensin used in the experiments were cytotoxic to the HFFs. Because inhibition in HFFs was incomplete, we speculate that HSV entry into these cells also occurs via a pH-independent pathway. The results are consistent with the notion that herpesviruses utilize multiple distinct entry pathways that are dependent on the type of cell encountered.

Poster # 32

Comparison of Bipedal Hopping Strategies of Kangaroo Rats on Solid versus Granular Terrain

Presented by: Joseph Hall

Mentor: David Lin **Campus:** Pullman

Major: Bioengineering

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Craig McGowan

In their natural environments, animals locomote on different terrains that impose different mechanical demands on the musculoskeletal system. Most biomechanical studies to date have used belted treadmills to analyze locomotion behavior due to the control they allow, but this is not a natural surface. Not much is known about adaptation of motor strategies to meet the variation in mechanical demand found in diverse natural terrains.

Of particular interest to our lab are Kangaroo rats, which are bipedal hoppers that encounter both solid and granular (sand) terrains in their natural environment. The primary goal of this study is to conduct a biomechanical comparison of bipedal hopping on solid and granular terrains. The secondary goal is to validate a new tool used to study locomotion on natural terrains. We invented a new kind of treadmill called the Variable Terrain Rotary Treadmill which can mimic any natural terrain, set the animal to locomote at specific speeds, and enable measurements within a controlled lab setting.

We tested six kangaroo rats at the same speed on a solid plywood surface against their natural terrain of Nevada sand. The animals hopped best at approximately 1.8 m/s. We recorded the animals via high-speed video and used joint marker tracking software to quantify the differences in their kinematics while hopping on solid versus sand surfaces. This included duty factor (duration of ground contact divided by hop period), velocity, and acceleration calculated from the marker positions.

We found that the animals had a longer duty factor on the solid surface (Nonparametric paired test; $p < 0.05$) and had a greater acceleration while on the ground on the sand ($p < 0.05$). The greater acceleration shows an increase in mechanical demand on the musculoskeletal system, and the change in the duty factor implies intentional adaptation to different surfaces.

Poster # 33

How the Legalization of Marijuana Has Impacted Law Enforcement

Presented by: Seth Hartman, Rachel Jones, Izzy Luengas, Griffin Patrick, Jessica Pietsch, William Roberts, Zoe Robinson, Mantz Wyrick, Maria Zuniga

Mentor: Anna Deighton, Mary Stohr **Campus:** Pullman

Major: Criminal Justice and Criminology

Category: Social Sciences

Co-authors:

Upon the passage of Initiative 502 (I-502) in 2012 and implementation in 2014, recreational marijuana became legal and available in the state of Washington. Six years later, numerous questions remain about how it has affected police officer's work. Specifically we are interested in how law enforcement has been shaped by recreational marijuana. As Washington State was one of the first states to officially legalize recreational marijuana use, we were interested in police officers' perceptions of the law and its implementation. Questions were asked regarding how law enforcement officers practices changed before and after the passage of I-502. The answers were used to assess the relative advantages and disadvantages of cannabis legalization from a law enforcement perspective. Twelve police agencies participated in focus groups. We present the findings from two of those agencies. The findings indicate that officers in Washington are generally supportive of legalization but have concerns regarding increased drugged driving and availability of cannabis to underage youths.

Poster # 35

Giardini Scolpiti

Presented by: Shelby Ruiz

Mentor: Judy Theodorson **Campus:** Pullman

Major: Interior Design

Category: Arts and Design

Feeling a sense of calm, even if fleeting and inconsistent is a phenomenon attributed to the surrounding of nature and a “biophilic” experience. Access to varying daylight levels, fresh air, plant life, and natural haptic materials can bring sensations of peace and tranquility if used appropriately in interior spaces. Through this design project, I hope to create such an experience indoors for geriatric patients, where the access to outdoor spaces of pure biophilic quality may not be permissible. The function of this space is to argue how nature and biophilic language can evoke a spiritual experience. Through the lens of biophilic design and organic forms, the construct of rules and logical rationality of neoclassical architecture is removed, and natural life is revealed to allow existing in its purest form.

In geriatric care facilities, a place of retreat is a necessary and fruitful addition that benefits the health and happiness of full time residents. Meant to evoke a feeling of calmness and serenity, a healing garden is created to bring forth positive reactions of the body and mind. Smells to remind, textures that connect one with their environment, and views of nature that make one feel as alive as the plants surrounding them is the goal of this volume.

The network of a leaf, alike to a Veronoi web and other organic geometric patterns, algorithms and mathematics surround us everywhere. They define our movement, our tendencies, and our understanding of the world. Like connective tissue, these patterns guide the way that people use their spaces and experience their environments as fabric to bring us together, rather than isolate individual experiences. As a response to form, an organic approach will be taken in order to inspire a mental state of peace from a sensory experience.

Housed within a 24 hour care facility for the elderly, this indoor sanctuary and healing garden is designed to function as a third place of the residents and visitors of the facility. Additionally, levels of privacy are offered for those looking to contemplate and enjoy a sensory experience individually.

Poster # 36

Catalytic Conversion of Biomass to Methanol

Presented by: Wyatt Fick

Mentor: Guodong Ding **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Co-authors:

As the world progresses it has become more and more important that new and cost effective techniques for synthesizing vital chemical resources with a much less harmful impact on the environment are devised. The experiment being conducted is focused on exploring the effectiveness of various metal catalysts that aid in the reacting of organic materials into methanol. The goal behind this research is to find a cost effective and environmentally friendly way of producing methanol, which could be applied to an industrial scale process. To ensure a cost effective and efficient method is found, room temperature and atmospheric pressure conditions are used in all reactions conducted in this experiment.

Many catalysts are being tested in this experiment, all of which have had a metal base such as copper, palladium or nickel. All experiments so far have taken place at room temperature and atmospheric pressure. The catalysts, chemical components and reaction times are all varied from reaction to reaction so that the most effective run times and chemical components can be discerned. Since the reactions take place at low temperature and pressure, the use of a pressurized reactor is unnecessary and the reactions can take place on top of a stirring plate. The reaction times are varied greatly from reaction to reaction, ranging from thirty minutes to twelve hours.

Once the reactions are completed, the samples are taken to be tested in a mass spectrometer, where the yield and selectivity towards methanol can be determined. The results of each set of reactions are used to help influence and determine the chemical components and run time used in the next reaction. In this way, it is expected that new insights will be made about catalyzed methanol reactions at low temperatures and pressures.

Poster # 37

"An All-American Boy": The Story of Tom Haji and Rural Nisei During WWII

Presented by: Mario Vega

Mentor: Clif Stratton **Campus:** Pullman

Major: History

Category: Humanities

The purpose of this project examines the life of Tom Haji, a Japanese-American who grew up in Skykomish and Monroe, Washington, was interned at Tule Lake following Executive Order 9066, and deployed to France and Italy where he died in April 1945. Through a biographical recreation of Tom's life that included examination of newspapers, yearbooks, historical photographs with those who knew him, this project reveals a set of complicated and more nuanced relationships between Japanese-Americans and white residents of rural Washington. While most accounts of the internment era emphasize division, Haji's life and relationships show the importance of ordinary local activities as an inclusive force. For example, his basketball coach and his team boycotted a game in which port authorities attempted to block Tom from coming with his team to a game near the coast. From his hometown, his internment, and the war a sense of what life was like for many Japanese-Americans can be understood on a deep and personal level. Haji reveals a story of a boy and his family becoming integral members of their community when national prejudices against Japanese-Americans were at their apex. Even after Pearl Harbor, Tom and his family were still seen as trusted members of the community which made their sudden internment even more devastating. Despite his internment at Tule Lake, Tom willingly signed up to serve in the Army like many Japanese-Americans in defense of their country and would fall during a battle in April of 1945 in Italy. Even though Tom lived a short life, his is still dearly remembered in the town of Monroe and speaks to the importance of interpersonal and community dialogue and relationships in combating institutionalized and local cultural racism.

Poster # 38

Incomprehensible Black Survivors; Rape, Rape Culture, and the Struggle for Visibility

Presented by: Alexis Jackson

Mentor: David Leonard **Campus:** Pullman

Major: Psychology

Category: Social Sciences

For my project, "Incomprehensible Black Survivors: Rape, Rape Culture, and the Struggle for Visibility," I examine the ways in which a history of white supremacy in the United States has led to hypersexualized ideas about black women. I also examine literature, film, and media that depicts the black female body in American society. I examine contrasts between black women victims and white women victims, within contemporary discourses of sexual violence. I am working to understand how and why black women are viewed as "incomprehensible" victims of sexual violence. Furthermore, I examine public conversations about the epidemic of sexual violence on college campuses, the #MeToo Movement and the case of Daniel Hotzclaw; specifically how these instances can reveal the erasure of sexual violence committed against black women.

Poster # 39

Deficit Irrigation in Grapevines

Presented by: Alexis Torp

Mentor: Pete Jacoby, Xiaochi Ma **Campus:** Pullman

Major: Fruit and Vegetable Management

Category: Organismal, Population, Ecological, and Evolutionary Biology

As water security and access becomes more difficult with increasing need and heightened drought concerns, growers are looking for creative solutions to the problem of irrigation in terms of cost and water accessibility. For wine-grape growers, irrigation has a direct effect on grape quality which translates into the quality of the wine producers create. For growers, the quality of the grape can have a significant economic impact, whether they make their own wine or sell their grapes to wineries. Deficit irrigation is the technique of irrigating during growth stages that are sensitive to drought stress, while limiting or completely abstaining from irrigating at other times of the plant growth cycle. The purpose of this study was to determine whether deficit irrigation is an effective method for optimizing water use efficiency of grapevines. The experiment included 33 rows of vines with 75 vines in each row. One row was used as a commercial control, irrigated with the industry average. The rest of the rows were separated into high, medium, and low irrigation treatments, equaling 10.27, 5.13, and 2.57 gallons per time per vine increments respectively. All vines were irrigated 23 times over the course of the growing season. Vines irrigated with the lowest level were found to have the highest water use efficiency, showing that deficit irrigation is a creative and effective method for growing quality grapes while optimizing irrigation.

Poster # 40

The Impacts of Transformation within Chilean Healthcare

Presented by: Devon Porter

Mentor: Clif Stratton **Campus:** Pullman

Major: Neuroscience

Category: Social Sciences

In "The Impacts of Transformation within Chilean Healthcare," the author contends that the structure, function, and management of the Chilean healthcare system was drastically impeded by the 1973 overthrow of President Salvador Allende by General Augusto Pinochet. President Allende worked towards socialist policies regarding healthcare initiatives that reflected the British National Health System, allowing publicly funded hospitals to provide for working-class citizens. With the installment of Pinochet, the socialist policy reforms instituted by Allende were revoked, along with the jailing and murder of physicians that did not adhere to Pinochet with continued to support Allende. The quality of public hospitals began to deteriorate along with the number of individuals who obtained health insurance. Health insurance became a priority only to white-collar men, leading to an increasing amount of communicative diseases spread among the general population, with physicians writing letters to US publishing companies explaining the issues that now consumed the Chilean healthcare system. The overhaul of Chilean healthcare directly reflects the current state of US health insurance, where recently instituted policy members by President Donald Trump wish to expand healthcare as a market rather than as an initiative for universal care for all citizens within the US, policies reflected as goals within the Obama administration with the installment of Obamacare.

Poster # 41

Negative Affective-like Cues and Escalated Alcohol Consumption in Mice

Presented by: Maddison Gostin, Jaimalynne Ventura

Mentor: Brendan Walker **Campus:** Pullman

Major: Psychology

Category: Organismal, Population, Ecological, and Evolutionary Biology

The kappa-opioid receptor/dynorphin (KOR/DYN) system has an important role in an organism's self-administration of alcohol during alcohol withdrawal once alcohol dependent. Binding of DYNs to KORs are implicated in negative affective states that promote excessive alcohol consumption during alcohol withdrawal. The KOR agonist, U50,488, has been successfully shown to mimic these withdrawal states and produces negative affective-like states in rats through activation of the KOR/DYN system. Furthermore, recent evidence has shown that when olfactory cues are paired with U50,488-induced activation of KORs in non-dependent rats, the olfactory cue representative of a negative affective state can promote escalated alcohol self-administration when the cue is presented alone. While this model was initially developed in rats for pharmacological investigations, zero studies have examined this model in mice. Therefore, researchers are unable to take advantage of contemporary genetic approaches only available in mice. To mitigate this deficit, the present experiment tested the hypothesis that negative affective-like cues can promote escalated alcohol consumption *in mice*.

To this end, transgenic mice were subjected to 30-minute two-bottle choice (2BC) sessions of 5% alcohol and water. After a preference for alcohol over water was established, 30-minute one-bottle choice (1BC) sessions of 5% alcohol were conducted until stable alcohol self-administration was achieved. Two stimulus exposure sessions were conducted for one hour each with an almond scent followed by 30-minute 1BC alcohol self-administration to confirm stimulus neutrality. Subsequently, a dose-response curve with the KOR agonist U50,488 (0–5 mg/kg) was conducted by pairing the varied doses of U50,488 with the olfactory cue for one hour. Following these conditioning sessions and confirmation of alcohol consumption stability, the olfactory cue was presented for one hour prior to alcohol consumption sessions to ascertain whether the cue alone could alter alcohol consumption. The results showed that the olfactory cue associated with U50,488 could effectively induce escalated alcohol self-administration. This model can be used in future investigations using genetic approaches to neurobiological manipulation.

Poster # 44

Size Inclusivity: A Content Analysis of Plus-size Apparel Consumer Needs

Presented by: Keena Hudson

Mentor: Chanmi Hwang **Campus:** Pullman

Major: Apparel, Merchandising, Design & Textiles

Category: Arts and Design

Plus-size consumers make up about sixty-seven percent of the female population in the United States (Christel, 2016), showing the importance and amount of the plus-size consumer in the U.S. Though this market is quite voluminous, this consumer market is feeling the lack of style design selection compared to their 'normal sized' counterparts (Nordhoff-Beard, 2017). With the lack of design and style selections for plus-size consumers, this research on promoting size inclusivity is necessary. This research will help add selection to the plus-size apparel and will benefit both academia and the apparel industry. The purpose of the study is to examine current plus-size apparel market and consumer needs to propose a design direction for this excluded market. A sequential mixed method was conducted which includes a) content analysis of 50 apparel websites that offer plus-size clothing, b) online survey of plus-size consumers and c) prototype development through computer-aided design. To ensure trustworthiness two researchers independently conducted a content analysis of the plus-size apparel retailers. A coding sheet was developed and the categories include style, silhouette, colors, market level, and price range. SPSS (Statistical Package for the Social Sciences) software was used for descriptive data analysis. After the content analysis was completed a survey using WSU Qualtrics was made to determine the apparel needs of the plus-size market. It was determined that the participants surveyed (n=) favored the above knee length, ¾ sleeve length, loose fitted, and scoop neck style casual dresses. The respondents also preferred abstract and geometric style prints. Using the analysis of the data from the plus-size market, an apparel design was proposed with the use of digital textile printing and the Lectra Avatar system.

Poster # 45

Chemiluminescent 1,2-Dioxetane Probes for the Detection of Hydrogen Polysulfides

Presented by: Deshka Neill

Mentor: Ming Xian **Campus:** Pullman

Major: Chemistry

Category: Engineering and Physical Sciences

Co-authors: Jake Day, Wei Chen

Hydrogen polysulfides (H_2S_n) are newly recognized biological molecules that have been attributed to the regulation of physiological functions in the human body. For example, hydrogen polysulfides have been shown to have anti-oxidant and vasorelaxation properties. However, despite these new revelations, there is still a lot of progress that needs to be made into the field regarding the interaction of hydrogen polysulfides with other molecules, and its degradation in the body. One of the best ways to study such interactions is through the use of biological probes. Highly sensitive chemiluminescent 1,2 dioxetane probes have recently been implemented in the imaging of biological molecules. In this research, three new and innovative 1,2- dioxetane chemiluminescent probes for hydrogen polysulfides have been synthesized and are in the process of being characterized via chemiluminescent spectroscopy. Preliminary results indicate that while one of the synthesized probes produces signals that are not measurable on our devices, the other two are quantifiable and respond to hydrogen polysulfides. This is likely due to the addition of a stabilizing electron withdrawing group on the main ring. While further testing is still necessary, it is expected that of the two emitting probes, one will be more selective to hydrogen polysulfides over other reactive sulfur species. These promising results would lead to testing on cells and possible animal studies, which would allow scientists to learn more about hydrogen polysulfides and their roles in mammalian bodies.

Poster # 46

Assimilation and Model Minorities in Muslim China

Presented by: Nancy Nightingale

Mentor: Lydia Gerber **Campus:** Pullman

Major: Chinese, History

Category: Humanities

The Hui Muslim minority in China has been relatively little researched compared to their more famous Uyghur counterpart. The Hui, however, have a truly individual experience that goes against the traditional narratives of Muslims in China. Using a combination of primary source interviews and historical research, this essay attempts to explain how, through assimilation, the Hui have differentiated themselves from other Muslim minority groups, as well as integrated themselves in a truly unique position in terms of their relationship with the Chinese Communist Party. The Hui have a long, extensive history due to the intermarriages among Muslim merchants and Han Chinese women, as well as the building of Muslim communities in China starting in the Tang Dynasty (618-907 AD). Modern-day interviews with the Hui people present their unique worldly combination of strict followership of Islamic law, combined with their personal pride and identity as being a dedicated member of Chinese society. These broadcasted interviews, as noted, are done by state approved agencies, so it is necessary to review these interviews within the understanding that the version of Hui culture being seen is a state-approved version. As a result of their extensive history within China's borders, this essay will also explains how the Hui managed to gain political and social autonomy due to their officially recognized legal status alongside Han Chinese, and how this has allowed China to uphold the Hui as a "model minority" against the restive Uyghurs in particular. My essay argues that despite the Hui's ability to easily blend their culture and traditions with that of Han Chinese, the Hui still find themselves in predicaments where their faith practice is regulated by government rules and political access is still greatly limited for even the model Muslim minority. This essay serves to contribute a more multi-faceted look at the experiences of Muslim communities within China's borders.

Poster # 47

Investigating Functionality of Proteins Controlling Stability

Presented by: Kyle Tucker

Mentor: Hanjo Hellmann **Campus:** Pullman

Major: Biology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Raed Al-Saharin Sutton Mooney, ,

In this constantly changing environment coupled with persistent population growth, it is becoming ever apparent that there is a need to find more efficient techniques to grow crops for human consumption. This project is able to help with some problems caused by drought, heat, and salt stress on plants. In canola (*Brassica napus*) the transcription factor BnRAP2.4-1 is up-regulated during times of stress, and it has been shown that elevated levels of this protein can improve stress tolerance. Unfortunately, BnRAP2.4-1 is highly instable and quickly degraded in the cell, which makes it difficult to strongly increase the amounts of this protein in the plant. We have recently identified the motifs that cause BnRAP2.4-1 instability, and hypothesize that deletion of these allows expression of a functional and stable protein in canola. I am currently creating and testing a stable mutant version of BnRAP2.4-1 with the aim to introduce the protein into canola and to improve stress tolerance in this and potentially other important crop plants. Positive implications of this project include maximizing use of arable agricultural land by improving yield, and thereby also limiting expansion into sensitive native habitats.

Poster # 48

What Makes Us Human?

Presented by: Kylie Perez

Mentor: Sian Ritchie **Campus:** Pullman

Major: Anthropology, Basic Medical Sciences

Category: Social Sciences

This research is interested in the question" what makes us human?" This question is addressed in a multitude of fields of study from biology to philosophy, from religion to artificial intelligence. But the definition that each researcher uses is drastically different depending on the subject field of the paper. This leads into the research question of this study, 'Is there a correlation between a student's choice of major, or area of undergraduate study, and how they define humanity?' The data will be collected through an anonymous survey distributed by Qualtrics through the WSU email system to as many different colleges in WSU as possible(College of Arts and Sciences, College of Business, etc.), in order to gather a wide variety of majors and view points. Then the answers will be coded based on answer type, categories include :biological, cognitive, creative, spiritual, social. The results of this research can be used in future studies from other researchers by creating a list of definitions that correlate to the type of study being done.

Poster # 49

Physical Activity Perceptions and Behavior of Pregnant Women with Past Miscarriage and Infertility Experiences

Presented by: Bryce Magee, Gretchen Stolte

Mentor: Chris Connolly **Campus:** Pullman

Major: Sport Science

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors:

Perceptions that pregnant women have towards physical activity (PA) appear to affect participation in activity type and intensity. Qualitative findings indicate that past adverse prenatal experiences may elevate pregnant women's PA concerns regarding the health of the baby. **PURPOSE**: This study investigated whether PA outcome expectancy differed among pregnant women with past miscarriage or infertility experiences and pregnant women without. The study also examined whether moderate to vigorous PA (MVPA) and PA discussion with a healthcare provider (HCP) differed between the two groups. **METHODS**: Pregnant women (N=497) completed an online survey and answered multiple questions about past pregnancy experiences, current PA perceptions and various behavior-specific PA modalities. These included: walking, light and intense jogging, cycling, swimming, prenatal yoga, aerobic dance, and resistance training. PA outcome expectancy for each modality was assessed on an 11-point Likert scale. Participation in each was defined as PA > 0 min/wk. MVPA was dichotomized as meeting guideline (MVPA ≥150 min/wk) or not. Participants were also asked questions regarding PA discussion with a current HCP. Mann-Whitney U-tests were performed to examine outcome expectancy differences between women with past miscarriage or infertility experiences and those without. Chi-square analyses were conducted to examine differences in meeting MVPA guideline, HCP discussion, and PA modality participation. **RESULTS**: A total of 170 women (30.5%) reported past miscarriage or infertility experiences. PA outcome expectancy for these women did not significantly differ from women without past adverse prenatal experience for any specific modality of activity. However, women with past miscarriage or infertility experiences were less likely to meet the current MVPA guideline [c^2 (1) = 4.32, p=.04]. Participation in specific PA modalities was not significantly greater for women without past adverse prenatal experience, nor was the occurrence of PA discussion with a HCP. **CONCLUSION**: Pregnant women with past miscarriage or infertility experiences did not perceive PA differently but did perform less MVPA than women without adverse experience. Trimester-specific examinations of PA perception and behavior are needed among this subpopulation.

Poster # 50

Does Colostrum Quality Influence Calf Cortisol Concentrations?

Presented by: Veronica Martin

Mentor: Amber Adams-Progar **Campus:** Pullman

Major: Animal Sciences

Category: Applied Sciences

Co-authors: Briah Parchment

In the dairy industry, one of the most important indicators of a calf's success is the quality of colostrum it receives shortly after birth. Calves depend on quality colostrum to help them develop a stronger immune system. Some companies are proposing that feeding a yeast-based supplement, such as Celmanax®, to cows may improve their ability to cope with transition period stress. While the product is intended to improve cow immunity during stress, the effects of this product on a cow's colostrum quality and, subsequently, the well-being of the cow's calf has not been previously investigated. Cortisol is a stress-related hormone that can be measured to monitor a calf's well-being. The objectives of this study were to determine if feeding Celmanax® to cows affects colostrum quality and calf serum cortisol concentrations. It was hypothesized that calves given a higher colostrum quality would have lower serum cortisol concentrations, especially during a stressful event.

Thirty-six lactating Holstein cows were assigned to one of two treatments: 1) no vaccinations at dry-off or 2) no vaccinations at dry-off but received Celmanax. The calves born to these cows were observed from birth to 40 days of age. At birth, colostrum quality was measured from each dam and a blood sample was collected from each calf. Subsequent blood samples were collected on Days 3, 7, 14, and 40. For the preliminary data presented in this abstract, a subset of samples (n = 18) was used for enzyme-linked immunosorbent assays to measure serum cortisol concentrations. All data were analyzed using PROC CORR and PROC MIXED in SAS.

In this dataset, cows that were fed Celmanax® tended to have a higher colostrum quality than cows that were not fed Celmanax® ($P = 0.07$). Serum cortisol concentrations were not affected by treatment ($P = 0.75$), calf age ($P = 0.21$), or calf body weight ($P = 0.45$). The remaining blood samples will be analyzed for cortisol concentrations. All blood samples will also be analyzed for serum tryptophan, serotonin, and various interleukin concentrations to investigate potential differences in calf hormonal and immune system components.

Poster # 51

Women of Wazzu

Presented by: Yasmeen Wafai

Mentor: Lisa Waananen Jones **Campus:** Pullman

Major: Journalism and Media Production

Category: Arts and Design

This creative project is a photojournalism series that features women at Washington State University to provide a visual representation of women in higher education. Photojournalism has roots in the 19th century and while technology has changed immensely since then, the impact and importance of taking photos to tell stories has not. In the early days of photojournalism, photos of things like war, poverty and child labor showed people what was going on away from home. Today, photojournalism still does that and has allowed news to be more visual. Photos allow people to understand events in a way words alone cannot. In her book *On Photography*, author Susan Sontag said, "To collect photographs is to collect the world." Sontag understood that photos matter because they make us understand the world in a new way.

As a journalist, it is important to me that my stories are genuine, so when I started thinking about creating a photo essay for my independent study, I knew I needed to take photos that would tell a story about something that was not only timely and relevant in terms of news, but also important socially.

My project seeks to feature women at WSU who are doing great things in research, academics or even just life in general. I wanted to focus on women because, for me, another part of journalism is providing an outlet for marginalized voices to be heard.

I reached out to the women, scheduled sessions with them and took photos of them in environments that meant something to them. I asked them questions and talked to them about their work and what it is like to be a woman in their field. I also recorded and transcribed the conversations. Accompanying the photos is background information on the women and quotes from them. This is an ongoing project and hopefully presenting this preliminary photo essay will help connect me with other women who are interested in participating.

Poster # 52

IseA Helps Legume Nodulation

Presented by: Lia Kellogg

Mentor: Michael Kahn, Katie Adolphsen **Campus:** Pullman

Major: Environmental and Ecosystem Sciences

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Rebecca McGee

Today's agricultural systems heavily rely on industrially produced nitrogen fertilizers to increase crop yields. An alternative is to use plants that can convert atmospheric nitrogen to ammonia by using a symbiotic relationship with nitrogen fixing bacteria. Interactions between legumes and rhizobia are the most common of these. The bacteria induce the formation of specialized nodules on the legume roots and in the specialized root environment can carry out the difficult and energy requiring nitrogenase reaction and support plant growth. My research in the Kahn Lab at Washington State University is trying to understand the activity of a gene, called iseA, which increases nodule formation when it is introduced into Sinorhizobium meliloti and Sinorhizobium medicae with barrel medic (Medicago truncatula) and into Rhizobium leguminosarum with pea and lentil. The experiment presented here was to investigate whether the increase in nodulation observed in three lentil cultivars, Avondale, Merrit and Pardina, also led to an increase in plant growth under greenhouse growing conditions. Plant biomass was increased for the cultivar Avondale, was not affected in Merrit and decreased in Pardina. Further experiments will be conducted to see if this result is consistent and whether the effect is shared by related cultivars.

Another experiment I am performing uses low pH to stress barrel medic inoculated with control S. meliloti or with S. meliloti expressing iseA. Long-term application of industrial nitrogen fertilizers can cause soil acidification. Lower pH is becoming common in the Palouse as a result of fertilizer application and low buffering capacity. Acidic soil inhibits the formation of the rhizobium/legume symbiosis, which in turn decreases the level of nitrogen fixation. We hypothesized that introducing the iseA gene which has been demonstrated to increase nodulation in several systems, may increase nodulation under stressed soil conditions. Increasing nodulation under acidic growing conditions may be a potential resource for current agricultural challenges. This experiment is currently running and results will be collected within the next several weeks.

Poster # 53

Development of an Analytical Method to Validate Pesticide Detection Limits in Saliva

Presented by: Catie Himes

Mentor: Elsa Silva-Lopez, Allan Felsot, Nelmi Devarie **Campus:** Tri-Cities

Major: Environmental and Ecosystem Sciences

Category: Engineering and Physical Sciences

Co-authors: Vincent Hebert, Stacey L. Roberts

A non-invasive portable biomonitoring sensor is being developed that will utilize a saliva medium to describe exposure of agricultural workers to pesticides. The project, which is funded by the National Institute of Occupational Safety and Health, is part of a collaborative effort with faculty at WSU (Department of Entomology and the School of Mechanical & Materials Engineering) and scientists at the Pacific Northwest National Laboratory. The objectives of the study are two-fold—development of a non-invasive portable chemical sensor for detecting pesticide residues in human saliva and use of pharmacokinetic studies to translate the level of contaminants in saliva to a whole body dose. My role in the project was to develop an analytical method for the neurotoxic insecticide chlorpyrifos (CPF) and its main metabolite, 3,5,6-trichloro-2-pyridinol (TCP) and thereby validate the detection limits of the portable sensor. All of my work was conducted in the Department of Entomology's Food and Environmental Quality Lab (FEQL) on the Tri-Cities campus. GC/MS methods were used to quantify pesticide concentrations in sample solutions. Solutions were prepared from a TCP stock (5 mg/mL) diluted to desired concentrations and derivatized using MTBSTFA in preparation for GC/MS analysis. Experiments proved that 25 µL of MTBSTFA completely derivatized TCP. TCP was extracted most efficiently from aqueous solution with toluene, while ethyl acetate extractions yielded inaccurate and imprecise results. Preliminary results indicated that the extraction efficiency of toluene was dependent on the concentration of TCP with efficiency decreasing at lower concentrations. TCP stored at -20^{o}C in water was stable for up to eight weeks, suggesting the potential to store saliva samples without loss of integrity before analysis.

Poster # 54

Digital Archiving of Tribal histories at Washington State University

Presented by: Jazmine Ike-Lopez

Mentor: Trevor Bond **Campus:** Pullman

Major: Accounting

Category: Humanities

This poster will outline the use of Mukurtu, creating metadata, and understanding the importance of relationships between tribal communities and archivists. My work in the Center of Digital Scholarship & Curation (CDSC) corresponds with the SURCA category of humanities because I study documents that are related to a socities history and then digitizing those document to provide information on a tribes historical conditions to the Plateau People's web portal. My work is centered on the ideals of informing individuals about the histories of a diverse society, the use of digital technology to collect and store information, and the relationship of institutions with communities. I will describe the role undergraduate workers have in the CDSC, the use of digital software to provide new access to historical documents, the building of tribal relations, and the respectful sharing of knowledge. An example of the process for the projects I've done include organizing documents, transferring them to a digital form, altering the properties of the digitzed form to fit the web portal, and forming a metadata sheet that provides as much information on the items that have been digitzed. This poster provides a unique perspective in the use of digital tools as a way to archive tribal histories in consultation with tribal communities. With sensitive and valuable information being provided by a tribe our departments also works to seperate information that is public and information that is for the private viewing of the tribe. This project serves to assist tribal communities in documenting their history.

Poster # 55

Behavioral Interactions Between Dairy Cows and Wild Birds

Presented by: Hannah Cameron, Isabella Duarte

Mentor: Amber Adams-Progar **Campus:** Pullman

Major: Animal Sciences

Category: Applied Sciences

Co-authors: Tyler Caskin

The number of wild bird species, especially European starlings (*Sturnus vulgaris*), tend to increase on dairy operations as the temperatures begin to decrease throughout the winter months. These birds have the potential to influence the behavior of cows on dairies because birds represent a novel stimulus and occupy space at the feed bunk. Other types of novel stimuli have been shown to increase exploration, arousal, and conflict behaviors in cows. Additionally, the decrease in feeding space leads to decreases in feeding activity, which can increase competition between cows. The objectives of this study were to: 1) record bovine and avian behavioral interactions on Washington dairies and 2) determine feeding location preferences for wild birds in the feed bunk. It was hypothesized that cows would exhibit more aversive and aggressive behaviors, as well as less feeding behaviors as the number of birds increased at the feed bunk. Behavioral data was recorded over the course of three weeks, using on-farm video cameras in fourteen locations on five Washington dairies. Instantaneous scan sampling of 1-minute intervals was used, and the results were analyzed using PROC GENMOD in SAS. Behaviors recorded included intra-species aggressive and aversive behaviors in cows, and inter-species aggressive and aversive behaviors between cows and birds. Other variables recorded included the percent of head gates used per pen, the number of birds at the feed bunk, and the number of cows eating at any given time. There were significant differences among locations in the percentage of head gates used ($P < 0.0001$), the number of cows eating ($P < 0.0001$), and the number of birds present ($P < 0.0001$). Using this information on avian-bovine interactions, as well as bird preferences for feeding location, will assist in the development of effective deterrence methods and minimize economic losses.

Poster # 58

Effect of Tobacco Ringspot Virus (TRSV) on Vine Growth and Wine Quality

Presented by: Corydon Funk

Mentor: Naidu Rayapati **Campus:** Other

Major: Integrated Plant Sciences, Winemaking (Viticulture and Enology)

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Naga Teja Natra, Noah Nilson, Timothy Olden

Tobacco ringspot virus (TRSV), a nematode-transmitted virus, was recently reported in a commercial vineyard in Washington State. This study was undertaken to determine effects of TRSV on vine growth and berry development in a red-fruited wine grape (*Vitis vinifera*) cultivar. Initially, vines of cv. Tempranillo showing fanleaf degeneration and decline symptoms and those without symptoms in the same vineyard were tested for TRSV by RT-PCR. Based on these results, symptomatic vines that tested positive for TRSV and non-symptomatic vines that tested negative for the virus were selected for collecting data on shoot length, leaf area, fruit yield and berry composition. For measuring shoot length, 15 symptomatic and 15 non-symptomatic vines were selected. Ten shoots per vine (5 shoots on each cordon) were flagged and shoot length from the same set of vines measured at weekly intervals using a measuring tape from two weeks after bud break in May until shoots reached transitional phase midseason (end of July). The results showed significant differences in shoot length between symptomatic and non-symptomatic vines throughout the study period, with average shoot length of infected vines nearly half the average shoot length of healthy vines. These observations indicated poor growth of shoots in virus-infected vines. Seven leaves per vine were collected on July 14th, 2017, from 15 non-symptomatic and 15 symptomatic vines and leaf area measured using a commercial leaf area meter. The results showed significantly smaller size leaves (average = 115.0 cm^2) in virus-infected vines compared to leaves from healthy vines (average = 152.4 cm^2). TRSV-infected vines produced smaller clusters with uneven size berries compared to clusters with uniform berries produced by healthy vines. A time-course analysis of grape samples harvested at different stages of berry ripening from virus-infected and un-infected vines did not show significant differences in soluble solids (or sugars), juice pH and titratable acidity and berry skin anthocyanins. Symptomatic vines showed 66.7% decrease in yield compared to healthy vines. Overall results suggested severe impacts of TRSV on vine growth and yield without significantly affecting grape quality.

Poster # 60

Economics of Clinical and Sub-clinical Bovine Respiratory Disease in Feedlot Cattle

Presented by: Grace Dickerson

Mentor: Shannon Neibergs **Campus:** Pullman

Major: Agricultural and Food Business Economics

Category: Applied Sciences

Co-authors: Jennifer N. Kiser, Holly L. Neibergs

Bovine respiratory disease (BRD) is a major cause of morbidity and mortality in feedlot cattle, costing the industry upwards of $1 billion each year. BRD is an infectious disease caused by a complex of viral and bacterial disease-causing pathogens. Clinical BRD is recognized by cough, nasal and eye discharge, ear tilt, and elevated rectal temperature. Many cattle are affected with BRD but do not show clinical signs. These cattle are only diagnosed post-harvest when subclinical BRD is observed by the presence of lung damage. In this study, 440 steers clinically diagnosed with BRD and 473 steers without clinical signs of BRD were followed to harvest and graded on the presence and severity of lung consolidation (LC) and lung fibrin tissue adhesion (FT). LC refers to fluid-filled or tissue-filled spaces in the lung cavities and was assessed on a numerical scale (0-3) by increasing severity. FT represents fibrous protein that adheres the surface of the lung to the rib cage or to other lung surfaces. FT was measured as normal (N), minor (M), or excessive (E) according to the magnitude of FT formation. Each carcass was issued a combined lung score reflecting both LC and FT generating 12 phenotype categories ranging from 0N to 3E. The 12 lung score categories were analyzed for their economic effect on carcass traits using SPSS (IBM, Armonk, NY) software. In total, 69% of steers presented LC or FT at slaughter, including 66% of steers without clinical signs of BRD. There was no correlation ($P < 0.05$) between lung scores and USDA quality grade, hot carcass weight, or market value. Differences in economic value were not discovered across the twelve phenotypes. Although cattle with LC or FT were not economically disadvantaged, failure to identify sub-clinically ill cattle remains a production and an animal welfare issue. Therefore an improved means of detecting sub-clinical BRD is needed. Future longitudinal studies should be undertaken to identify if the time of onset of LC of FT is critical in effecting economic value of cattle affected with clinical and subclinical BRD.

Poster # 61

Farming Revamped by GMO's

Presented by: Jordan Cresanti

Mentor: Clif Stratton **Campus:** Pullman

Major: Nursing (BSN)

Category: Humanities

Norman Borlaug made significant contributions to the agriculture industry, and it's unfortunate that young generations aren't aware that his work affects their daily lives. Borlaug began creating new strands of wheat by combining multiple strands from local farmers. His final product, a strand of wheat that could be grown in several climates, increased wheat production exponentially: His efforts jumpstarted an event known as the Green Revolution. Borlaug first introduced his creation in Mexico and during the 1960's. However, his efforts weren't always supported. According to the journal *The World Food Crisis*, Herbert L. Marx Jr. states that Borlaug's efforts are "increasing the risk of catastrophic crop failures because of disease, and that these specialized varieties were forcing world's farmers to become too dependent on fertilizer". Borlaug never intended for any negative effects, he stated that he had a goal of ending world hunger, which was his overall motivation for his creation. The Green Revolution has influenced our society today drastically because most of our food uses some sort of chemical during the growing process; this can vary from GMO's, pesticides, or fertilizer. Overall, Borlaug had good intentions, but his overall goal of world hunger wasn't achieved and he ended up hurting the environment due to overproduction of his artificial seeds. I would argue that the farming industry was revamped by the introduction of GMO's and more specifically, Borlaug's creation of the artificial seed.

Poster # 62

The Effects of Adverse Childhood Experiences on University Students

Presented by: Justin Frow

Mentor: Robert Fellows **Campus:** Pullman

Major: Neuroscience, Psychology

Category: Social Sciences

Co-authors: Maureen Schmitter-Edgecombe

Research has shown that adverse childhood experiences (ACEs) are associated with increased risk of negative health conditions for the general population. However, research examining ACEs and their effects on health behaviors and outcomes in university students is sparse. To fill this gap, 224 university students between the ages of 18 and 21 (M=20.1 SD=1.4) completed a set of health behavior questionnaires and a modified ACE questionnaire (excluding questions about physical and sexual abuse). In the total sample, approximately 26% of participants reported experiencing three or more ACEs with the most frequently reported ACEs being parental separation/divorce (40.2%), living with a mentally ill person (30.8%), emotional abuse (25.4%), and living with someone who had substance use issues (25.4%). Students with three or more ACEs (n=60) reported significantly greater sleep disturbance, fatigue, and poorer overall health than those with less than three (n=164). Students with three or more ACEs were also significantly more likely to report problems with alcohol and drug use. Taken together, the results of this study suggest that university students with multiple ACEs are more likely to engage in poorer health behaviors. The results also indicate that these effects are seen even when questions about physical and sexual abuse are not considered. Future research should focus on examining potential mechanisms linking ACEs to poorer health behaviors and subsequent chronic medical conditions so that effective interventions can be developed.

Poster # 63

Electric Field Effects on Ammonia Decomposition Over a Ni-Perovskite Catalyst

Presented by: Matthew Sundheim

Mentor: Su Ha **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Co-authors: Jake Gray

Catalyst tuning is traditionally achieved by physicochemical processes: changing the material, adding a dopant, adjusting particle sizes, or using a different support. Recent research suggests that similar catalyst tuning can be accomplished through purely physical means by applying an external electric field. This research will look at using an electric field over a nickel catalyst to increase the selectivity and yield of hydrogen producing reactions. Ammonia has recently garnered significant interest for use as a simple fuel which can be converted *in situ* to hydrogen gas for use in hydrogen fuel cells. Porous catalyst pellets of homemade socketed nickel nanoparticles supported on a LaSrTi perovskite have been fabricated for use in a tubular flow reactor to test the effects of an electric field on hydrogen production by decomposition of ammonia. The socketed nanoparticles were created by reducing the perovskite catalyst at 1000 °C for 20 hours. This suggests that the nanoparticles will be stable for long periods of time at temperatures up to 1000 °C. Characterization of the nanoparticles shows that the mean size is approximately 170 nanometers in diameter. Preliminary calculations using a modified form of the Van't Hoff equation suggests that applying an electric field to the catalyst as the reaction is carried out will strongly affect the thermodynamics of the reaction. This will be verified by monitoring the reaction conditions using real-time gas analysis mass spectroscopy. A control experiment has already been conducted without an electric field to verify that the catalyst will allow for the decomposition of ammonia. The data from the initial experiment shows that ammonia decomposition begins at 600 °C with a maximum at 750 °C. Future work for this project will be to optimize the experimental temperature for the reaction and run long term experiments to determine hydrogen production under a positive and negative electric field to compare with the hydrogen production under no electric field.

Poster # 64

Cross Disciplinary Spatial Intervention - Psychology Advising Suite Redesign

Presented by: Alexandra Bennett, Priscilla Duong, Yeaji Kan, John Robancho

Mentor: Robert Krikac, Chioma Heim, Audrey Van Nuland **Campus:** Pullman

Major: Psychology

Category: Arts and Design

Co-authors: Laurel Behrend, Mackenzie Bowers, Chi Fan Chang, Kathleen Ryan, Tessa Trudeau, Elliot Wills, Kelli Young

In the fall of 2017, interior design students and psychology students at Washington State University worked collaboratively on redesigning the Psychology Advising Suite. Interior design students contributed their knowledge around creating interior settings that support human activities and academic values to support with redesign efforts. Psychology students contributed environmental psychology and student support theories to aid in creating a space that will promote learning as well as a space conducive to co-curricular activities. This project provide students with a chance to collaborate across disciplines, reflecting real world work experiences.

Currently, the advising suite poorly represents Washington State University and the Psych Department's values and quality of services provided. The outdated aesthetics and haggard conditions work against what the advisors are trying to accomplish: a welcoming and collaborative space for the students. The overall design of the space lacks excitement and optimal work conditions with orange carpet, pink walls and variable room temperatures. In its existing state it can cause students to avoid the services offered and raise levels of anxiety.

The team determined that the goals would be to have the space make a good first impression so that the space was more inviting. Using Stimulation Theory and Behavioral Constraint Theory, the space was redesigned to be more flexible so that it better serves the department for peer support, meeting with their psych mentors, and for studying. There is a potential to offer a space that can reduce the stress and anxiety students could feel while waiting to discuss their educational progress.

A design was created for the existing space that applied these theories so that the space that will be more highly utilized by the psychology students. With the proposed design ideas for the suite, using colors that reflect positive haptic senses will encourage students to use the space more frequently and enhance their psychological state of mind. Using cooler hues within the spectrum will stimulate their cognitive awareness. Lighting levels were adjusted in the space to support higher productivity, and using flexible furniture and adaptable design solutions were used to increase the usability of the spaces.

Poster # 65

Mapping Diet-induced Alternative Polyadenylation of Hypothalamic Transcripts in the Obese Rat

Presented by: Julianna Brutman

Mentor: Jon Davis **Campus:** Pullman

Major: Neuroscience

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Zhihua Jiang, Jennifer Michal, Bastian Stark, Yangzi Zhang, Xiang Zhou

In the United States alone, over two-thirds of the adult population and roughly one-third of the youth population are considered overweight or obese. Importantly, obesity can only arise when caloric intake exceeds caloric expenditure. The central nervous system (CNS), most notably the hypothalamus, plays a key role in regulating food intake. Interestingly, diet-induced obesity (DIO) generates genetic expression changes in the CNS that regulate both food intake and body weight gain. Recently, insertion of alternative polyadenylation sequences (APSs) has been recognized as a critical regulator of RNA biogenesis, a powerful biological event that regulates energy homeostasis. Specifically, APSs act mechanistically by controlling transcriptome function, and thereby, information flows that contribute to an obese phenotype. *Here, we contend that the DIO phenotype is driven by APS events within the hypothalamus, the endogenous appetite center of the CNS.*

To address this contention, we employed a novel RNA-Seq Next Generation Sequencing approach that utilized the power of Whole Transcriptome Termini Site Sequencing (WTTS-Seq) to simultaneously measure APS events on multiple RNA biotypes in the hypothalamus of DIO adult male *Long Evans* rats. Our WTTS-Seq analysis mapped approximately 89,022 unique hypothalamic APSs induced in DIO rats relative to chow-fed controls. Notably, we detected APSs on protein encoding mRNAs that control neuron projection development, synapse organization, and glutamate signaling, key events hypothesized to maintain excess food intake. Importantly, quantitative real time PCR indicated that APS insertion led to increased hypothalamic expression of multiple RNA biotypes that contribute to or help maintain an obese phenotype. Collectively, these data highlight APS events as a novel genetic mechanism that directs hypothalamic RNA biogenesis events in the context of DIO.

Poster # 66

Effects of Feeding Celmanax on Cow Colostrum Quality and Calf Growth

Presented by: Casey Beksinski

Mentor: Amber Adams-Progar **Campus:** Pullman

Major: Animal Sciences

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Hannah Chiapetta, Briah Parchment

Previous studies show that 20% of transition cows are diagnosed with a post-calving disorder. Celmanax® is a yeast-based feed supplement that has the potential to improve a cow's immune system function during stress throughout growth. The effects of the supplement on calf health and growth; however, has not been studied. The objectives of this study were to determine how feeding Celmanax® to cows affects: 1) colostrum quality; 2) calf development and growth; and 3) calf total serum protein concentrations. Thirty-six multiparous Holstein cows were assigned to one of two treatments: 1) received no dry-off vaccinations (n = 21) or 2) received no dry-off vaccinations and was fed Celmanax® (n = 15). Calves from each cow were then monitored from birth to 40 days of age. At birth, colostrum quality was measured, the calf was weighed, and a blood sample was taken from each calf to measure pre-colostrum total serum protein concentrations. Each calf was weighed every seven days after that, and an additional blood sample was collected at three days of age to measure post-colostrum total serum protein concentrations. Differences between treatments were analyzed using PROC TTEST in SAS. No significant differences were detected for colostrum quality ($P = 0.73$), calf birth weight ($P = 0.90$), weaning weight ($P = 0.29$), pre-colostrum total serum protein ($P = 0.53$), or post-colostrum total serum protein ($P = 0.89$). These results show that feeding Celmanax® to cows does not appear to affect colostrum quality, calf total serum protein concentrations, or calf growth. In conclusion, the use of Celmanax® and its effects on cow health and production should be further studied to determine the economic impact of feeding this product.

Poster # 67

Synthesis and Reactivity of Molecular Fluorescent Pincer Complexes

Presented by: Jordan Fernandez

Mentor: Zachariah Heiden **Campus:** Pullman

Major: Chemistry

Category: Engineering and Physical Sciences

The development of palladium catalyst has become a great interest for pharmaceutical and industrial synthesis applications due to their ability to make carbon-carbon bonds. However, most palladium catalyst often degrade over time due to the generation of Pd(0) nanoparticle or unreactive palladium metal forming within the catalytic cycle. This causes the palladium catalyst to lose efficiency and adds the problem of having to filter out the palladium nanoparticle from medicines such as Crestor. In order to prevent the generation of palladium nanoparticles from forming generating a pincer catalyst was explored due to the multidentate ligands ability to stabilize multiple metal oxidation states. An organic dye molecule was incorporated into the pincer framework because fluorescent organic dyes are offer a wide range of photo-physical properties and act as electron reservoirs. The implementation of organic fluorescent dyes is also attractive because they also have the potential to conduct oxidation/reduction chemistry. This poster will describe how the fluorescent dye molecule, BODIPY, can be incorporated into a pincer ligand scaffold to not only provide a unique insight into the reaction mechanism, but also introduce ligand-based redox and photochemistry capable of manipulating the reactivity at a metal center.

Poster # 68

Improving Preharvest Sprouting Tolerance in Wheat

Presented by: Grace Murekatete

Mentor: Camille Steber **Campus:** Pullman

Major: Agricultural Biotechnology

Category: Applied Sciences

Co-authors: Stephanie Sjoberg

Preharvest sprouting is the germination of mature wheat grain on the mother plant when rainy conditions occur before harvest. Preharvest sprouting can be prevented by higher seed dormancy, the inability of freshly matured seeds to germinate until they experience dormancy-breaking treatments. Moist chilling is one treatment that breaks seed dormancy. Thus, we would expect a higher risk of preharvest sprouting when rain is associated with lower temperature. Seed dormancy is also lost during dry storage through after-ripening. The breeding goal is to have dormancy that is high enough prevent prehavest sprouting if it rains at maturity, but that is then lost rapidly in 6 to 8 weeks of after-ripening to problems with poor germination when winter wheat is planted in the fall (called poor emergence). Preharvest sprouting tolerance was examined using spike-wetting tests. Wheat flowers (called spikes) were harvested from the field at physiological maturity, after-ripened for 5 days, then placed under a misting system to simulate rain. Visible sprouting was scored daily. First, to identify winter wheat varieties that have good preharvest sprouting tolerance without compromising seedling emergence, spike-wetting tests were compared to germination tests once wheat had been well after-ripened. Second, we examined the effect of increased ABA hormone sensitivity on preharvest sprouting at low temperature. The plant hormone ABA induces seed dormancy. Wheat mutants with increased ABA sensitivity show increased seed dormancy. The preharvest sprouting tolerance of this ERA8 (ENHANCED RESPONSE TO ABA8) mutant was compared to wild type using spike wetting tests performed at three temperatures. The ERA8 mutant was more preharvest sprouting tolerant than wild type, but this tolerance was less apparent at lower temperatures. Farmers are forced to sell their grain at a considerable discount when the crop is damaged by preharvest sprouting. This research can help avoid losses for farmers by identified good genetic sources of preharvest sprouting tolerance.

Poster # 69

Coxiella burnetii Pathogenesis in *Drosophila melanogaster*

Presented by: Sarah Borgnes, Michael Knight

Mentor: Alan Goodman **Campus:** Pullman

Major: Biochemistry

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Marena Guzman

Coxiella burnetii is a gram-negative obligate intracellular bacterium characterized by its low infectious dose, environmental stability, and causation of Q fever in both human mammalian animal hosts. By primarily dispersing via inhalation of contaminated aerosols, *Coxiella* has been categorized as a Category B pathogen by the NIAID biodefence research agenda. An attenuated strain of *Coxiella* known as the Nine Mile Phase II clone 4 strain (NMII), has been shown to cause pathogenesis in wild-type *Drosophila melanogaster*, yet it is non-infectious to immunocompetent mammalian animals. NMII clone 4 strain of *Coxiella burnetii* induces activation of the immunodeficiency (IMD) pathway specific to gram-negative bacterial infection within *Drosophila melanogaster*. By infecting *Drosophila* originating from the fully sequenced inbred lines of the *Drosophila* Genomic Reference Panel (DGRP), we hypothesize that enough genetic variance will be present to identify genetic complexes that contribute to the susceptibility or resistance to infection of *Coxiella burnetii*. Furthermore, genome-wide association studies (GWAS) analyze the DGRP mortality to elucidate any putative genetic elements contributing to resistance or susceptibility of infection. The genes identified by the strongest association, lowest P-value, will be validated as genetic variants coupled with susceptibility or resistance to infection of *Coxiella*. Considering that nearly 75% of human genes implicated in disease have a functional homolog in flies, our preliminary data suggests that the use of a *Drosophila* model to screen for factors involved in *Coxiella* pathogenesis can be applied to mammalian species.

Poster # 72

Facile Tailoring of Polymeric Gas Separation Membranes by Ion Exchange

Presented by: Brendan Hay

Mentor: Peter Pfromm **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

The separation of gases and vapors by permeation through selective polymeric membranes can be used in recovery of valuable hydrogen in refineries, production of inexpensive blanket nitrogen on oil platforms or for transportation of sensitive fruit, small portable oxygen enrichment machines to alleviate breathing problems, and capture of carbon dioxide from combustion flue gas, to give only a few examples. Membranes with selectivities that can be tailored to the problem at hand without cumbersome chemical synthesis would be of interest in membrane separations.

Ion exchange resins and membranes are traditionally used in the aqueous phase to remove or exchange ions, for example for desalination or softening of water. The polymer backbone of these resins and membranes is chemically inert. The counter-ions contained in an ion-exchange membrane, however, are mobile and are easily exchanged so that a sodium form of a membrane can be converted to the calcium form or the magnesium form with relative ease.

The **Hypothesis** is that anion or cation exchange membranes with different counter-ions will show selectivities for example for CO_2 over nitrogen that are substantially impacted by the type of counter ion that is located in the membrane. This would open an avenue to tailor membrane selectivities of membranes based on the same polymer backbone by simply exchanging counter ions in the membrane tailored to the separation problem.

Poster # 74

Monitoring Gene-expression Dynamics of tarP During Chlamydial Development Using Fast Fluorescent Timer

Presented by: Pierce Claassen

Mentor: Amanda Brinkworth, Rey Carabeo **Campus:** Pullman

Major: Microbiology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Jordan Bolen, Patrick Johnson

Chlamydia trachomatis is a bacterial pathogen which requires a host cell to live and reproduce. It can cause a sexually transmitted infection that may, in recurring and chronic cases, elicit sterility and pelvic inflammatory disease, despite host immunity and antibiotic treatment. *Chlamydia* development involves two bacterial forms, the reticulate body, which is infectious, and the elementary body, which is metabolically active and non-infectious. How *Chlamydia* regulates transcription to withstand environmental changes must be documented in order to understand how it is able to persist in human hosts. The current methods of detecting the time and magnitude of gene expression during chlamydial development are time-consuming and costly. We hypothesize that by using Fast Fluorescent Timer (FFT) as a reporter for chlamydial promoter activity we will be able to visualize both immediate and previous gene expression of any gene in the chlamydial genome. FFT is a protein that fluoresces blue during folding and is red when fully mature. Given that the protein reflects two different wavelengths of light, we will be able to compare the ratio of blue to red protein, which will allow us to calculate the relative immediate levels of gene expression. We chose to monitor gene expression of *tarP*, which encodes a protein that recruits actin filaments and induces uptake of *Chlamydia* into the host cell. Previous studies have shown that *tarP* is highly transcribed at 18-24 hours post-infection. We built a plasmid, a vector for genetic information, which contains the FFT gene under control of the *tarP* promoter, and an antibiotic resistance gene for penicillin. This plasmid was cloned in *Escherichia coli* and was confirmed by genetic sequencing prior to transformation into *C. trachomatis*. After selecting for an isolate of *Chlamydia* that contains the plasmid, we were able to observe FFT expression similar to that of TarP by fluorescence microscopy. We will monitor gene expression under environmental stresses, such as iron-starvation, to learn when *Chlamydia* modifies expression levels. By using this reporter system with multiple chlamydial promoters, we expect to map gene expression during chlamydial development such that we will discover novel targets for antibacterial therapy.

Poster # 75

Efficacy of Oxygen and/or High Atmospheric Pressure to Alleviate Morphine Withdrawal Syndrome

Presented by: Maadhanki Kasimanickam

Mentor: Raymond Quock **Campus:** Pullman

Major: Zoology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Abigail Brewer, Raymond M. Quock

Opioids include unlawful drugs such as heroin as well as prescription pain relievers like oxycodone, hydrocodone, morphine, fentanyl, and others. These opioids act through opioid receptors located on neuronal cell membranes in order to relieve pain. Misuse of these substances can result in addiction and deaths. Addiction to opioids has become a national concern and has affected public health as well as social and economic welfare. Fortunately, effective medications such as naloxone, methadone, and others exist to recover from opioid symptoms. However, unpleasant opiate withdrawal symptoms happen before the recovery and the antagonists of opioids may cause addiction as well. Hyperbaric oxygen therapy has shown to ease these withdrawal symptoms. Conversely, there are complications such as decompression sickness and oxygen toxicity that can occur with hyperbaric oxygen treatment. The current study was to analyze the efficacy of air pressure, oxygen components, and combination of both in alleviating opiate withdrawal symptoms using a mouse model. Four experimental groups of acute-morphine dependent mice (consisting of twelve mice in each group) were established with consecutive injections of morphine for four days, with increasing dosages. Naloxone was used to antagonize the effect of the morphine given. The four groups of morphine dependent mice were given four different treatments: normobaric air, hyperbaric air, normobaric oxygen, or hyperbaric oxygen for 60 minutes. These treatments were given 30 minutes prior to the naloxone precipitation. Withdrawal symptoms such as wet dog shakes, tremors, jumps, rears, defecations, ptosis, piloerection, and grooming were observed for 30 minutes in the four different treatment groups. Upon single ANOVA and t-test analyses, quantitative counts for wet dog shakes, jumps, rears, and defecations did not significantly vary among the four treatments. Therefore, this study concludes that air pressure, oxygen, and/or a combination of both did not alleviate morphine withdrawal symptoms. Further studies are warranted with the increment of replicates and the lengthening of the observation time for a concrete conclusion since other studies have identified the ease of opiate withdrawal symptoms with hyperbaric oxygen therapy.

Poster # 76

Tissue Engineering of 3D-printed Articular Cartilage

Presented by: Rachel Kagan

Mentor: Arda Gozen **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Articular cartilage, the tissue wrapping moving joints such as the knee, does not heal after deterioration. Osteoarthritis, the disease that marks cartilage deterioration, is on the rise and there are no current treatments available to restore the degraded articular cartilage. Our goal is to utilize tissue engineering as a means to grow an articular cartilage tissue in vitro in a unique bioreactor. Ideally, an engineered tissue should resemble the structure and function of native articular cartilage. Structurally, articular cartilage is a multiphasic heterogeneous tissue whose anatomy can be divided into four distinct zones that vary in their elastic properties, porosity and cellular composition. Engineering an articular tissue in the lab that mimics these four zones in structure is a very complex task. In a step towards that, we aim at utilizing three-dimensional (3D)-printing and manufacturing techniques to develop a protocol for printing a scaffold that can be used in the bioreactor to grow chondrocytes on to produce articular cartilage. The ultimate scaffold will be made of layers printed that vary in their properties to mimic the structural anatomy of native cartilage. To achieve our ultimate goal, the protocols for printing hydrogels that can be manipulated to attain the variable properties of native cartilage are being optimized. Using a unique CELLINK BIOX 3D-bioprinter, printing of bioinks has been performed to produce a scaffold to implant in the knee in place of the deteriorated articular cartilage. The effects of the concentrations of the hydrogels used in printing on the mechanical and rheological properties of the resulting prints are being studied. Furthermore, a 3D mode of the heterogeneous structure of native cartilage is being designed using SolidWorks. This 3D model will be exported to the CELLINK BIO X 3D-printer to print with both the hydrogel inks and bioinks with cells. We have determined the ideal composition of hydrogel bioinks and the printing parameters to print these inks. When these studies are accomplished, it is our hope that an articular cartilage tissue that mimics native articular cartilage can be engineered.

Poster # 77

Intelli-Bra

Presented by: Nimay Bolar

Mentor: Arda Gozen, Abhishek Gannarapu **Campus:** Pullman

Major: Materials Science and Engineering, Mechanical Engineering

Category: Applied Sciences

Co-authors: Yiying Zhou

The Intelli-Bra is designed to be a smart breast sensor capable of detecting volumetric changes in a woman's breast as she breast feeds her baby. This will enable the mother to know how much milk and nutrition the baby is potentially receiving.

The sensor is made of a silicone material known as Ecoflex. The sensor has a channel running around it that holds an ionic liquid capable of conducting electricity. To simulate female breasts, we have created pouches of Ecoflex strapped to a mannequin. Breast feeding is simulated by infusing the pouches with water and drawing it out. This is done through an injection device that infuses and withdraws a controlled amount of water. The sensor rests on one of the pouches and is connected to an LCR meter that supplies alternating current (AC). The sensor stretches and conforms to the shape of the pouch as water is filled in. The impedance (resistance) of the sensor is measured as we simulate breast feeding and null activity. It is seen that the impedance of the ionic liquid changes as breast volume increases and decreases. The changes in impedance depend on the frequency of the alternating current, which is controlled through the LCR meter.

This project has been in the works since Fall 2016. we have made significant progress over the past year and improved on our design and methods of testing. we are on track to start testing our product on feeding mothers and are in talks with bra manufacturers with hopes to achieve commercialization within the next year.

Poster # 78

Information Overload: The Effect of Too Much Feedback on Probabilistic Decision Making

Presented by: Denzel McCray, Maria McCray

Mentor: John Hinson, Paul Whitney **Campus:** Pullman

Major: Basic Medical Sciences, Psychology

Category: Social Sciences

Co-authors: Amy T. Nusbaum, Cristina G. Wilson

People frequently need to adjust their behavior to counter their pre-existing biases. For example, individuals are often overconfident in their knowledge, but that bias may have negative consequences when studying for an exam. Overcoming these pre-existing biases requires cognitive flexibility, which is the general ability to adapt actions and cognition to changing demands. Tasks that examine cognitive flexibility typically require research participants to adapt to rules that are artificial and learned within the task, rather than overcoming pre-existing biases that affect everyday life. The Framed Gambling Task (FGT) is a novel task developed in our lab that assesses the ability to overcome a pre-existing bias. Participants are given a choice between a sure option (gain or loss) and one of two risky deck options. Over time, participants must learn that one deck is good and should be selected and one deck is bad and should be avoided. Framing bias drives participants to select the gamble option when it is paired with the sure loss and to select the sure gain otherwise. However, framing bias does not always lead to the correct choice. Participants demonstrate cognitive flexibility by increasingly choosing the advantageous choice when that choice violates their pre-existing bias. Previous research with the FGT has shown individual differences in cognitive flexibility in older adults and in people that differ in trait anxiety. Feedback provided for choice outcomes contributes to cognitive flexibility on the FGT, but has not been studied in detail. The goal of this study was to optimize the levels of feedback on the task and examine whether additional feedback could improve performance. In the typical FGT, participants receive feedback on the choice they made. In this study, participants either received no feedback on their choices, partial feedback (feedback on some of their choices), typical feedback, or forgone feedback (feedback on both their choice and the other, not selected option). Surprisingly, performance in the foregone feedback group was comparable to those who either received no feedback or partial feedback, despite receiving the highest amount of feedback. The typical feedback group showed the greatest levels of cognitive flexibility.

Poster # 79

Estrogen Action in the Epithelial Cell of the Mouse Vagina Regulates Neutrophil Infiltration and Vaginal Tissue Integrity

Presented by: Gerardo Herrera Birrueta

Mentor: Wipawee Winuthayanon **Campus:** Pullman

Major: Biochemistry

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Shuai Li, Jacob S. Lizarraga, Keila K. Tam

The female vaginal tract is composed of stroma, epithelial, and cornified cell layers. The composition of each layer is critical for the overall function of the organ. In this study, we used *Wnt7a*$^{Cre/+}$ *ESR1*$^{flox/flox}$ mouse model, deleting estrogen receptor alpha (*Esr1*) in the epithelium of the female reproductive tract. ESR1 is the receptor for major sex hormone estrogen. Its signaling pathway plays a crucial role in sexual development and tissue regulation. Previous studies have shown that ESR1 is required in uteri for epithelial cell growth, proliferation, and embryo implantation. Through immunohistochemical, histological and genetic analysis, we validated our hypothesis that ESR1 is important for vaginal epithelium development, tissue integrity and is responsible for immunosuppression in the vaginal tissue. In details, the *Wnt7a*$^{Cre/+}$ *ESR1*$^{flox/flox}$ animals lack the formation of cornified cell layers, had loosely adhered epithelial cells which are smaller in size and have a higher proliferating index value compared to wild-type animals (WT). They also displayed the presence of vast amounts of neutrophils in the vaginal tissue correlating with an elevated immune gene expression and higher neutrophil-mediated protease activity in the cervical vaginal fluid (CVF) throughout the estrous cycle. This study is important because we are exposed to many endocrine disruptors such as BPA and pesticides in our daily lives. These chemical compounds can bind to estrogen receptors making tissue less sensitive to estrogen and altering normal tissue physiology. In the future, we want to identify ESR1 interaction partners who are involved in this pathway and contribute to these changes.

Poster # 80

Left-over Women: Collectivist Feminism in Modern China

Presented by: Krista Brutman

Mentor: Lydia Gerber **Campus:** Pullman

Major: Mathematics

Category: Humanities

Since the beginning of the One-Child-Policy in 1979 China has experienced a severe gender imbalance, with approximately 34 million more men than women currently. Aware of this, the Chinese government has been actively involved in motivating young women to limit or delay graduate education in order to marry at a youthful age. Women over 30 today have to face the stigma of being labeled "Leftover Women" and blamed for their failure to get married at a socially acceptable age. While many researchers have explored the significant impact the government's policies and subsequent public shaming have on the women in question, this project chose to look at the Leftover Woman Phenomenon as an opportunity for self-actualization, rather than as evidence of personal failure, emphasizing in particular the power inherent in being an only child and a female child in today's Chinese society. Through a quantitative analysis of Chinese government statistics presenting the growing participation of women in higher education, a qualitative analysis of personal accounts of left-over women, and in in-depth examination of the current cultural and social climate, this project argues that being a Left-Over Woman is not only acceptable, but in certain circumstances perhaps even supported by a woman's family. Through analysis of factors such as the One-Child policy, the research finds that becoming a Left-Over woman is becoming acceptable in Chinese society through a slow social shift. The One-Child Policy changed how girls were raised, giving their parents reason to educate them and empower them in hopes of familial care in elderly age. Women were then free to choose education or work in early adulthood. As laws protecting women fail to perform their intended purpose, women are given even greater reason to elect to remain single. This research is significant because it identifies a form of collectivist feminism through denying marriage; being a Left-Over woman is a form of collectivist feminism that is moderately more accepted in modern Chinese society. This paper contributes to a more complex reading of the opportunities and challenges of Chinese women today.

Poster # 81

Muscle Tissue Structure and Remodeling in a Mouse Model of Limb Girdle Muscular Dystrophy 2i

Presented by: Yemeserach Bishaw

Mentor: Bertrand Tanner **Campus:** Pullman

Major: Biochemistry

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Jennifer Eldridge, Jay-J Yarbrough

Limb girdle muscular dystrophy 2i (LGMD2i) is caused by a mutation in the Fukutin-Related Protein gene, which in turn causes improper glycosylation of the alpha-dystroglycan complex in skeletal muscle. LGMD2i is a condition that causes weakness and muscle wasting in the arms and legs and is most apparent in the proximal muscles closest to the body, such as thighs, shoulders, and pelvis. LGMD2i often develops in late childhood and may include difficulty in walking, running and climbing, and often worsens over time. The P448L mouse is a knock-in transgenic mouse model that displays the LGMD2i pathologies that are similar in humans. The P448L mice show dystrophic markers such as, elevated serum creatinine kinase levels, an increase in muscle fibrosis, small muscle fiber size, and increased central nucleation of muscle fibers; all of which suggests high rates of muscle damage, repair, and regeneration. Prior studies investigated the effects of simvastatin on Duchenne muscular dystrophy in the transgenic *mdx* mouse and found simvastatin to be a possible drug therapy that could decrease muscle damage. Simvastatin is a drug commonly used in humans to lower blood cholesterol levels and improve the risk of cardiac disease. We sought to find the effects of simvastatin on muscle tissue structure and remodeling in the P448L mouse model. We believe that if simvastatin does indeed decrease muscle damage in the mouse model, we should see larger fibers sizes and decreased number of central nuclei in our histological samples. While preliminary data is inconclusive, our studies are ongoing, and we anticipate seeing histological differences in mice that were treated with simvastatin.

Poster # 82

Mapping of the Conformational and Mechanical Properties of Bacterial Surface Biopolymers Using Atomic Force Microscopy (AFM)

Presented by: Brian Karlberg

Mentor: Nehal Abu-Lail **Campus:** Pullman

Major: Bioengineering

Category: Engineering and Physical Sciences

Co-authors: Somayeh Ramezanian, Samuel Uzoechi

Bacteria are involved in the daily lives of humans in a variety of ways. They serve a beneficial role as a component of the human microbiome contributing to digestion of food. Bacteria can also have negative consequences to human health by causing infectious diseases and by developing resistance to antibiotic drugs thus complicating treatments. In the environment, bacteria are usually found at proximity of solid surfaces likely to access the high availability of nutrients. When attached to surfaces and connected by a network of extracellular substances (EPS), bacterial cells are called living in biofilms. Living as a community enhances the bacterial ability to survive stressful environments. The broad range of impact bacteria has on human welfare motivated us to understand the conformational properties of bacterial cell surface molecules as they relate to how bacteria adhere to surfaces. To do that, atomic force microscopy (AFM) measurements were conducted on points that spread the entire surfaces of model *Escherichia coli* cells in water. Collected force measurements of the bacterial surface were analyzed using the NanoScope 1.5 software to determine the Young's modulus of a bacterial cell. Specifically, curves were fit to a Sneddon model of contact mechanics. Similarly, by fitting the force-distance curve to a steric model using the solver add-in in Excel 2013, the length and graft density of the bacterial surface biopolymer brush were quantified. Contour plots of the quantified elasticities, biopolymer brush thicknesses and grafting densities based on the location coordinates on the bacterial surfaces were generated using Sigmaplot 11.0. Our results show that the perimeter of a bacterial cell is characterized by a lower elasticity as well as a longer biopolymer brush compared to those estimated at the center top of the cell. These results suggest that bacteria likely use their longer brushes on the edges to facilitate their adhesion by bridging to surfaces as well as to maintain their structural reinforcement by developing higher elasticities and biopolymer grafting densities on their centers.

Poster # 83

A Cost-benefit Approach to Motivated Top-down Control

Presented by: Samantha Gottlieb

Mentor: Cristina Wilson **Campus:** Pullman

Major: Neuroscience, Psychology

Category: Social Sciences

Co-authors: Lysandra Perez

Individuals with trait anxiety prefer to reserve attentional resources for vigilance, leaving fewer resources available for top-down control, i.e., the ability to maintain goal-relevant information in attention and use it to direct behavior. As a result, trait anxious individuals tend to perform worse in environments which require preventing interference from irrelevant distractors (e.g., studying for an exam when social media accounts are open). However, anxiety differences in top-down control are not always found, leading to the prominent theory that trait anxious individuals shift resources from vigilance to top-down control when sufficiently motivated. Recent research conceptualizing the operation of top-down control as a cost-benefit decision may provide a theoretical framework for predicting when trait anxious individuals will allocate attentional resources towards top-down control. According to this framework, top-down control is utilized when the expected benefits outweigh the costs, where the benefit of control is the payoff for good performance in the primary task (for the studying example, achieving a good grade on an exam), and the cost is the depletion of attentional resources available for the performance of other tasks (checking social media accounts). The goal of the current study was to determine if a cost-benefit framework can predict conditions where trait anxious individuals will be motivated to employ top-down attentional control. We independently manipulated the costs and benefits of control in the Continuous Performance Task, AX version (AX-CPT), a widely used measure of attentional control. Each participant completed three AX-CPT conditions: baseline, benefit, and cost. High trait anxiety individuals showed worse top-down control in the baseline condition relative to low trait anxiety individuals. However, as predicted by a cost-benefit framework, the benefit condition motivated high trait anxiety individuals to improve top-down control to the level of low anxiety individuals. Also consistent with a cost-benefit framework, the cost condition increased vulnerability to response interference from baseline in high anxiety participants, suggesting increasing costs drove participants to shift attentional resources towards vigilance.

Poster # 84

Interaction of Bumble Bee Communities on Small Farms

Presented by: Lucy Eggleston

Mentor: Dave Crowder **Campus:** Pullman

Major: Winemaking (Viticulture and Enology)

Category: Applied Sciences

Co-authors: Elias Bloom, Rachel Olsson, Robert Schaffer

Bees pollinate seventy five percent of the food humans grow worldwide. However, bee populations have been recently shown to be in decline, jeopardizing these pollination services. Development of urban spaces has infringed upon land historically dedicated to crop production. Therefore, urban farms are becoming an increasingly relevant solution to the problem of poor access to fresh fruits and vegetables for people living in city centers. While some species of bees may be present on these farms, varying bee species have different pollination abilities and habitat requirements based upon physical characteristics known as functional traits. Certain farms do not currently provide these habitat features, so habitat augmentation would allow a more diverse array of functional traits to be expressed within the pollinator community. Therefore, we compiled a database for understanding which functional traits were most affected by increased levels of urbanization. Using bumblebees as the model organism, the functional traits we examined were nest construction, seasonality, and food preference. We selected nine small scale, organic farms from western Washington state and grouped them into three categories based on the relative percent of surrounding urbanization. Using our database, we found a smaller suite of represented functional traits displayed as the level of urbanization increased. However, certain on-farm cultural practices can improve functional trait diversity. Therefore, pollination success can be elevated in less desirable, urbanized landscapes. We can use our results to make recommendations to growers on bee habitat augmentation strategies, thusly increasing the availability of fresh produce to people living in highly developed areas.

Poster # 85

Realizing Femtomolar Detection Limits: Optimizing Nicotine Metabolite Extraction from Mammal Plasma using Solid Phase Extraction and Liquid Chromatography-Mass Spectrometry

Presented by: Virginia Ross

Mentor: Brian Clowers, Peyton Nosbusch **Campus:** Pullman

Major: Chemistry

Category: Engineering and Physical Sciences

The efficient extraction of nicotine, along with other drugs, is essential for the purposes of monitoring dosage, usage, and understanding fundamental metabolomic processes. With respect to forensic disciplines and biological applications where sample size is limited, extraction efficiency of the target analyte from extremely small samples is challenging. Using mammal plasma volumes that derive from a single drop of blood we compared two analytical protocols to extract nicotine and its associated metabolites followed by subsequent detection using liquid chromatography and mass spectrometry. Specifically, we examined the extraction efficiency of two cation exchange cartridges, one containing a set of charge-balanced mixed-mode resin and the other containing a pH-dependent anionic functional group. Following the development of the analytical method, the optimized procedure was used to measure the levels of nicotine and cotinine from treated rat pups. Quantitation of the respective alkaloids in the tens of femtomoles was achieved using a series of deuterated standards spiked into the target samples. Because the mass spectrometer can accurately measure changes in *m/z* ratio, the signal between the deuterated internal standard and the target analytes are readily resolved using the high-resolution time-of-flight mass spectrometer. Direct integration of the respective signal channels allows for the accurate and precise determination of the target analyte concentration in the unknown sample. Given the importance of evaluating the impact of different drugs on the adolescent brain and the small blood volume limitation, the analytical approach designed can aid in research for clinical diagnostics.

Poster # 86

Development a Survey to Investigate Study Abroad Destination Choice

Presented by: Nam Nguyen

Mentor: Chad Gotch **Campus:** Pullman

Major: International Business, Marketing

Category: Social Sciences

This study comprises two complementary efforts to produce a high-quality survey instrument to investigate the factors that influence students while selecting their study abroad destination. Participants are undergraduate students at Washington State University who have expressed interest in completing a study abroad experience. The first phase of this study uses a cognitive interviewing technique. In this method, the interviewer sits down with a survey respondent, and asks the respondent to verbalize what they are thinking as they complete survey items. This process provides a window into how respondents perceive, interpret, and form a response to survey items. Additional follow-up questions gauge reaction to the survey and solicit recommendations for improving it. The second phase of the study involves pilot testing a survey revised after the cognitive interview findings. In this phase, representatives of the study population are invited to complete a paper version of the survey voluntarily during a study abroad informational session. Item responses are analyzed to further guide revision of the survey. This study is focused on creating a trustworthy instrument for collecting information about factors students are considering as they think about study abroad locations. By completing this study, the research team will produce a tool for collecting high-quality data to inform our understandings of undergraduate students and programming designed to help them decide on and have a remarkable study abroad experience.

Poster # 87

PEPc Knockdown *Setaria viridis* Plants are Hungrier for CO2 than Wildtype

Presented by: Nicole Carlson

Mentor: Erika Serrano, Asaph Cousins **Campus:** Pullman

Major: Biology

Category: Molecular, Cellular, and Chemical Biology

Drought stress is one of the most important environmental stress factors limiting crop productivity worldwide. When plants experience drought they close their stomata, the pores in their leaves that allow CO_2 to diffuse into the plant at the cost of losing water. This reduces stomatal conductance which limits water loss however, lower stomatal conductance also limits the influx of CO_2 available for photosynthesis. Photosynthesis is the process that fixes CO_2 into biomass and determines a crop's productivity. As an adaptation to low atmospheric CO_2, certain plant species developed a modified photosynthetic pathway called C_4 photosynthesis. C_4 crops that are drought-tolerant can maintain high rates of photosynthesis at lower rates of stomatal conductance. Stomatal conductance is regulated by many environmental cues such as light, CO_2 concentration, and water availability, but the dominant mechanism involved in stomatal regulation has not been clearly identified. Phosphoenolpyruvate carboxylase (PEPc) is the main carboxylating enzyme of the C_4 cycle. We used PEPc knockdowns of the C_4 model *Setaria viridis* to investigate the role of PEPc on the regulation of stomatal conductance by CO_2. We measured stomatal conductance and photosynthesis using the LI-6800 gas exchange system on wild-type and four lines of mutants with medium and low PEPc activity. Also, we measured photorespiration and water use efficiency to measure how efficient the plants were using CO_2 and water. Low PEPc activity increased stomatal conductance and water loss but did not affect the operation of the C_4 cycle, as is shown by photorespiration results. CO_2 assimilation measured at 2% O_2 was not significantly different than assimilation rates measured at 21% O_2 for the knockdown mutants. However, mutants with low PEPc activity did have a significant reduction in CO_2 assimilation and stomatal closing at high CO_2 compared to wild-type. These results link low PEPc activity with impaired stomatal closing in response to CO_2 the mutant knockdown lines.

Poster # 88

Evaluation of Apply Hybrid Selections for their Potential Use for Cider Production

Presented by: Coleman Schnebly

Mentor: Amit Dhingra **Campus:** Pullman

Major: Agricultural Biotechnology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Kate Evans, Scott Mattinson, Nathan Tarlyn

Cider is a value-added product for which popular in the EU, but represents a small in the US beverage market. There is an increasing demand amongst farmers and hard cider producers for dependable cider apple varieties. Traditional hard cider varieties availability in the US is limited and information about their growing habits or susceptibility to disease is sparse. This project focused on evaluating fruit juice from a collection of ten F1 hybrid apple selections to determine if they would be desirable for cider production. The F1 selections were generated from crosses between *Malus* × *domestica* and other *Malus spp*. Fruit from each hybrid selection was harvested at optimal maturity and data on total yield, average fruit size, and quantity of juice per gram of fruit was collected. Extracted juice was analyzed for total soluble solids (sugars), titratable acid, and astringency, three main characteristics that the cider producers use to determine if an apple selection is desirable for cider production. Preliminary results indicated that on average the F1 hybrid selections had high levels of total soluble solids measured as % BRIX, and high acidity, while astringency levels varied between the selections. This high acidity is especially noteworthy since the levels of titratable acids is significantly higher than other available apples, which can allow for the production of sharp cider. This data enabled the identification of apple selections that have potentially desirable traits. However, several more years of data collection will need to occur to ensure the consistency of these results, as well as to provide time to evaluate the trees themselves.

Poster # 89

Aggression in Twitter Use

Presented by: Megan Loman

Mentor: Christopher Barry **Campus:** Pullman

Major: Criminal Justice and Criminology, Psychology

Category: Social Sciences

Co-authors: Madison Cole, Daja Sawyer, Kirsten Westmoreland

Research on social media behavior has increased due to society's growing use of social media and their apparent role in interpersonal interactions. Personality variables have been an area of focus in attempts to understand individual differences in use of social media. Twitter is one social media site that, until a recent expansion, allowed users to share a status of 140 characters or less. Previous research has found that individuals high in psychopathy and Machiavellianism tweeted with more anger and more swearing than others (Sumner, Byers, Boochever, & Park, 2012). Additionally, Hughes, Rowe, Bately, and Lee found that there wasn't a connection between neuroticism and overall Twitter use (2012). However, these initial studies relied on self-report of personality and Twitter use and computer software that categorized tweets by linguistics, whereas the present study human coders directly coded themes in participants' Twitter posts. The present study was interested in correlates of aggressive Twitter content.

Participants were 88 undergraduates (9 males, 79 females). They first completed measures of Big Five personality traits, loneliness, fear of missing out (FOMO), narcissism, and self-esteem. Participants provided their Twitter handle, and the most recent 30 days of participants' Twitter content were coded by researchers according to the following themes: Accomplishment, Activity/event/location, Physical appearance, Affiliation, or Other (see Barry, Doucette, Loflin, Rivera-Hudson, & Herrington, 2017) and whether the tweet was aggressive, friendly, positive or negative in tone, or humorous.

A higher proportion of aggressive tweets was correlated with a higher proportion of tweets about accomplishments and physical appearance. Those who tweeted aggressively also were more likely to tweet about activities or events they attended. Importantly, none of the personality variables examined were related to themes of Twitter content. This finding is consistent with other research that showed few correlations between personality factors and actual content of Instagram posts (e.g., Barry et al., 2017) rather than relying on participant self-report of social media content. Such methods suggest that Twitter content may not provide window into the personality of the person posting, but they may have important implications by how such content is perceived by others.

Poster # 90

Mayweed Chamomile Growing Degree Day Model

Presented by: Malia Frame

Mentor: Ian Burke, Rachel Zuger **Campus:** Pullman

Major: Agricultural Technology and Production Management

Category: Applied Sciences

Co-authors: Amber L Hauvermale, Kyle N Race

This study was conducted to develop a growing degree day model for the developmental stages of Mayweed Chamomile. To gather this data plant growth stages and plant heights were recorded every three days during the growing season. The sample area was eight one meter by one meter squares in winter wheat and eight one meter by one meter squares in spring wheat. In each plot fifteen plants were rated and measured, with one constant plant rated and measured first every time. The data was compiled and synthesized into plot average stages to be compared to the growing degree days. The results of this study can be used by growers to develop a weed management plan. Understanding the growth stages of a weed and the timing of each stage allows for better weed control measures.

Poster # 91

Development of a New Self-Schema Measure: Examining Construct Validity and Reliability

Presented by: Christina Strauch

Mentor: Walter Scott **Campus:** Pullman

Major: English, Psychology

Category: Social Sciences

Co-authors: Suzanna Penningroth

In cognitive therapy, a major aim is to alter maladaptive self-schemata that contribute to psychopathology (Clark, 2014). Although accurate assessment of self-schemata is critical, the few standardized measures that exist for assessing self-schemata lack sufficient content validity. For the self-schema construct, basic research reveals that self-knowledge is organized in the form of multiple *self-with-other* representations (e.g., self-with-friend, self-at-work; Andersen & Chen, 2002), with each individual self-schema possessing associative links to idiosyncratic scripts and goals (Baldwin & Dandeneau, 2005). However, existing self-schema measures such as the Young Schema Questionnaire (YSQ; Schmidt, Joiner, Young, & Telch, 1995) continue to assess single, generalized self-schematic beliefs (e.g., "I lack common sense") and do not measure associated scripts or goals. In an effort to develop a more content valid measure that is more relevant to and representative of the self-schema construct, we developed the Relational Self-Schema Measure (RSSM). The RSSM has respondents identify multiple, highly accessible, self-with-other representations. For each individual self-schema, the respondent describes associated scripts and goals. In the present study, we examined the temporal reliability and construct validity of the RSSM. In study 1, 45 participants completed the RSSM on two separate occasions four months apart. We assessed the reliability of the RSSM by evaluating the extent to which people described similar self-schemata, including similar scripts and goals, across these two time points. In study 2, we evaluated the RSSM's construct validity by having 146 participants complete the RSSM, the Big Five Inventory (John, Naumann, & Soto, 2008), the Rejection Sensitivity Questionnaire (Downey & Feldman, 1996), and the YSQ-Short Form (Schmidt et al., 1995). Initial findings provide preliminary support both for the temporal reliability and the construct validity of the RSSM.

Poster # 92

More Than Mao: The Culpability of Other CCP Officials During the Great Chinese Famine

Presented by: Nikolas Massa

Mentor: Ling Ma **Campus:** Pullman

Major: Asian Studies, History

Category: Humanities

China has had and will continue to have a definitive impact on global politics. However, as Westerners we have relatively little insight into China's internal political workings, especially during the Maoist period (1949-1976). For many Westerners (encouraged by books like Jung Chang and Jon Halliday's 2006 work *Mao: the Unknown Story*), Mao is nothing more than a brutal and murderous dictator who drove China into a period of radical leftism and decline. However, to the Chinese government and many Chinese people, Mao is foremost the founder of their nation who—while not faultless—created the building blocks of their advancing nation. Much of this contention regarding Mao centers on the period of the Great Leap Forward resulting in the Great Chinese Famine (1958-1962) causing, in more recent estimates, a minimum of 45 million deaths. In the West, blame for the deaths caused by famine falls squarely and exclusively on Mao. Meanwhile, the Chinese government, while not eager to discuss this issue, blames at least in part local politicians and natural disasters. This project is based on a qualitative analysis of published works of leading officials in the Chinese Communist Party as well as Chairman Mao and the private observations of his doctor, Li Zhisui, all in English translation. These documents reveal that Mao was not alone in supporting the leftist policies that led to the famine. Leaders like Deng Xiaoping, Liu Shaoqi, and Lin Biao, who each in their own way contributed to this largely man-made disaster, actively supported Mao's policies. Even those who initially opposed these policies, like Zhou Enlai, soon came to support Mao. Overall, these documents reveal that the responsibility for the Great Famine falls on many more heads than Mao's. In challenging both prominent western and official Chinese perspectives on this time period, this project contributes to a more multi-faceted understanding of this critical and to this day not fully understood time period in China's recent history.

Poster # 93

PGRMC1 Enhances the Growth and Development of Triple-negative Breast Cancer

Presented by: Sierra Gallaway

Mentor: James Pru **Campus:** Pullman

Major: Genetics and Cell Biology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Nicole C. Kelp, Cindy A. Pru

Triple-negative breast cancer (TNBC) tumors, which lack expression of the classical progesterone and estrogen receptors, as well as the HER2 receptor, have the highest breast cancer mortality rate, due to its resistance to conventional therapies and high rates of recurrence and metastasis. The expression of progesterone receptor membrane component 1 (PGRMC1) is commonly elevated in several women's cancers, particularly TNBC. While such correlative gene expression studies have been informative, they do not clearly demonstrate that changes in the expression of PGRMC1 contribute to the development and/or progression of these cancers. As such, the objective of this study was to evaluate the role of PGRMC1 in the development and progression of TNBC tumors using a mouse xenograft tumor model. Here, MDA-MB-231 (MDA) TNBC cells were transfected with control of *Pgrmc1-3XFlag* lentiviral vector constructs to generate cell lines in which PGRMC1 protein is expressed endogenously (control) or is over-expressed (PGRMC1-3XFLAG). Western blotting and immunocytochemistry were used to validate endogenous PGRMC1 or PGRMC1-3XFLAG expression in these cells lines. As expected, the PGRMC1-3XFLAG cells expressed both the endogenous and Flag-tagged PGRMC1 proteins based on Western blotting and immunocytochemistry. Intraperitoneal TNBC tumors were developed in immunocompromised nude mice by inoculating each mouse with 1 X 10^7 control or PGRMC1-3XFLAG cells (n=10). After 10 weeks, tumors were harvested, weighed, and evaluated for proliferation and vascular development. PGRMC1-3XFLAG tumors grew faster and larger with less necrosis than control tumors (p=0.0145). As determined by immunohistochemistry for the mitosis marker phospho-histone H3, cell proliferation was significantly elevated in PGRMC1-3XFLAG transfected cells. Vascular development was evaluated by immunohistochemistry through the use of an antibody specific for CD31, a marker of endothelial cells. PGRMC1-3XFLAG tumors were more vascularized based on CD31 staining (p=0.001). In summary, this study shows that elevated expression of PGRMC1 in TNBC cells increases xenograft breast tumor growth through increased mitosis and angiogenesis. A key to understanding PGRMC1 mechanism of action will be to begin identifying PGRMC1-interacting proteins. Given the presence of a ligand binding domain, PGRMC1 may useful for pharmacological or gene therapy targeting as a mechanism to treat TNBC.

Poster # 94

Exploring the Role of Selection on the Innate Immunity in the Malaria Vector, *Anopheles gambiae*

Presented by: Sarah Kehr

Mentor: Omar Cornejo **Campus:** Pullman

Major: Microbiology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Joel Nelson

The interaction between vectors, parasites, and hosts result in differential selective pressures that generate a changing landscape of challenges that each organism must face. Vector-parasite interactions are one of the key components for how vector-borne infectious diseases spread. Vectors have been commonly thought to be unaffected by the pathogen they carry; a hypothesis that has been challenged with recent findings, suggesting that the parasites can change the behavior and fitness of the infected individuals when compared to uninfected ones. The molecular basis responsible for the traits putatively affected by the parasite, and the potential for adaptation in the vector has not been fully characterized. Recent studies have documented some of the functional interactions between the vector *Anopheles gambiae* (African malaria mosquito) and the malarial parasite *Plasmodium falciparum*. These functional studies lack the evolutionary component to understand if those genes have been important in the process of co-evolution (adaptation) between parasite and host, or if they have the potential for evolving in the population. Recent studies have addressed the extent of selection across the *Anopheles sp*. genome, but none to our knowledge have addressed if the genes functionally implicated in immunity/resistance to the malarial pathogen show signatures of selection. Here we use full genome data from 765 mosquitoes ranging from 9 different populations of *Anopheles gambiae* and *Anopheles coluzzi* to analyze the extent of selection for genes of interest. We analyze regions of the genome that have been identified as being under selection, to characterize those containing genes functionally implicated in mosquito immunity to malarial parasites using summary statistics and linkage maps. Some of the identified immune-related genes seem to work cooperatively and some of them seem to occur physically together in the genome, making it difficult to identify single evolutionary culprits that could explain the adaptation of *Anopheles* to carry the malarial parasite. The evolutionary analysis of the genes involved in *Anopheles* mosquito's immune response to *Plasmodium* infection could help us better identify putative target genes that could help us reduce the competence of the mosquito to carry the malarial parasite.

Poster # 95

Arbitrary Detention in the United States

Presented by: Madeleine Hunter

Mentor: Ken Faunce **Campus:** Pullman

Major: History

Category: Social Sciences

Co-authors: Kasey Markland, Kari Whitney, Margaret Wycoff, Kiara Yektansani

In the Summer of 2016, the United Nations Working Group on Arbitrary Detention was invited by the United States Government to investigate and suggest remedies to instances of arbitrary detention. My research started as part of a group project which culminated in a presentation to the Working Group at the United Nations in Geneva concerning arbitrary detention in the form of what it effectively the modern debtors prison. This project builds upon this initial project to examine arbitrary detention in the form of economic discrimination more in depth, and suggest remedies to the problem. The United States Supreme Court case Bearden v. Georgia (1983) determined that imprisoning an individual for the non-willful failure to pay a court imposed fine is unconstitutional, yet the practice still occurs a alarming rates all over the country. The research finds that a combination of private corporate influence, and ignorance of law on the part of key legal personnel such as public defenders and judges are central to the problematic occurance of the modern debtors prison. Furthur, it suggests practical implementations of practices at the court level in an effort to solve the problem of the modern debtors prison.

Poster # 96

Palouse Wild Cider Apple Breeding Program: Hands-on Learning at its Best

Presented by: Tymon James

Mentor: Cameron Peace **Campus:** Pullman

Major: Fruit and Vegetable Management, Integrated Plant Sciences

Category: Applied Sciences

Co-authors: Feixiong Luo

Hands-on learning is often missing from standard education environments. When it comes to hands-on experience, the Palouse wild cider apple breeding program is the best for budding breeders! In this program, students make decisions at every step. My own education has been enhanced by conducting field and lab work and writing a formal description of the program. Field work included cross-pollinating, observing tree attributes, and collecting leaf samples. Lab work focused on a "parentage project" to determine parents of seedlings, which involved extracting DNA, amplifying DNA fragments via PCR, and separating and visualizing fragments on a DNA Analyzer machine. This student-run breeding program creates an optimal educational setting to obtain real-world experience in all aspects of fruit breeding. The student can make mistakes that would otherwise be costly, in the safety of a learning environment. The hands-on experience gained in this WSU program provides necessary knowledge and skills critical to future pursuits in fruit breeding professions.

Poster # 97

Synthesis and Characterization of a Bio-mimicking Heterogeneous Palladium Nanoparticle Catalyst

Presented by: Michael Brown

Mentor: Steven Saunders **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Co-authors: Kristin Bryant, Shane Reynolds

Metal nanoparticles play a significant role in many industrial reactions. Nanoparticle syntheses are typically highly specialized and can generate a large amount of waste. A general method to produce monodispersed, supported nanoparticles with low chemical waste is highly desirable. Some of the most active catalysts are enzymes which feature a metal complexed with a nitrogen group. With the goal of creating a heterogeneous catalyst which mimics these enzymes, we deposited a palladium nanoparticle (PdNP) onto a silica support that was functionalized with a pendant amine group that could interact with the metal nanoparticle. We hypothesize that metal and the nearby amine group can facilitate both acid and base-catalyzed reactions. The silica support material was functionalized with (3-aminopropyl)triethoxysilane via a simple condensation reaction. The functionalized support material was characterized spectroscopically to ensure the presence of the pendant amine group. FTIR and solid-state NMR qualitatively confirmed the presence of the amine group. The presence of the amine was then quantitatively confirmed via a gravimetric analysis after the pendant amines were reacted with CO_2. CO_2 readily reacts with primary and secondary amines ensuring complete quantification. We then leveraged a novel Switchable Ionic Surfactant (SwIS) system to synthesize and deposit the PdNPs onto the functionalized silica support. The SwIS is a molecule that can be “turned on” to act as a surfactant which can template a metal nanoparticle and then “turned off” to release the nanoparticle in order to deposit on the support surface. This method of depositing the nanoparticles has been shown to not require a high-temperature activation process, thus we have the potential to perform fundamental, size-dependent experiments. The presence and morphology of the deposited nanoparticles were determined via Transmission Electron Microscopy. This work presents a novel strategy to prepare a bio-mimicking, heterogeneous catalyst which has the potential to be applied to many different applications. In future work, we will test this catalyst with a decarboxylation reaction relevant to biomass conversion.

Poster # 98

Organized Crime and the Six Billion Dollar a Year Industry

Presented by: Rylee Sullivan

Mentor: Ken Faunce **Campus:** Pullman

Major: Psychology

Category: Humanities

In this study, I examined organized crimes role in human trafficking, specifically researching the role that Asian Triads, and the Russian Mafia have had in this industry. Human trafficking has affected over 4 million migrants, with the prime destination being the United States, making this one of the most lucrative industries for organized crime groups to get involved in. For my study, I examined studies done by other academics as well as reading testimony from trafficked victims. I found that without the involvement of organized crime syndicates, smuggling people trans- or internationally at the current rates would just not be possible. Members of law enforcement are urging policy makers to make the comprehensive changes needed to save the lives of thousands, but this is an issue that is easy to forget about as long as a bystander believes the victim is a willing participant.

Poster # 99

Progesterone Inhibits Replication of *Coxiella burnetii* in Nutrient Broth and During Infection of Cultured Cells

Presented by: Zachary Howard

Mentor: Anders Omsland **Campus:** Pullman

Major: Genetics and Cell Biology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Eduardo Vallejo Esquerra

Coxiella burnetii is a Gram-negative bacterial pathogen. During infection, *C. burnetii* invades eukaryotic cells and replicates within a vacuole referred to as the *Coxiella* Containing Vacuole. *C. burnetii* is the causative agent of Q fever and coxiellosis in humans and animals, respectively. *C. burnetii* is typically shed into the environment via urine, feces, and birth products of domestic ruminants; human infection can occur after inhalation of aerosolized bacteria, or via ingestion of certain animal products (e.g., unpasteurized milk). An infectious dose of less than 10 bacteria can establish infection in humans. *C. burnetii* is known to colonize the placenta and cause reproductive disorders, such as abortions, in animals. Epidemiological studies of Q fever have also identified differences in infection severity between males and females. However, the molecular mechanisms implicated in sex-dependent infection phenotypes remain unclear. Thus, we hypothesized that mammalian sex hormone can affect *C. burnetii* replication. To test this hypothesis, we investigated the effect of the two major groups of female sex hormones, estrogens and progestogens, on *C. burnetii* replication in host cell-free nutrient medium and during infection of cultured host cells. Estradiol, the major estrogen, had minimal effect on *C. burnetii* replication, but progesterone, the major progestogen involved in pregnancy maintenance, inhibited *C. burnetii* replication. More specifically, we found that *C. burnetii* replication was inhibited under axenic conditions by addition of 200uM progesterone to the culture medium. During intracellular replication, addition of 10uM progesterone to the culture medium was sufficient to inhibit *C. burnetii* replication in JEG-3 cells, a human placental cell line. Together, these results indicate that *C. burnetii* replication is affected by mammalian sex hormones in a hormone-specific manner.

Poster # 100

Genome Wide Association Analysis of Miscarriage after d35 of Gestation in Holstein Heifers using the Illumina GGP50 BeadChip

Presented by: Alexandria Wahl

Mentor: Holly Neibergs **Campus:** Pullman

Major: Animal Sciences

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: J. Dalton, J. N. Kiser, T. E. Spencer, E. M. Suarez, J. A. Toenges

In dairy heifers artificial insemination (AI) fertilization rates are 90 to 100% but by day 35 of gestation only 55-60% of pregnancies will remain and an additional 7-10% of pregnancies will be lost by calving. The objective of this study was to identify the loci associated with miscarriages after day 35 of gestation in highly fertile Holstein heifers. Holstein dairy heifers (n = 561) that were raised together and conceived to their first AI were followed to calving. Of these, 499 calved (C) and 62 miscarried (MC). MC heifers were genotyped using the Illumina GGP50 BeadChip (43,938 single nucleotide polymorphisms or SNPS), while C heifers were genotyped with the Illumina BovineHD BeadChip (777,000 SNPs). A common set of shared SNPs (43,938 SNPs) between the GGP50 and the BovineHD BeadChips were used for the genome wide association analysis and a 34 kilobase region surrounding the significant SNPs was investigated for positional candidate genes. After quality control for SNPs and animals, 460 heifers (56 MC and 404 C) and 40,040 SNPs remained for the analysis. A allelic association test with a Yates correction was used to identify loci moderately ($1 \times 10\text{-}5 > P < 5 \times 10\text{-}7$) and strongly ($P < 5 \times 10\text{-}7$) associated with miscarriages. Fifteen loci were moderately and 31 loci were strongly associated with miscarriage after day 35. Associated loci included 28 positional candidate genes. The disruption of the functions of many of the positional candidate genes results in insufficient or lack of embryonic development and/or fetal growth. The identification of loci and genes associated with miscarriage provides a foundation for further study of the roles of these genes in fertility and an approach to reduce the economic losses associated with miscarriages in the dairy industry.

Poster # 101

Colonial Past Sheds Light on Modern Strife in South Sudan

Presented by: Tommy Conway

Mentor: Clif Stratton **Campus:** Pullman

Major: Biology

Category: Social Sciences

In the second month of 2017, a famine was declared in South Sudan. Millions of Sudanese were at risk of starvation from crop failures. This tragedy was a shock for people around the globe, but the root cause was in no way natural. This famine was primarily the product of war, which has been a recurring motif of the region's history since Sudan gained its independence in 1956. These conflicts are, in turn, tied to British colonial policies when Sudan (including the South) was under the joint control of Britain and Egypt, with Britain holding de facto power. When this colony was first established, the borders were drawn without regard for the established territorial boundaries adopted by the indigenous peoples. These peoples had established boundaries for good cause, as Sudan was home to a vast variety of languages, cultures, and societies, as reported by European ethnographers and linguistic anthropologists at the time. Even if colonial powers were aware of the potential instability caused by this arbitrary drawing of colonial boundaries, they neglected any measures to help unify the territory and prevent conflict. Once Sudan gained independence, it was immediately subject to prolonged war, eventually leading to the creation of South Sudan in 2011. Regardless of this attempt at peace, South Sudan remains a famine-ravaged war zone that is a monument of the lasting effects of colonialism in the world today.

Poster # 102

Portland to Philippines: Innovation of Soft White Wheat for Export Markets

Presented by: Madisyn Beaudoin

Mentor: Arron Carter, Amit Dhingra **Campus:** Pullman

Major: Field Crop Management

Category: Applied Sciences

Co-authors: Adrienne Burke. Kyall Hagemeyer, Gary Shelton

Portland to Philippines is a research project oriented to improve quality of soft white wheat for export markets. By improving the quality of the soft white wheat, the export demand for this commodity with remain high, which will in turn benefit the American farmer. The main objective of this project is to analyze the 2017 soft white wheat early generation breeding material for end-use quality performance. Other objectives include correlating predictive performance between early generation end-use quality tests, as well as with actual baking performance. Early generation lines will be screened for kernel hardness, protein content, milling traits, and micro SRC Water using approved AACCI methods. For the above listed traits, screening will be done for low protein and low kernel hardness, high break flour and total flour yield, and low SRC Water absorption. After determining the predictive power and correlations of these traits in early generation material, previous years' data will be used for further analysis. The 2015 and 2016 data will be used to correlate with actual baking performance from the corresponding 2016 and 2017 yield trials. Early generation traits will be correlated with cookie diameter to determine which traits are highly correlated and thus require more stringent selection in early generations. The expected results from this research are to improve the selection of soft white wheat quality in early generations. Maintaining breeding lines with high end use quality will ensure the quality of released cultivars meets export demands, and will help the American farmer and the American economy in an ever-changing global market.

Poster # 103

The Effect of Solvent Ratio in the Decarboxylation of Fatty Acid

Presented by: Mackenzie Palafox

Mentor: Chuhua Jia **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Co-authors:

With the depletion of natural resources, renewable energy and clean fuel have become the focus of many research studies. Not only is clean fuel more environmentally friendly by reducing the production of CO_2, it can be derived from renewable biomasses. Renewable diesel can be derived from natural oils and fats, converted to fatty acids and then produce fuel via catalytic reaction. The use of biphasic, liquid phase catalysis in the decarboxylation of stearic acid to n-Heptadecane, with varying ratios of cyclohexane to water, investigates the effect of the solvent ratio on the yield. This study looks at multiple different volumetric ratios of cyclohexane to water in a biphasic and single-phase reactions. The use of two immiscible fluids allow for easier separation of product and catalyst. Based on previous studies, 0.15 g stearic acid (as feedstock), 0.05 g Pd/C (as catalyst) were combined in a reactor with cyclohexane to water solvent ratios of 24:0, 20:4, 16:8, 12:12, 8:16, 4:20, 2:22, 1:23, and 0:24. The reaction was run at 260°C and 28 bar H_2 for 6 hours. Yield of n-Heptadecane was found using calibration data and gas chromatography-mass spectrometry (GC-MS). The study showed that a biphasic solvent produces higher yield than a single-phase solvent. In addition, the highest yield of 93% n-Heptadecane was produced using a solvent ratio of 12:12, and the ratio of 2:22 produced 91% yield.

Poster # 106

Supposedly Sexually Insatiable: A Comparison of Female Rulers And Their Sex Legends

Presented by: Abagail Poelstra

Mentor: Lydia Gerber **Campus:** Pullman

Major: Asian Studies, Environmental and Ecosystem Sciences

Category: Humanities

In almost every culture captured in history, women in power have been rare, and if remembered positively, they were regarded as good mothers or faithful virgins. How, on the other hand, do historical texts remember women who were very successful, but who also used their sexuality to rise to power. This project examines three such cases from different cultures and times in history: Theodora of Byzantine, co-ruler with her husband from 527-548, Wu Zhao, China's only woman emperor (independent rule 690-705) and Catherine the Great of Russia, who reigned independently from 1762-1796. All three woman gained power through marriage into the imperial line and were by all accounts popular with their subjects. Though from different time periods and different cultures, each of these three female rulers had multiple sex legends rise around her as a way of discrediting the quality of their rule. Based on a qualitative analysis of multiple biographical accounts, ranging in date of publication from shortly after their reigns to current research, and with the aid of additional secondary sources, I created a timeline for each woman ruler, focusing on their rise to power and reign, and the societal standards for women during that time. By utilizing gender theory and cross applying the timeline, I discuss the validity of each rumor discrediting them as sexually insatiable, why and when they may have been spread, and what purpose they may have served in the societies that kept them alive. I discovered that most of these "sex legends" lacked evidence/validity and arose after the female rulers' deaths. On the other hand, in each of these cases the female ruler had risen at least in part due to the power of their beauty and their ability to use it effectively in manipulating others. This project contributes to an exploration of the intersection of gender and power, and the common challenge in different cultural settings to come to terms with female sexuality as a societal force.

Poster # 107

Using analysis of Whisker Stable Isotopes to Investigate Predation by California Sea Lions (*Zalophus californianus*) on Endangered Chinook Salmon (*Oncorhynchus tshawystcha*) at Bonneville Dam Fish Ladders

Presented by: Katelyn Bartleson

Mentor: Ray Lee **Campus:** Pullman

Major: Wildlife Ecology and Conservation Sciences

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors:

California sea lions (*Zalophus californianus*) significantly impact endangered Columbia River Chinook salmon (*Oncorhynchus tshawytscha*) populations. Sea lions travel 140 miles upstream to consume Chinook salmon concentrated at the Bonneville Dam fish ladders. Effects on already low Chinook salmon runs in the Columbia River has led to the lethal removal of recurring sea lions at the dam by fish and wildlife management. Our research seeks to quantify salmon consumption in lethally removed individuals and compare this to other coastal sea lions. We are conducting stable isotope analysis of whisker growth increments postmortem that will estimate the amount of salmon in the diet of adult male California sea lions (30 individuals sampled) observed feeding at the fish ladders. Sea lion whiskers grow continuously throughout the lifespan and record food consumption through the accumulation of dietary carbon and nitrogen isotopes stored in the whisker keratin proteins. Predation on Chinook smolts (migrating downstream) is reflected in whisker keratin with depleted ^{13}C values (freshwater carbon), while adult Chinook salmon (migrating upstream) consumption is reflected in elevated levels of ^{15}N (marine predator nitrogen). In this study, we sectioned 100-300 mm sea lion whiskers into approximately 0.5-1 mm increments, then measured the relative abundance of carbon and nitrogen isotopes in each increment using an isotope ratio mass spectrometer. Whisker isotope values from Steller sea lions (*Eumetopias jubatus*) and harbor seals (*Phoca vitulina*) were also measured for comparison. The results show variability in the diet of sea lions foraging at Bonneville Dam, and analyses are ongoing to assess whether there are significant differences compared to Pinnipeds that are not foraging at the dam. This research may ultimately help in Chinook salmon recovery and assist in making more informed predictions about the benefits of dam removal on Columbia River ecosystems.

Poster # 108

Identification and Validation of Loci Associated with Bovine Respiratory Disease Susceptibility in Holstein Calves

Presented by: Macy Cornmesser

Mentor: Holly Neibergs **Campus:** Pullman

Major: Biology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Jennifer Kiser

Bovine respiratory disease (BRD) is one of the most common infectious diseases that plagues the dairy and beef cattle industries. A previous genome-wide association analysis (GWAA) in pre-weaned Holstein calves from California and New Mexico identified multiple loci moderately associated ($P < 1 \times 10\text{-}5$) with susceptibility to BRD. The objective of this study was to identify new loci and validate previously identified loci associated with susceptibility to BRD in an independent, pre-weaned, Holstein calf population. Male and female Holstein calves ($n = 140$) from a Wisconsin dairy were assessed using the McGuirk health scoring system for BRD and identified as a case (scores ≥5) or a control (scores ≤ 4). Blood samples were collected for DNA extraction and genotyping was conducted using the Neogen GGP50 BeadChip for controls (49,463 SNPs) and the Illumina BovineHD Beadchip for cases (777,962 SNPs). GGP50 genotypes were imputed to 777,962 SNPs using Beagle 4.1 and a Holstein reference population of > 4,000 animals with BovineHD BeadChip genotypes. A GWAA was performed using an efficient mixed-model association eXpedited statistical approach and pseudo-heritability was estimated. The GWAA identified four loci moderately associated ($P < 1 \times 10\text{-}5$) and two loci strongly associated ($P < 5 \times 10\text{-}7$) with susceptibility to BRD. Loci identified on BTA1 as associated with BRD in Wisconsin Holstein calves were within a Kb of one or more of the top 2000 SNPs associated with BRD susceptibility in previous Holstein calf studies. The identification and validation of loci associated with BRD susceptibility will allow for genomic selection of cattle with greater resistance to BRD, thereby reducing the prevalence and impact of BRD on the cattle industry by improving animal welfare and increasing industry profitability.

Poster # 109

Conflict in the Congo: A Legacy of Empire, Tyranny and Kleptocracy

Presented by: Sean Nooney

Mentor: Clif Stratton **Campus:** Pullman

Major: History

Category: Social Sciences

I argue in "Conflict in the Congo: A Legacy of Empire, Tyranny and Kleptocracy" that the seemingly endless war and ethnic conflict that has plagued the fledgling Democratic Republic of the Congo throughout the 21st century, is primarily a result of the long and destructive legacy of imperialism, tyranny and kleptocracy in the Congo Basin beginning with King Leopold II and culminating with the dictatorship of Mobutu Sese Seko and its aftermath. Western intervention in the Congo first began with King Leopold's takeover and rule starting in 1885 as chronicled in the brilliant monograph *King Leopold's Ghost* by renowned historian Adam Hochschild. After massive international uproar over genocidal practices, King Leopold sold his colony to the Belgian government in 1908. Forty more years of Belgian colonial rule would ignite the flames of popular resistance in the 20th century that culminated in an independent government headed by Prime Minister Patrice Lumumba in 1960. But after Lumumba's assassination by the CIA resulting from collusion between the Belgians, the Americans, and Joseph Mobutu, the Congo descended into civil war. Mobutu with American support emerged victorious, and he set about a forty-year reign of terror that was extensively documented in the book *Mobutu's Totalitarian Political System* by political scientist Peta Ikambana. Mobutu's U.S. backed authoritarian regime managed to transfer vast amounts of resources out of the Congo and into the industrialized West. Unable to withstand another draining kleptocratic regime the Congo was propelled into the Rwandan genocide and its resulting Great African War. The bloody collapse of Mobutu's Congo led to the chaotic birth of the current Democratic Republic of the Congo. This historical investigation into the modern Congo's history and its relation to the regions present, reveals that only through a proper understanding of the past can we begin to address the reoccurring causes of Congolese suffering and poverty.

Poster # 110

Magnetic Separation of Technetium from Low Level Waste by Greigite Sorption

Presented by: Jonathan Moore

Mentor: John McCloy **Campus:** Pullman

Major: Materials Science and Engineering

Category: Engineering and Physical Sciences

Co-authors: Mostafa Ahmadzadeh, Emily Nienhuis

The heavy metal technetium (^{99}Tc) isotope is commonly found in the form of the pertechnetate ion (TcO^{4}), which is highly soluble and environmentally mobile with the capability of entering the food chain. The nuclear waste industry has had difficulty removing Tc from the supernatant liquid that constitutes the low-level waste (LLW). Some proposed solutions have included capturing Tc in ion exchange media and disposing of those resins, or incorporating the Tc as part of a LLW cement waste form. The former solution puts off the disposal of Tc to another entity, and the latter has been shown to result in leached Tc from cement pore water. Given the lack of a robust separation and immobilization procedure, a method to remove and ultimately dispose of Tc from the LLW has been proposed. Greigite, an iron sulfide (Fe_3S_4) with an inverse spinel crystal structure, exhibits heavy metal sorption capabilities, strong magnetic properties, can be made as an insoluble nanoparticle, and is believed to have the capacity to sorb Tc which could then be removed with magnets. The research that has been conducted in this lab focuses on synthesizing greigite with a hydrothermal process, which involves forming the particles at elevated temperature and pressure over an extended period of time. Presently, these results have shown that the amount of greigite that can be synthesized by this process is limited to 70.0-wt% Fe_3S_4, the remainder of which is pyrite FeS_2. This technology could help decrease the environmental impact of the nuclear fuel industry and allow the Tc to be effectively contained.

Poster # 111

Terrorism in Northern Africa

Presented by: Bailey Powers

Mentor: Matthew Unangst **Campus:** Pullman

Major: Basic Medical Sciences

Category: Humanities

This project is a reflection on the Algerian War, which took place from November 1954-1962, between the Algerian and French forces. With the primary focus aimed at violence and terrorism, this research explores the long-term repercussions evident from the war in the African country of Algeria. This research projects explains Northern Africa, specifically Algeria, before the war, during the war, and after the war. The Algerian war impacts modern day terrorism today, and the main position this paper takes is modern day terrorism in Northern Africa evolved from the Algerian War. Throughout the war, the French and the Algerian armies continuously used terror tactics to scare the other side. This lead to multiple very violent outbreaks caused through the influence of retaliation. Nearly half a million lives were taken, and millions of Algerians were forced out of their homes during the conflict. Many Algerians were also captured, tortured, and then killed. After the war ended, Northern Africa was left in shambles and chaos – economically, politically, culturally, and agriculturally. Terrorism and violence had been engraved in African society, causing modern terroristic groups to evolve over time, with the roots lying in the French-Algerian conflict. This hypothesis is explained through many decades of historical events, starting from before the Algerian war, all the way until the present. This research draws from both primary and secondary sources, including research journals, newspaper articles, monographs, and books.

Poster # 112

The Effectiveness of an Electrochemical Scaffold Producing Hypochlorous Acid Against *Candida albicans* Fungal Biofilms

Presented by: Hannah Zmuda

Mentor: Haluk Beyenal **Campus:** Pullman

Major: Bioengineering

Category: Engineering and Physical Sciences

Co-authors: Mia Mae Kiamco, Abdelrhman Mohamed, Robin Patel, Yash Raval

Chronic wounds are difficult to treat because of the presence of pathogenic biofilms in the wound site. Biofilms are communities of bacterial and/or fungal cells suspended in an extracellular polymeric substance (EPS). The EPS protects the pathogenic cells from host immune responses as well as external stresses, making eradication and wound healing difficult to achieve. Current treatment options utilize topical or systemic antibiotic treatment. Topical treatments are not effective in eradicating biofilms because the thickness of the biofilm makes it difficult for the compounds to reach the wound bed. Additionally, antibiotics are often not effective because of innate biofilm-associated as well as acquired resistance. The present study examines a novel technology that can simultaneously eradicate biofilms on wound surfaces and promote wound healing.

The electrochemical scaffold (e-scaffold) is a platform technology that allows controlled, continuous electrochemical production of low concentrations of biocides. The e-scaffold consists of a three-electrode system, a working and counter electrode made of conductive carbon fabric accompanied by a silver-silver chloride reference electrode. Hypochlorous acid is generated by oxidizing chloride ions from the surrounding saline solution into chlorine gas when a constant potential of 1.5 $V_{Ag/AgCl}$ is applied, then the chlorine gas dissolves into water. Our research group previously demonstrated the e-scaffold's effectiveness in eradicating antibiotic resistant bacterial biofilms.

In the present study, the effectiveness of electrochemically produced hypochlorous acid from the e-scaffold against the pathogenic *Candida albicans* biofilm is demonstrated. An *in vitro* model is used to evaluate the efficacy of the e-scaffold hypochlorous acid treatment and optimize the duration of the treatment. Once optimized, 12-hour and 24-hour e-scaffold hypochlorous acid treatments are tested on the *ex vivo* infected porcine explant model to show that the treatment does not affect host cell viability and that the biofilm is eradicated from host tissue. These findings suggest that the e-scaffold is a novel non-antibiotic treatment approach for managing chronic wound infections.

Poster # 113

Real-time tarP Gene Expression Observed in *Chlamydia trachomatis* with the Fast Fluorescent Timer

Presented by: Patrick Johnson

Mentor: Amanda Brinkworth, Ray Carabeo **Campus:** Pullman

Major: Genetics and Cell Biology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Jordan Bolen, Pierce Claasen

Chlamydia trachomatis is the most prevalent bacterial sexually transmitted infection globally with tens of millions of new cases occurring every year. A better understanding of chlamydial development is needed to understand how *Chlamydia* is able to survive despite antibacterial treatment and immune responses. A critical component in the development of *C. trachomatis* is the TarP protein, which assists the bacteria in the infection of host cells. We hypothesized that by using a new method of monitoring gene expression, the Fast Fluorescent Timer (FFT), we would be able to observe transcriptional activity from the *tarP* promoter in real time. Folding of the FFT protein results in two fluorescent species, an initial blue form and a stable mature red form. This method has the advantage of being accurate down to the individual bacterium and being able to distinguish between old and new transcription, and also has significantly lower associated labor costs and preparation times compared to standard methods of gene quantification. Plasmids containing the TarP promoter, the FFT gene, and a gene encoding for antibiotic resistance were constructed in *E.coli*. The plasmid was confirmed by genetic sequencing and transformed into *C. trachomatis*. Penicillin-resistant *Chlamydia* were isolated over several passages, and individual bacterium were observed under by fluorescence microscopy throughout development. We found that fluorescent intensity of the observed cells increased in the late stages of the *C. trachomatis* life cycle, which is consistent with TarP expression results from other methods of expression determination. We are continuing to use this strain to study how *tarP* expression changes during immune stress in the presence of the inflammatory molecule, interferon-gamma. The Fast Fluorescent Timer has huge potential for the study of *Chlamydia* biology because it can be detected in real-time, while indicating old and new transcriptional activity. We intend to construct a FFT library with all *C. trachomatis* promoters, so that gene expression at any point during the cell's life cycle can be accurately assessed. This work will provide a more precise understanding of *Chlamydia* development such that more effective treatments for chlamydial infections can be developed.

Poster # 114

Biofilm Growth of Multidrug-Resistant *Escherichia coli* during Exposure to Natural Antibiotics

Presented by: Mohammed Alzawad, Kaycee Faber, Raquel Murillo, Sarah Schroeder

Mentor: Nehal Abu-Lail **Campus:** Pullman

Major: Bioengineering

Category: Engineering and Physical Sciences

Co-authors: Samuel Uzoechi

In recent years, antibiotics have been diminishing in their effectiveness in controlling or eliminating bacterial infections. One adaptation mechanism bacteria possess to resist antibiotics is the development of biofilms. Biofilms are communities of cells that are well connected through a rich matrix of extracellular polymeric substances (EPS). Upon forming biofilms, diffusion of antibiotics into biofilms is restricted. In addition, some bacterial cells change their phenotypes to become resistant to antibiotics. These are referred to as persister cells. Because of the misuse of antibiotics, multidrug resistant (MDR) bacterial cells are emerging. These bacterial cells survive in the presence of commonly used antibiotics. As such, alternative means to kill MDR bacteria causing infections are being sought. This study investigates the use of natural antibiotics, namely apple cider vinegar and garlic, as means to control biofilms. A strong biofilm forming strain of MDR E. coli was investigated for its ability to form biofilms in the presence of the minimum inhibitory concentrations (MBICs) of the prescribed antibiotics, applied individually or synergistically. Biofilm formation for 72 hours was quantified via standard staining with crystal violet and a drop-plate assay. The pH was measured during biofilm formation. Our results indicate that when natural antibiotics were applied, at the MBIC, individually on mature biofilms, biofilm growth decreased by 20% as opposed to the biofilms without treatment or to biofilms with a synergistic treatment. Our preliminary results indicate that incorporating one of the natural antibiotics, apple cider vinegar or garlic, into a daily diet may decreases the extent of MDR E. coli biofilm growth and allow for other treatments to be more effective.

Poster # 116

Quantifying the Accuracy of Landsat in Estimating Reservoir Water Surface Area

Presented by: Lambert Ngenzi

Mentor: Alex Fremier **Campus:** Pullman

Major: Environmental and Ecosystem Sciences

Category: Applied Sciences

Co-authors:

Water is a crucial resource for food production in semi-arid regions of the world, such as parts of West Africa. Thus, the management of water storage plays a critical role in human well-being. In this research, we are trying to understand the dynamics (temporal and spatial) of water storage in small reservoirs in the Volta Basin by using remotely sensed imagery. We know that Google Earth images are more accurate than Landsat images, but Google Earth has only been collecting data for the last fifteen years. However, the Landsat program has collected more than three million images for about forty years. First, we will assess the accuracy satellite images (Landsat 7 or 8) by comparing them to available aerial photography (Google Earth). We will quantify how accuracy changes with soil color, latitude and size of reservoirs for a period of time ranging from 2000-2016. A detailed accuracy assessment will improve our ability to estimate changes in storage across semi-arid regions of the world in an effort to inform water resources management, especially in developing countries such as Ghana and Burkina Faso. In addition, we hope to detect changes in water quantity by assessing the impact of the local communities and their activities in these small reservoirs in the Volta Basin.

Poster # 117

Retinoic Acid Receptor Alpha (RARA) in Male Germ Cells has Varied Roles during Spermatogenesis.

Presented by: Marissa Chukwu

Mentor: KwanHee Kim **Campus:** Pullman

Major: Zoology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Sze Ming Law-Nagaoka, Natalie Peer

Spermatogenesis is a complex process by which sperm are produced in the testis. Removal of vitamin A from the diet results in testis degeneration and infertility in male mice. Retinoic acid (RA) is a biologically active form of vitamin A. RA signaling is mediated by six different nuclear receptors that act as transcription factors. When retinoic acid receptor alpha (Rara) gene, the gene for one of these receptors, is mutated in both germ cells and somatic cells, the male mice were infertile. RARA functions have been described in somatic cells; however, the roles of RARA in germ cells have yet to be fully elucidated.

To test the hypothesis that RARA has specific roles in germ cells, we generated Rara germ cell-specific conditional knockout (Rara cKO) mice. Using Cre/loxP technology, the Rara gene was deleted in male germ cells, and not in somatic cells. The results revealed disorganization of germ cells in the seminiferous tubules and reduced epididymal sperm counts in Rara cKO mice compared to control animals.

Additionally, we found unexpectedly that Rara cKO mice showed abnormal synaptonemal complex (SC) integrity and DNA damage during meiosis, including DNA fragmentation. During meiosis, homologous chromosome pairs bind a specific group of proteins, forming the SCs. By conducting gene expression studies on germ cells isolated from cKO or control mice, we identified almost 30 meiotic genes potentially regulated by RARA, such as Rec8 and Smc1b involved in maintaining SC integrity, and Eme2 involved in DNA repair. The gene expression was lower in Rara cKO germ cells compared to controls. To determine the RNA and protein levels of these genes, we performed real-time RT-PCR and Western blot analyses. The protein REC8, a component of the SC, was virtually absent in Rara cKO germ cells by Western blot analysis. Further investigation is currently underway to evaluate the protein levels of other genes. Altogether, we found that RARA is important in germ cell development, sperm production, germ cell organization, and maintenance of the SC integrity during meiosis.

Poster # 118

The 18th Century Pacific Northwest Fur Trade: Global Competition and Involvement of Indigenous Populations

Presented by: Astrid Cortes

Mentor: Kathleen Fry **Campus:** Pullman

Major: Environmental and Ecosystem Sciences

Category: Humanities

This project highlights the dynamics between various competing fur trade companies and the indigenous populations they relied upon in the 18th century Pacific Northwest. In this relationship, the indigenous population provided them with their hunting, preparing, and trading of fur skills—experience that would've taken these companies years to master. Indigenous labor was the essence of the fur trade industry, without their knowledge it would not have been as successful as it was. They brought along quality, efficiency, and most importantly low-prices with their work—attributes that made countries around the world notice the benefits and become involved, either by establishing their own posts or participating in the commercial aspect. Native American participation thus contributed immensely to the global expansion of the industry. However, their involvement with the American and European companies also contributed to their cultural degradation. Violence between and within tribes intensified as young men competed to hunt for the most fur-bearing animals as a form of status enhancement, an instance that resulted in war-like environments and deaths. Their spiritual connection with nature was also harmed as they began to exploit it of its resources in order to accommodate to the increasing demand for pelts. These new opportunities that were presented to them caused them to lose grasp of their values. This project originated in my History 105 course that asked students to identify a topic of historical importance in the American West, but which had larger global impact or connections. I first consulted secondary sources such as scholarly monographs and journal articles to enhance my understanding of the topic. Primary sources from the Library of Congress and National Archives database, including photographs, congressional acts, and official governmental statements that date back to the eighteenth century also enabled me to examine the history more deeply. These in-depth sources that were analyzed allowed clear understanding that the American West that is seen today roots back to the influence of the Northwest Pacific fur trade, a global phenomenon that flourished at the hands of the indigenous—a feat that transformed their social, economic, and cultural ways forever.

Poster # 119

Total Suspended Sediment Influences the Rate of River Meander Migration

Presented by: Sandra Spearman

Mentor: Alexander Fremier **Campus:** Pullman

Major: Environmental and Ecosystem Sciences

Category: Engineering and Physical Sciences

What causes the rate at which rivers meander laterally? Commonly it is thought that the properties of the eroding bank influence river meander migration rates. A recent study in the Amazon Basin, however, showed a strong correlation between river meander migration rate and the amount of total suspended sediment in the river. This suggests that upstream sediment delivery directly influences downstream fluvial geomorphology. In this research, we asked if this correlation holds across large meandering streams in the US. We compiled available data for the past 30 years (1990-2018) on stream discharge and total suspended sediment for eight streams. We then used Google Earth Pro and ArcGIS to quantify river meander migration rate for the same period. We measured river channel widths and lengths of multiple meander bends (2-3). We used channel width and length to normalize the data for river size. We then compared total suspended sediment to migration distance. Our findings show a significant linear relationship, as total suspended sediment increases, the distance the river migrates also increases. This supports the original hypothesis that the amount of total suspended sediment flowing through the river affects the amount the river will migrate. With this knowledge, we may be able to predict the future migration of rivers, by looking at the yearly total suspended sediment in the river and the potential link between upstream land use practices and downstream impacts.

Poster # 120

Identification of Vaccinium Hybrids Using SSR Markers

Presented by: Grant Nelson

Mentor: Amit Dhingra **Campus:** Pullman

Major: Genetics and Cell Biology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Ryan Christian, Danielle Guzman, Brennan Hyden, Nathan Tarlyn

Vaccinium species have been widely cultivated for hundreds of years, with varieties such as blueberries and cranberries representing a significant portion of the commercial markets for fruit. In 2016, Washington State lead the United States in blueberry production, with over 120 million pounds grown in the state. In 2017, the total yield was anticipated to increase further, beyond 132 million pounds. However, while blueberries produce a significant market, one variety of vaccinium is considered to have better taste; the huckleberry is often considered to be a tastier and more nutritious fruit. The berry has remained undomesticated through the years due to poor berry yields and the fastidious nature of the plant. While the native species are resistant to cultivation, little has been previously done to develop a new species for growing. Our lab then has begun to work with the objective of developing a new hybrid species of blueberry and huckleberry to with the beneficial characteristics of both. We have cross bred seven species of blueberry with two species of huckleberry to develop an F_1 population of hybrid offspring utilizing honeybees. Due to the long development time of these plants, we will be unable to observe phenotypic changes for some time, and as a result we have begun genotyping the offspring. By identifying genotypic patterns with SSRs (short sequence repeats), we can locate plants with both huckleberry and blueberry DNA within our population, and select these individuals for growth and future phenotypic selection.

Poster # 122

Remote Sensing to Predict Wheat Agronomic Characteristics

Presented by: Jessica Hartman

Mentor: Arron Carter **Campus:** Pullman

Major: Earth Sciences (Geology)

Category: Applied Sciences

Co-authors: Jayfred Godoy

As world population grows, and new threats, such as climate change and disease, become increasing threats to global food supply, it is vital that the science of growing crops remains ahead of the demands that would threaten it. One such scientific advantage is seen in the scanning of winter wheat crops using spectral reflectance. By gathering data on individual genetic lines during the growing season, predictions can be made about the probable success of different lines. This data takes the form of specific values for reflected wavelengths of light, and ratios of these wavelengths present in a plot can give information regarding plant health, such as NDVI, or Normalized Difference Vegetation Index. These indices can distinguish minute differences in, for example, how long the variety stays green into the season. When measured for thousands of plots, this differentiation can provide information early in the growing season, which can identify which varieties could be most successful. Checks, that is, lines that are known to be well-suited to the region in which they are planted, are also compared to the experimental varieties throughout the growing season, both by visual field notes, and spectral reflectance data. By comparing these measured traits to agronomic characteristics, once harvest has taken place, the real value of making predictions based on this data for future varieties can be assessed.

Poster # 123

An Iron Membrane Reactor to Synthesize Ammonia as an Energy Vector for Renewable Electricity

Presented by: Cory Gunson, Alexis Wright

Mentor: Peter Pfromm **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Grid-scale storage of intermittent renewable electricity from wind turbines and solar cells, paired with ready back-conversion to a useful form of energy is an enabling technology to increase the competitiveness of renewable energy.

Permanent chemical bonds would be an attractive storage mode for electricity. Electricity can be used in electrolysis of water to produce hydrogen. Hydrogen, however, is notoriously difficult to store and transport. Storage and transport of ammonia (NH_3) on the other hand is simple, inexpensive, and well established nationwide due to the fertilizer industry. Besides its use as a fertilizer, ammonia can be used as a fuel in internal combustion engines, fired in turbines or industrial furnaces, split catalytically to recover hydrogen, and turned into electricity in fuel cells. The overall conversion from renewable electricity to ammonia would have an estimated energy efficiency of 63%, with three quarters of the energy losses due to electrolysis of water.

The current industrial ammonia synthesis process is only economical at very large scale with several days for startup or shut down. Here, a new rugged, nimble, and down-scaleable process to synthesize ammonia from renewable energy-derived hydrogen is explored to enable grid scale storage of electrical energy.

The first obstacle to ammonia synthesis is activation (splitting) of nitrogen molecules that are held together by one of the strongest chemical bonds known. Previous **results** show conclusively that gaseous nitrogen molecules are activated at about 1300F by manganese through splitting of nitrogen molecules into atoms, forming stable bulk manganese nitrides (Mn_xN_y). Published work demonstrates that a vanadium membrane can transport nitrogen atoms, and ammonia can be formed at the surface of the vanadium where hydrogen meets the emerging nitrogen atoms. Iron would transport nitrogen atoms much faster than vanadium, but it does not split nitrogen molecules for activation.

The **Hypothesis** is that manganese deposited on a thin iron membrane will split nitrogen molecules into atoms at about 1300F and form manganese nitride. The nitrogen atoms will diffuse from a manganese layer through the underlying iron membrane and meet hydrogen on the opposite membrane surface to form ammonia.

Poster # 126

The Effects of Food Restriction on Behavioral Indicators of Facultative Migration in Pine Siskins

Presented by: Samantha Dohrman, Madeleine O'Conner

Mentor: Heather Watts, Ashley Robart **Campus:** Pullman

Major: Zoology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Different species of migratory birds display different migratory pattern. Some of the best known migrants are obligate migrants, which migrate on a regular schedule between predictable locations. On the other hand facultative migration is less predictable both temporally and spatially. Currently the conditions that trigger facultative migration are not well understood. In this study, pine siskins (*Spinus pinus*) were used to better understand facultative migration by investigating the role of food availability in this process. Previous research done using infrared sensors to monitor bird activity has shown that pine siskins show increased activity when they have less food available. To follow up on this work, here we conducted a detailed behavioral study to determine what behavioral changes accounted for the increase in activity observed when food availability is restricted. To do this, we analyzed video recordings of birds that had either *ad libitum* access to food or were restricted to 75% of their *ad libitum* food intake. Behavior was quantified using scan sampling and a previously published ethogram. We found that food restricted birds had a significant increase in flight activity compared to birds with *ad libitum* access to food. Birds with the restricted diet also showed an increase in time on the cage floor compared to the controls. This could be an indication of increased foraging behavior, another behavioral response to the lack of food. Our results suggests a migratory response to the reduced food availability, consistent with hypothesis that declining food availability is an important trigger of facultative migration.

Poster # 127

Role of the Nipah Virus Fusion Protein and Glycoprotein on Innate Immune Responses

Presented by: Keesha Matz

Mentor: Alan Goodman **Campus:** Pullman

Major: Microbiology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Hector Aguilar-Carreno

Nipah virus (NiV) is an RNA virus that has a 40-90% mortality rate in humans. There have been deadly outbreaks almost every year in Southeast Asia since 1999. To date, there are no approved vaccines or cures for NiV, thus there is emphasis on research that is focused on understanding the immune response to viral infection. Through a better understanding of how the human body responds to this virus, we aim to develop therapies to treat NiV infection. Once a human becomes infected with NiV, the innate immune response becomes activated and signals for cells to enter into an antiviral state. This is the body's first line of defense against a viral infection. Therefore, it is advantageous for NiV to decrease the host's innate immune response, thereby allowing the virus to increase its infectivity potential, replicate to higher levels, and spread from one host to another. Several NiV proteins have already been shown to inhibit the innate immune response, and we investigated the potential role of two additional NiV proteins, the fusion protein (NiV-F) and glycoprotein (NiV-G), in modulating the innate immune response of infected host cells. We hypothesized that NiV-F and NiV-G would modulate innate immune responses of the host cell through inhibition of intracellular proteins, RIG-I and MDA5, that are known to initiate innate immune response signaling upon infection with viruses containing an RNA genome. Through an *in vitro* luciferase experiment, we quantified innate immune responses in the presence and absence of NiV-F and NiV-G. Results indicated that there was a statistically significant decrease in innate immune response when NiV-F and NiV-G were present. Further mechanistic experiments indicated that NiV-G decreased the activity of one specific innate immune pathway named, interferon regulatory factor 3, a transcription factor that induces interferon-beta, a potent innate immune response cytokine. Taken together, NiV-F and NiV-G proteins may be a cornerstone of the virus's ability to evade the host innate immune response. Targeting these proteins could aid in the development of future therapeutics to improve host defense against NiV infection.

Poster # 129

Development of an Air Quality Sensor for Use in Teaching Introductory Environmental Engineering

Presented by: Yoni Rodriguez

Mentor: Von Walden **Campus:** Pullman

Major: Biochemistry

Category: Engineering and Physical Sciences

Co-authors: Kristian Gubsch, Patrick O'Keeffe, Kevin Toombs

An interactive laboratory module is being developed to introduce undergraduate engineering students to environmental engineering as part of an introductory course. This lab module will provide students an opportunity to experience hands-on engineering, computer programming, and research development skills to design an Air-Quality Unit (AQU) for real-time data collection. This module will encourage students to use the scientific method to create a hypothesis based on their observations regarding their surroundings. Students will then develop an experiment with the AQU to test their hypothesis. Each AQU will contain a non-dispersive infrared (NDIR) K-30 sensor to detect C02. A Bosch Sensortec BME280 for measuring humidity/pressure/temperature; and an Alphasense OPC-N2 optical particle monitor that measures PMI .0, PM2.5, and PM 10. All sensors are wired to a Raspberry Pi3 model B (RPi3) microprocessor that automates data collection. The RPi3 transmits data via a direct on-site ethernet connection or Adafruit Fona Cellular Breakout to an Amazon Web Services database. An Adafruit Ultimate GPS Breakout is also connected to the RPi3 to ensure accurate time and location. Students operate the RPi3 through a Linux interface to run specific scripts written in the Python programming language. These AQU's are modeled after the streetlight sensor units deployed in Spokane, WA by WSU researchers for the Urbanova Project. The Urbanova Project is a combined effort to develop Spokane into a sustainable city that utilizes smart city technologies and applications to improve infrastructure, public safety, energy, transportation and waste management. An ongoing WSU REU is focused on deploying the second set of AQU's that will transmit data to a cloud-based database in real-time. This network will provide information regarding temperature, pressure, humidity, C02, and particulate matter concentration. This program will educate the public on their air-quality as well as allow researchers to study the health impacts of various concentrations of particulate matter.

Poster # 130

Small Grain Breeding: Emphasis on Field Evaluations of Diverse Millet Species

Presented by: Cody Holland

Mentor: Kevin Murphy **Campus:** Pullman

Major: Organic Agriculture Systems

Category: Applied Sciences

Of the approximately 1500 species within the Poaceae tribe, Paniceae, *Panicum miliaceum* L. (proso millet), *Setaria italica* L. (foxtail millet), *Pennisetum glaucum* L. (pearl millet), and *Eleusine coracana* L. (finger millet) are the most economically important. Particularly in semi-arid, low-input agricultural regions of the world including parts of India, Africa, and southeastern Asia, various types of millet sustain entire populations. In the United States, however, millets have been designated minor cereal crops whose economic importance is relegated mostly to bird and livestock feed. Almost all production of millet in the United States is conducted in the Great Plains region (e.g., North & South Dakota, Wyoming, Nebraska, and Colorado), and the 400,000 to 600,000 acres in production annually are predominantly proso millet. Despite the many agronomic and nutritional virtues of millets—exceptional tolerance of marginal soils & other biotic and abiotic pests, gluten-free protein & energy source—they have not benefited from extensive breeding and research efforts relative to major commodity crops like corn and wheat. This multi-species millet variety trial sought to assuage the deficit in data for millet breeding germplasm by assessing in-field agronomic characteristics of diverse of millets. Of the five agronomic metrics considered—% emergence, days-to-head (DTH), days-to-maturity (DTM), height (cm), and yield (kg/ha)—statistically significant results were obtained only for DTH and DTM, for proso varieties, and DTH and height, for foxtail varieties. Proso varieties ‘Prosos’ and ‘USSR’ (PI 291363) were the quickest to mature with regards to DTH and DTM. Foxtail variety ‘Harbin 5’ matured quickest in terms of DTH, and along with variety ‘Hang Gu 1’ exhibited the greatest height. All four finger millet varieties failed while still in vegetative growth. Pearl millet variety, ‘TIFGrain102’ yielded no grain, and was not distinguishable statistically from other species’ varieties. The results of this study corroborate results from other variety trials of its kind—that is, proso millet is most well-adapted to northerly dry-land farming, compared to other millet species. Future iterations of this study will strengthen the statistical evaluation of the germplasm in question, and provide crucial information to breeders wishing to produce modern vigorous cultivars.

Poster # 131

Considering Women in the Great Leap Forward

Presented by: William Millick

Mentor: Lydia Gerber **Campus:** Pullman

Major: Architectural Studies

Category: Social Sciences

The period of the Great Leap Forward (GLF), 1958 to 1962 was devastating to the people of rural China, causing widespread famine and a death toll now estimated to be above 45 million people. This research project uses both quantitative and qualitative methods in its analysis of available English-language resources on the GLF, including Frank Dikötter's *Mao's Great Famine* (2010), Zhou Xun's *Forgotten Voices* (2013), and Kimberley Ens Manning's *Eating Bitterness* (2011), to explore how gender affected the experience of those who lived through the GLF. Drawing from information about the policies implemented, anecdotal accounts and the limited statistical information available, this project argues that the policies of the GLF, including its disregard for gender differences actually increased the respective burden for women. This project contributes to a better understanding of the experience of women in Communist China and also serves to illuminate a time period in recent Chinese history that deserves to be better understood.

Poster # 132

The Anti-Nuclear Movement

Presented by: Nicole Takahashi

Mentor: Clif Stratton **Campus:** Pullman

Major: Neuroscience

Category: Humanities

In “The Anti-Nuclear Movement,” I argue that the growing international support for nuclear prohibition is historically rooted in the Cold War, specifically Europe’s relation with the Soviet Union, and the multiple nuclear disasters that followed. After the United States successfully dropped the atomic bombs on Nagasaki and Hiroshima, Japan to put an end to World War II, other powerful nations, such as Germany and France, began to build their own nuclear arsenal. The German and French governments attempted to persuade the public that nuclear technology was safe and that securing these weapons was the only way to defend the people against a nuclear attack, but Bertrand Russell, in his broadcast talk “Man’s Peril” (1954), contradicted the government’s propaganda by summoning the public to re-evaluate their disinterest in neighboring nuclear research centers/plants for the sake of the human race. Russell’s talk resonated with various groups of people, from farmers to housewives, who joined in pursuit to question the accountability of their government and demanded transparency behind the dangers involved with nuclear technology. Since the governments were not able to adequately justify their reasoning and neglected to address the people’s concerns, a series of small nuclear plant protests began, which later erupted into the anti-nuclear movement seen today. The movement has become a conversation catalyst that has forced international leaders to re-evaluate the importance of nuclear regulation today, even though the roots of the anti-nuclear movement can be traced to the early years following the defeat of the Soviet Union in World War II.

Poster # 133

The Accelerated Growth Effect of Subinhibitory Antibiotic Concentrations on Pathogenic Bacteria

Presented by: Lars Neuenschwander

Mentor: Phuc Ha **Campus:** Pullman

Major: Bioengineering, Spanish

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Haluk Beyenal

Subinhibitory concentrations of antimicrobial agents are concentrations that are below the level required to inhibit detectable growth and replication of a microorganism. It was previously reported that when treated with a specific subinhibitory concentration of tobramycin, *Pseudomonas aeruginosa* and *Escherichia coli* formed biofilms with higher biomass than those grown without antibiotic treatment [*Nature* 436, 1171 (2005)]. In another study, Alonso et al. had noted that antibiotic concentrations below therapeutic levels have had varying effects on bacterial physiology including an increase in mutation frequency in *P. aeruginosa* [*Microbiology* (reading, Engl.) 145 (Pt 10) 2857-2862(1999)]. If these were to be true, the treatment assumed to be at or above the minimum inhibitory concentration (MIC) might in fact cause the accelerated growth of certain cells within the biofilm. Most of previous observations were tested primarily on Gram negative species and with limited range of antibiotics. This study sought to address this knowledge gap by exploring the growth of both Gram negative and Gram positive bacteria in the presence of different antibiotics at various subinhibitory concentration levels. We used Gram negative *E.coli* and Gram positive *Staphylococcus aureus*. These bacteria were cultured in Tryptic Soy Broth medium (10 g/L) and minimum inhibitory concentrations of tetracycline, tobramycin, and ciprofloxacin were determined through optical density using a plate reader (Cytation 5). Subinhibitory concentrations were then determined through iterative testing. In this study, Gram positive *S. aureus* showed accelerated growth in response to specific subinhibitory concentrations of antibiotics including tetracycline, tobramycin, and ciprofloxacin. Total biomass of *S. aureus* after the sixteen hour growth period was seen to be greater at subinhibitory concentrations when compared to a untreated control. Through this research, a basis of how subinhibitory antibiotic concentrations interact with different bacterial species was developed. It was proven that Gram positive bacteria experience increased growth at subinhibitory antibiotic concentrations when treated with tetracycline, tobramycin and ciprofloxacin in a manner similar to Gram negative *E.coli*. The mechanisms underlying this common behavior would be an important aspect to explore. Identification of the motive force that triggers the bacterial doubling time would be helpful for controlling the bacterial growth as desired.

Poster # 134

Impact of Anthropogenic Activity on the Activity Patterns of Sympatric Mammals in Washington State

Presented by: Leandro Lessin

Mentor: Daniel Thornton **Campus:** Pullman

Major: Biology, Wildlife Ecology and Conservation Sciences

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors:

The population of humans is projected to increase to roughly 11 billion people by the end of the 21st century. Therefore, the increase of disturbance on wildlife behavior is also expected. Although we can expect drastic changes in our environment in the upcoming decades due to human overpopulation and climate change, it is difficult to fully understand just how much impact direct human activity will have on wildlife. In this study, we compared the behavioral responses of mammals in areas of high human activity and areas of low human activity. Our study area was primarily composed of the Colville National Forest and the Okanogan National Forest in Washington state. With the use of camera trapping technology, we analyzed the 24-hour activity patterns of ungulates, rodents, canids, and felids near trails and roads of varied human presence. While we are still waiting on results, we expect that mammals in areas of high human activity will tend to avoid humans by shifting their diurnal circadian rhythm to a more nocturnal one.

Poster # 135

How Facebook Users Evaluate the Information They See

Presented by: Kaylee Fontes, Jessica Mannard, Megan Messer

Mentor: Julie Kmec **Campus:** Pullman

Major: Sociology

Category: Social Sciences

Many people share news articles on Facebook; a study done by the Pew Research Center found that more than half of adults rely on social media pages for news. The problem with this is it allows for personal judgment to determine the validity of the news source. Determining the degree to which personal judgment affects people's belief in sources is important to show whether news being shared on social media platforms, such as Facebook, is reliable. In this online survey-experimental study, we ask the question "Does the social class of an individual depicted in a Facebook profile affect how others evaluate the news articles he posts or shares?" We manipulated the profile's social class and the news article presented stayed the same across all profiles. Viewers were asked a series of questions to determine if they thought the posted article was true or "fake news." We drew on responses from eighty-six responses. The results to these questions showed no distinct patterns across social class background of the Facebook profile, leading us to conclude that the social class depicted on a Facebook profile has very little influence on the viewer's opinion shared on that profile. We discuss reasons why social class may not have had an influence and why the method of data collection may have had an impact on the results that we gathered.

Poster # 136

Night Out Task

Presented by: Nhu Huynh, Sewit Kidane

Mentor: Maureen Schmitter-Edgecombe **Campus:** Pullman

Major: Neuroscience, Psychology

Category: Social Sciences

Co-authors: Reanne Cunningham, Sewit Kidane

Introduction/Problem Statement: Traditional neuropsychological assessments do an excellent job of isolating changes to specific cognitive domains, but generally, do a poor job of predicting functional abilities. Furthermore, the functional assessments that have been developed tend to be most effective in recognizing significant difficulties, rather than more subtle changes that can occur with age. The purpose of our research is to determine if functional changes can be measured early on in healthy older adults. The Night Out Task (NOT), which provides a naturalistic assessment of everyday functioning, is administered in a laboratory setting. Improving our understanding of subtle functional changes that can occur with age could inform early interventions to prevent functional disability.

Participants and Methods: Participants included 34 healthy older adults (ages 60-83, m=68.09, SD=6.02) and 34 healthy young adults (ages 18-29, m=19.59, SD=2.21). Each of these participants was administered a battery of cognitive test and completed the NOT. The NOT has three primary variables; Total Task Time, Total Errors per task attempted, and Sequencing Score; and six nuanced variables; Self-corrections, Double checking, Online planning time, Interruptions, Simultaneous Score, and Pre-planning time. Significant differences between these two groups were determined by using T-tests.

Results: The NOT was performed slower by the older adult group than the younger adult group (t=3.56, p<.05). The groups did not differ on the Sequencing, Total Errors, Pre-planning or in their Simultaneous scores. Compared to the younger adults, the older adults made more self-corrections (t=2.82, p<.05), checked over their work more (t=3.38, p<.05), interrupted tasks more (t=3.19, p<.05) and spent more time online planning (t=3.99, p<.05).

Conclusion/Discussion: Healthy older adults may be compensating for subtle changes they are experiencing with age by using self-monitoring strategies. We found that the older adults were correcting mistakes, checking over their work more, and engaging in more online planning than younger adults, suggesting that the NOT may be sensitive to subtle functional changes with age. Although the older adults were able to accurately complete the NOT tasks, they showed a decrease in efficiency and task completion time. The NOT data helps contribute to the understanding of the aging process.

Poster # 137

Analysis of an Inverse Gaussian Plume Modeling Method for Estimating Methane Emissions from Underground Pipeline Leaks

Presented by: Matthew Roetcisoender

Mentor: Brian Lamb **Campus:** Pullman

Major: Civil Engineering

Category: Engineering and Physical Sciences

Co-authors: Tom Ferrara

Improving the accuracy and efficiency of methane emission detection is a vital aspect to improving safety and reducing greenhouse gas emissions where leaking natural gas infrastructure is concerned. A mobile technique known as EPA Method 33a was used to estimate methane emission rates from previously surveyed underground leaks in three locations, New York, New Jersey, and Los Angeles in mainly suburban environments. Method 33a requires measurement of ambient methane concentrations for 5 to 15 min downwind of a source along with measured wind and turbulence data. These data are used to estimate the maximum plume concentration and the Gaussian diffusion coefficients for use in the inverse calculation. For the method evaluation, different methods for estimating these parameters were evaluated using measured leak rates or in some cases controlled methane releases. Linear regressions and method difference graphical tests were employed to determine the overall accuracy of Method 33 for each of the different parameter sets used in the inverse method.

Poster # 138

The Effects of Social Darwinism and The Eugenics Movement on the Politics of Modern Medicine

Presented by: Nora Kelley

Mentor: Clif Stratton **Campus:** Pullman

Major: Nursing (BSN)

Category: Humanities

In this project I examine the role of Social Darwinism in the rise of the eugenics movement in 20th century Europe. Eugenics in Europe began in Britain, and made its way over to Germany via the United States, fueling the thoughts and actions of many who played a key role in the Holocaust. Despite the beliefs of the movement's supporters, the eugenics movement lacked any morality. As father of eugenics Francis Galton argued in 1904 that "we must… leave morals as far as possible out of the conversation." Eugenicists of the time believed that they were not doing anything inhumane or unjust, but rather they were simply bettering the human race. A study into the mindset via the writings of prominent European eugenicists allows today's historians to understand what may have fueled the beliefs and actions that lead to things such as compulsory sterilization and the mass genocide of European Jews. While the ideas that allowed such events as these to occur during the 20th Century are all but extinct, there are still many eugenics-based issues that plague the political and medical worlds today. Examples include the "curing of Downs Syndrome" in Iceland which really involved aborting all fetuses that exhibited Downs Syndrome and altering the genes of fetuses to prevent or express certain characteristics. While procedures such as the ones listed above may be beneficial to the human race in a purely scientific way, are genome altering procedures really ethical and humane? This historical study contributes to that conversation.

Poster # 139

The Effect of Nutraceuticals on the Histological Expression of Biomarkers of Engineered Articular Cartilage Tissue

Presented by: Rachelle Muzones

Mentor: Nehal Abu-Lail **Campus:** Pullman

Major: Bioengineering

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Haneen Abusharkh, Mahmoud M. Amr, Alia Mallah, Bernard Van Wie

Osteoarthritis (OA) is a degenerative joint disease that affects over 30 million adults in the U.S. [1]. OA is the result of breakage of articular cartilage (AC) lubricating moving bones. OA is associated with discomfort, pain and mobility complications. There is currently no cure for OA. More than 600,000 knee replacements are done each year to decrease the severity of OA [2], but these surgeries are either invasive or temporal. Tissue engineering has been proposed as a solution for OA, where an engineered AC tissue can be used to replace a diseased tissue. Nutraceuticals are additive chemicals derived from food sources that can potentially combat the chronic nature of the OA disease and improve the regeneration of AC. In this study, we hypothesized that using nutraceuticals in culture media would increase the chondrogenic potential of bovine chondrocytes (BACh). This improvement can be shown by an increase in two major biomarkers of a healthy AC tissue, collagen and glycosaminoglycan (GAG). To test our hypothesis, BACh were grown in micromass cultures, in triplicates, for 21 days and effect of nutraceuticals in media on chondrogenesis were tested at days 3, 10 and 21 of the culture. Nutraceuticals used in the experiment were catachein hydrate, gallic acid, alpha-tocopherol, and ascorbic Acid. A negative control free of nutraceuticals was also investigated. Histological techniques were used to qualitatively test for the two major biomarkers of healthy cartilage; total collagen and total GAG by using the stains aniline blue and toluidine blue, respectively. To quantify the staining results, Image J was used to process the histology images for optical density. It was observed that at day 21 that alpha tocopherol caused the most increase in the expression of total GAG while ascorbic acid caused the most increase in the expression of collagen. From this study, it can be seen that nutraceuticals have a positive effect on the expression of collagen and GAG and that further temporal studies are needed to continue to understand the effect of nutraceuticals on these biomarkers at different stages of the culture.

Poster # 140

Identification of Loci Associated with Embryonic and Fetal Loss in Holstein Heifers

Presented by: Jewel Toenges

Mentor: Holly Neibergs **Campus:** Pullman

Major: Animal Sciences

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: J. Dalton, J. N. Kiser, T. E. Spencer, E. M. Suarez, A. M. Wahl

Holstein heifers are commonly bred at one to five consecutive estrus cycles to achieve a pregnancy. Although 90 -100% of oocytes will be fertilized at each breeding, embryonic loss results in only 55-60% of heifers remaining pregnant at day 35 after the first breeding, and an additional 7-10% of fetuses lost before term. Embryonic losses are even greater for heifers that require more than one breeding to achieve pregnancy 35 days post breeding. It is unknown if the genetic factors associated with embryonic loss are also associated with fetal loss in dairy heifers. Therefore, the objective of this study was to investigate if loci associated with embryonic loss were shared with loci associated with fetal loss in Holstein heifers. One thousand twenty-two heifers were bred by artificial insemination during observed estrus for up to 5 consecutive estrus cycles, and pregnancy was determined via palpation on day 35 for heifers not returning to estrus. Heifers with fetal loss were identified by failure to calve or an observed miscarriage. Heifers were genotyped using the Illumina BovineHD BeadChip (777,962 SNPs; 902 heifers) or the GeneSeek GGP50 BeadChip (48,268 SNPs; 120 heifers). GeneSeek GGP50 BeadChip SNPs were imputed to 777,962 SNPs using Beagle 4.1 and a reference population of BovineHD genotypes from 4,838 Holsteins. A genome-wide associated analysis (GWAA) was conducted with a significance threshold ($P < 1 \times 10^{-5}$) to identify associations. The GWAA identified 4 loci associated with embryonic loss and 446 loci (913 SNPs) associated with fetal loss. None of the loci associated with embryonic and fetal loss were shared suggesting that the genetic factors associated with them are different. These results support that embryonic and fetal loss are independent traits and will need to be selected for individually to reduce pregnancy loss in Holstein heifers.

Poster # 141

The Effect of Food Preparation Methods on the Release of Iron from the Lucky Iron Fish® and Subsequent Iron Enrichment of Foods

Presented by: Rachel Wittenberg

Mentor: Kathy Beerman **Campus:** Pullman

Major: Zoology

Category: Applied Sciences

Co-authors: Steven McGeehan, Ana María Rodriguez-Vivaldi

According to the World Health Organization (WHO), the most common nutrient-related cause of anemia is a lack of dietary iron. In regions of the world where populations are at greatest risk for iron deficiency anemia (IDA), barriers make screening and subsequent treatment challenging. Thus, IDA remains one of the most common, yet treatable, nutrition-related health problems in developing countries. A new approach to IDA remediation, called Lucky Iron Fish™ (LIF), overcomes many of these challenges. When placed into a pot of boiling, acidified water for 10 minutes, this reusable, fish-shaped ingot releases iron into the cooking water. Subsequently, food absorbs the iron from the iron-enriched water, increasing the overall iron content of the meal. It has been estimated that one meal prepared with a LIF can substantially contribute to overall daily iron requirements. To better understand this process, a series of experiments were conducted to measure ferrous (Fe^{2+}) and total iron release in response to 3 acidification treatments (acetic acid, ascorbic acid, and lemon juice) at varying pH values (pH 4.0, 4.5, 5.0, and 5.5). The results of this study demonstrated that release of iron from the LIF was dependent on both pH and the nature of the acidifying agent. The laboratory results offer further proof of concept that the LIF can enhance dietary iron intakes, but also demonstrate the need to better understand the various means of water acidification. Additionally, experiments using the LIF were conducted to determine how food preparation methodologies can optimize the iron content of specific staple foods from rural Guatemala, and if so, which methodology were most efficacious. It was determined that black beans both soaked and cooked in iron-enriched tap water acidified to pH 4 with acetic acid resulted in the greatest amount of iron absorbed by food. This information furthers our understanding of optimal use of the LIF in meal preparation in rural Guatemala and provides a better understanding of how using specific cultural food practices can assist in lowering the occurrence of IDA.

Poster # 142

The Influence of Enzymes on the Dissolution of Recycled Waste Cotton

Presented by: Ashley Wright

Mentor: Hang Liu **Campus:** Pullman

Major: Apparel, Merchandising, Design & Textiles

Category: Applied Sciences

Cotton is the most consumed natural fiber in the textile and apparel industry, with a worldwide cotton fiber production of 24.5 million tons in 2013. On average an American adult abandons 68 pounds of textiles each year with two thirds being cotton products. Approximately 95% of this cotton waste goes to landfill/incinerators with only 5% is recycled. Cotton cultivation consumes 2.6% of global water, which reduces freshwater reserves causing drought problems in the cultivation areas and a general damage of the water environment. In addition, fertilizer and pesticide consumption involved in the cotton cultivation is estimated as 11% of the world consumption of agrochemicals, being around 50% in developing countries. Therefore, it is critical to recycle cotton waste to conserve natural resources and to reduce virgin cotton production. The current recycling method is fiber reclamation, a technique to tear open cotton waste and collect old fibers. This method recycles cotton into low quality fibers that can be used for insulation in residential homes and commercial buildings, printing paper and cleaning wipes. An innovative cotton waste recycling method has been developed at WSU to produce high quality regenerated fibers using eco-friendly chemicals. In this project, the effect of enzyme (i.e., cellulase) in reducing chemical use during the recycling process was studied. Cotton waste fabric was treated using cellulase with different conditions and their influence on cotton degree of polymerization was investigated. Four enzyme treatments of different treatment time and conditions were tested and the degree of polymerization of treated cotton was measurement by following the method described in ASTM D795 -13 (Standard Test Method for Intrinsic Viscosity of Cellulose) using Cupriethylenediamine Hydrobide solution with an Ubblelohde viscometer at approximately 30 °C. The results showed that the degree of polymerization of cellulase enzyme treated cotton waste reduced from 1800 of the original cotton to 1190 ~ 1440 of treated cotton depending on treatment conditions. The reduction in degree of polymerization of cotton waste will reduce acid use during recycling process. This will also assist in the next step towards fiber spinning.

Poster # 143

The Effects of Glucose Starvation on *Pseudomonas putida* Biofilm Growth on Silicon

Presented by: Paige Ford

Mentor: Nehal Abu-Lail **Campus:** Pullman

Major: Bioengineering

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Somayeh Ramezanian

Bacterial biofilms are resilient and are means through which bacterial cells can survive for longer periods in stressed environments than they would do alone. Utilizing that resiliency, in our work, bacterial biofilms were investigated for their abilities to enhance soil mechanical properties. Biofilms can do that either by gluing soil particles together via cohesive interactions among the biofilms or by reducing water permeability within soil. *Pseudomonas putida*, a commonly found bacterium in soil, is known for its ability to form biofilms and to sustain stressful environmental conditions of extreme ionic strength and pH. Because of their traits, we hypothesized that P. putida biofilms would be able to survive starvation conditions in soil. To test our hypothesis, the longevity of *P. putida* biofilms without a regular supply of glucose was examined. The study consisted of a 140 silicon slide samples; 70 slides were used as the positive control and were fed glucose daily at the rate of 1 g/L. The other 70 slides were used for the "starved" group and were fed glucose daily at 1 g/L up for seven days to allow for biofilm growth and received no glucose after that for the 30 day duration of the experiment. Over the 30-day period, samples were taken intermittently for imaging biofilms and for counting the bacterial colony forming units (CFU). The results of the experiment showed that the *P. putida* biofilms could maintain a strong biofilm for about 10 days before the CFU begins to drop. Beyond the 10 days, biofilms were still visible and viable in both groups. The CFU counts were larger in the fed group compared to the starved group. The biofilms were thicker in the fed group compared to the starved group. Our results proved that our hypothesis is valid and *P. putida* biofilms can withstand starvation up to 30 days. This result is important as it indicates that these biofilms can be potentially implemented in the field to improve soil mechanical properties and prevent erosion.

Poster # 146

Treatment of African Americans in the American West and Afro-Brazilians in Brazil Post-Slavery

Presented by: Abigail Culver

Mentor: Kathleen Fry **Campus:** Pullman

Major: Sport Science

Category: Humanities

The purpose of this research is to compare and contrast the treatment of African Americans in the American West to Afro-Brazilians in Brazil post-slavery in the late 19th and early 20th centuries. This project began as an assignment for History 105: Roots of Contemporary Issues that required students to identify a topic of historical significance in the American West, but which also related or connected to a larger global history. Both America and Brazil have a long history of African-based slavery as a result of the trans-Atlantic slave trade and attendant systems of racial inequality, which made them compatible regions for my research. Using WSU library databases, I first consulted relevant scholarly sources—monographs and journal articles—to provide the foundation for understanding this history. Primary source research and analysis filled in my understanding by detailing specific events, narratives, and perspectives from the time period. I focus on the wage inequality between freed slaves and non-black people; the economic hierarchy that developed as a result of the racial aspects of slavery; and the comradery within and progressive elements of the communities that shaped the culture and identities of the respective African American and Afro-Brazilian populations in the American West and Brazil. Interestingly, in the American West both residential and legal segregation were much more prevalent than in Brazil. The phenotypic degree of whiteness was valued highly in Brazil, with lighter being better, whereas one's blood lineage was a better marker of race in the United States. Relating the populations of Afro-Brazilians and African Americans in these two countries reveals fascinating data about how effects of the trans-Atlantic slave trade live on decades after it ended. Persons of African descent were treated inequitably socially and economically and still are today, which can be correlated to the roots of slavery. Researching this history helped me better understand the history of African Americans in the African West, but also how that history fits into a larger global narrative and connects to persons with a similar heritage in other areas of the world.

Poster # 147

Building Smart Cities Technology to Monitor Spokane's Air Quality

Presented by: Kristian Gubsch

Mentor: Von Walden, Candis Claiborn **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Co-authors: Patrick O'Keeffe, Yoni Rodriguez, Kevin Toombs

The purpose of this research project is to build a network of inexpensive air quality sensors that transmit to a cloud-based database to monitor Spokane's air quality in real-time. This project is in collaboration with the broader Urbanova project which has the goal to integrate technology to help Spokane become a more sustainable "smart" city. It is important to understand the air quality in Spokane so we can maintain healthy levels of particulate matter in the atmosphere and also educate the public on what they are breathing. These air quality sensors were built using the Raspberry Pi 3 Model B, the CO2Meter K-30 CO2 sensor, the Adafruit BME280 temperature/pressure/humidity sensor, and the AlphaSense OPC-N2 Particle Monitor. Data was collected using automated Python scripts. There are currently three sensors that are operating in the Spokane University District that are part of Avista's Streetlight program. One of the goals of this project is to expand the sensor network as well as create mobile sensors that use Adafruit's Ultimate GPS Breakout to track location. Another goal is to store the collected data using Amazon Web Services allowing our data is both secured and easily accessible. The desired result is to have multiple working sensors that are communicating with the Amazon Web Services database so the data can be processed and analyzed in real-time. Here we show preliminary results of this research using data collected when testing sensors on the roof of the Paccar building and in the laboratory. Once the sensors are deployed in Spokane, we can begin analyzing the air quality of various locations around Spokane to help educate the public about their air quality.

Poster # 148

Loci Associated with Pregnancy Loss in US Holstein Heifers using Imputed and Actual Genotypes of 777,962 Single Nucleotide Polymorphisms

Presented by: Emaly Suarez

Mentor: Holly Neibergs **Campus:** Pullman

Major: Animal Sciences

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Joseph Dalton, Jennifer N. Kiser, Thomas E. Spencer, Jewel A. Toenges, Alexandria M. Wahl

In the dairy industry, pregnancy loss costs producers an estimated $400 -500 million annually. One way to reduce pregnancy loss is through genomic selection, where cattle are selected to remain in the breeding herd based on genotypes associated or predictive of fertility. The objective of this study was to identify loci (genotypes) that are predictive of conceiving at first service and maintaining that pregnancy until calving for use in genomic selection. Heifers between 12 and 14 months of age were bred by artificial insemination (AI) at observed estrus and determined to be pregnant at day 35 by palpation. Illumina Bovine HD Bead Chip (777,962 SNPs) genotypes of heifers that conceived and maintained their pregnancies (n = 470) until parturition (PREG) were compared to genotypes of heifers that miscarried after day 35 (NPREG) after imputation to 777,962 SNPs from Illumina GGP50K (48,268 SNPs). Imputation was performed with BEAGLE 4.1 using genotypes from a reference population of 4,838 Holsteins. After quality control for SNPs and animals, 590,955 SNPs and 463 heifers (59 NPREG and 404 PREG) remained for the genome-wide association analysis (GWAA) to identify loci associated with pregnancy loss. Thirty-four quantitative trait loci (QTL) and 19 positional candidate genes (Bonferroni threshold $P < 5 \times 10^{-8}$) were associated with pregnancy loss after day 35. Four of the QTL identified in this study have previously been identified as associated with embryonic loss in heifers prior to day 35, suggesting that these QTL are associated with pregnancy loss throughout gestation. A comparison of the QTL identified as associated with fertility without imputation of the 48,268 SNPs to 777,962 SNPs reduced the number of associated QTL to 3. Increased density of SNPs using imputation resulted in a greater number of QTL associated with fertility than identified with 48,268 SNPs. Identification of QTL associated with pregnancy loss facilitates genomic selection to reduce pregnancy loss after day 35.

Poster # 149

The Role of Shu-complex Members in APOBEC-induced Mutations

Presented by: Ellen MacNary

Mentor: Tony Mertz **Campus:** Pullman

Major: Biochemistry, English

Category: Molecular, Cellular, and Chemical Biology

At its most basic level, the uncontrollable growth of cancer cells is caused by mutations. In addition, mutations are known to contribute to metastasis and resistance to chemotherapeutics. One source of mutagenesis in cancers is the enzymatic family of cytidine deaminases known as APOBECs. The APOBEC3 subfamily of deaminases normally function in innate immunity by degrading retroviral genomes. Unfortunately, APOBECs also provide significant mutations that allow tumor genomes to evolve. Some cancers, such as bladder, cervical, and breast are more greatly affected by APOBEC-induced mutations than others and the frequency of APOBEC signature mutations varies greatly among different tumors. This begged the question: why do APOBECs mutate some tumors more than others? Two mechanisms have been proposed to account for differential level of ABOBEC-induced mutations in tumors with similar amounts of APOBEC expression. First, varying amounts of replication stress or replication defects may dictate the level of APOBEC activity on genomic DNA by modulating the abundance of single-stranded DNA (ssDNA) within cells, which serves as a substrate the APOBECs. Second, repair of deoxyuridines bases that are caused by APOBECs deamination of cytidine maybe more, or less, efficient in some tumors than in others. In this project we aimed to better understand repair mechanisms cells use to avoid APOBECs-induced mutations. Our lab previously demonstrated in a *Saccharomyces cerevisiae* yeast model that deletions of genes required for error-free bypass, *MPH1* and *UBC13*, increases mutations caused by APOBEC3B-mediated deamination of ssDNA present on the lagging strand template during DNA replication. Members of replication-associated Shu protein complex has also been implicated in error-free bypass of DNA damage. Therefore, we investigated whether members of the Shu-complex protect against APOBEC-induced mutation. We deleted genes encoding Shu-complex members, *CSM2* and *PSY3*, individually and in combination with deletion of *MPH1*. Mutation rate measurements and mutation spectra indicated that the Shu-complex members protected against APOBEC mutagenesis and were epistatic to loss of *MPH1*, indicating they play a role in error-free bypass of abasic sites during DNA replication. Our results indicate that human homologs of the Shu-complex members and error-free bypass proteins should be investigated as modulators of APOBEC-induced mutations.

Poster # 150

CO2 Flux Bias Correction Assessment in Eddy Covariance Towers Over Long Term Agricultural Sites

Presented by: Victoria Dziekan

Mentor: Shelley Pressley **Campus:** Pullman

Major: Civil Engineering

Category: Engineering and Physical Sciences

Co-authors: Brian Lamb, Patrick O'Keeffe, Eric Russell

A systematic error in the measurement of carbon dioxide flux in eddy covariance systems was discovered when it was shown that air temperature tends to fluctuate at frequencies higher than that which could be captured by thermistors commonly used in infrared gas analyzers by Campbell Scientific. In open path analyzers specifically, a correction calculation must be applied to its output, which makes the calculation of the flux sensitive to not just carbon dioxide density and vertical wind speed, but also to values of water vapor density, air pressure, and air temperature. Because the thermistors were outputting inaccurate temperature deviations, and thus inaccurate carbon dioxide density, carbon dioxide flux was thus observed to scale with kinematic sensible heat, which should theoretically not occur.

Funding updates have allowed Washington State University to continue monitoring at their three agricultural sites, as well as to update from low to high frequency thermistors, manual to automated data collection, and from Eddy Pro to Easy Flux analysis software.

In order to develop a linear regression that would error correct fifteen years of low frequency data in light of these of these updates, the analysis software outputs were first compared. Once bad data was removed, it was clear that the Easy Flux software was returning slightly higher carbon dioxide flux values, but it was found to be negligible based on magnitude. The low frequency data was then scaled to the high frequency data for each sensor using the linear regression that was generated using the new data, and then compared against each site, season, and crop. By doing this sort of backlogging, a better understanding of how net ecosystem exchange of carbon can change temporally in an agricultural context can be reached, and this will be especially relevant as the climate continues to change.

Poster # 151

Vietnam and the American Home Front

Presented by: Precelia Derricks

Mentor: Ken Faunce **Campus:** Pullman

Major: History

Category: Humanities

The purpose of this research is to look at the underlying causes and consequences of the Vietnam War and the impact that it has played in the rise of present day communist Vietnam and the role that said consequences has played in impacting current U.S. – Vietnam relations. The research also seeks to look at how the U.S.'s current relations with Vietnam has also impacted its policy regarding other communist leaning nations and regimes. The Vietnam War originally started as a nationalistic issue between imperialistic French forces and nationalistic Vietnamese forces. French forces who were frustrated and low on weaponry after the Second World War were not in the right frame of mind nor did they have the morale to keep up their territories in Indochina. Taking advantage of their weakened state the Communist Viet Minh, who had the backing of the USSR, engaged in a strenuous 8-year battle that led to eventual French withdrawal. At the same time during this conflict, unlike its European counterparts, the U.S. came out of the War mostly unscathed in terms of its economy and was therefore able to provide its ally with financial and military support through the Mutual Defense Assistance Act of 1949 in an attempt to stop Communism from further spreading in the East. The belief in the Domino Theory by U.S. policy makers and military officials explained the heavy war escalation that took place under the presidencies of Truman through L.B.J. The U.S.'s paranoia regarding the Domino Theory lead to them missing an important opportunity to limiting Communism's sphere of influence in the East and them eventually dragging itself into war with a place that it considered to be an insignificant backwater. The U.S. war with Vietnam began in 1955, a year after the French had officially lost at Điện Biên Phủ thus ending the First Indochina War, and their defeat in this "backwater" would not only heighten the threat of Communism as it became clear the U.S. couldn't stop it in the East, but it also shattered the American public's sense of invincibility and "American exceptionalism".

Poster # 152

Parent-Student Conversations in Response to a Student Conduct Violation

Presented by: Jamie Adams, Jules Cesar Mugisha, Carla Salle, Brittany Srp

Mentor: Matthew Bumpus, Eleanor Dizon **Campus:** Pullman

Major: Human Development

Category: Social Sciences

One common university strategy following a student substance use violation is to notify parents, by letter, of the violation; parental notification is assumed to play a role in reducing future student substance use and misuse in the future. Only a handful of studies to date have examined parent-student communication following parent notification; Thompson and colleagues (2013) surveyed parents and found that (a) discussing the consequences of the student's decisions, and (b) the risks of alcohol abuse were the most common topics discussed.

In this study we present data from students who received a violation, specifically, their perceptions of whether the conversation had an impact.

Data from this study were drawn from a larger study of WSU students who received a student conduct violation during the 2016-2017 academic year (n=389; 52% male; mean=18.5 years of age). As part of a survey that students completed in the weeks following the violation, they were asked whether they discussed the violation with their parent. Students who reported discussing the violation with their parents responded to the following question: "how were you impacted by the conversations with your parent?" Researchers assessed responses and identified themes that emerged regarding student-parent conversations:

1. Parents were impacted emotionally/behaviorally (e.g., "they were clearly upset");
2. Students were impacted emotionally/behaviorally (e.g., "I've started drinking and smoking less because they showed me how disappointed the violation made them");
3. Parents gave advice or coaching (e.g., "I was told to be more careful");
4. Parents discussed possible consequences (e.g., "if I get in trouble again, I could get kicked out of school");
5. Parents and/or students discussed the unfairness of the violation (e.g., "I feel like they supported me and thought the violation was a little excessive");
6. Student did not identify any impact (e.g., "no impact, I was told not to get caught next time").

Poster # 153

Multiscale Analysis of Forest Neighborhood Characteristics of Different Size Classes of Pacific Yew Trees in an Old-growth Pseudotsuga-Tsuga Forest, Southern Washington Cascades

Presented by: Sean Alexander

Mentor: Mark Swanson **Campus:** Pullman

Major: Forestry, Wildlife Ecology and Conservation Sciences

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Mark Swanson, James Lutz, Sarah Germain

Pacific yew (*Taxus brevifolia*), a conifer native to the forests of the Pacific Northwest, is a late-successional tree species of substantial conservation concern due to region-wide habitat loss. Little research has been conducted that contributes to the understanding of factors that play a role in the establishment, growth, and survival of this species. Further, the spatial scale at which forest structural and compositional variables influence demography of Pacific yew has not been explored. We use spatially explicit tree location data from the Wind River Experimental Forest (Hemlock, Washington, 45.8090° N, 121.9823°W, 635 m elevation) to identify variables that differ between locations where Pacific yew is present vs. absent. We apply a variance-decomposition model that nests two spatial subset models within a larger-scale model. Additionally, to reduce the variability in the models, we manipulate the shape of the analysis window to isolate features of the surrounding environment, such as structure to the south (incident solar angle) of sample points. Our hypothesis is that we will see little variation in the 5000 m^2 (0.5 hectare) and 1000 m^2 (0.1 hectare) spatial scales between yew-presence and randomly selected yew-absence locations, while variation at the 250 m^2 scale will differ due to microhabitat variation influencing yew establishment dynamics. These models may identify important factors influencing the distribution and survival of this species and may also assist forest managers in designing specific silvicultural treatments for facilitating Pacific yew regeneration and growth, benefitting stand- and landscape-scale biodiversity.

Poster # 154

Development of Fine Mapping Populations for Cloning Yield Contributing Genes in Wheat (*Triticum aestivum L.*)

Presented by: Kayla Beechinor

Mentor: Michael Pumphrey **Campus:** Pullman

Major: Agricultural Biotechnology, Field Crop Management

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Jayfred Gaham Godoy, Sheri Rynearson

As the global population rises and cultivated land shrinks, scientists fear that there will not be enough food to feed the world by the year 2050. With wheat being one of the main food staples, it is necessary to develop high-yielding varieties in order to keep up with the demand for wheat. This can be achieved by finding genes which contribute to the yield increasing traits of wheat. Specifically, in this research, the yield contributing traits include number of grains per spike, grain weight, and spike length. When found, these genes will be incorporated to create new wheats with superior yield performance or used to improve existing varieties. The goal of this research is to develop fine mapping populations that would facilitate the future cloning of yield-related genes. Previous research included studying a population that was segregating for yield and detecting a genetic region on the long arm of wheat chromosome 4A that was associated to yield contributing traits. Using six molecular markers that are specific to this region of interest, we screened 75 lines from the original population and identified two that were heterozygous for all six markers. Heterozygous plants from each of these two lines are currently being grown and will constitute two fine mapping populations. These fine mapping populations will be used to further characterize the chromosome 4A region and clone the genes controlling grains per spike, grain weight, and spike length.

Poster # 155

Assessment of Alternatives for Per- and Polyfluroalkyl Substances Found in Aqueous Film Forming Foam

Presented by: McKynzie Clark

Mentor: Kara Whitman **Campus:** Pullman

Major: Environmental and Ecosystem Sciences

Category: Applied Sciences

In the 1960s per- and polyfluroalkyl substances (PFAS) first entered the environment through the use of aqueous film forming foams (AFFF) used to extinguish fires. These substances have been heavily used in the military and aviation, to protect lives and valuable equipment. The main environmental issues with these chemicals stem from their chemical structure. These synthetic chemicals do not break down thus they have high persistence and bioaccumulative potential. Scientists have found that these chemicals are highly persistent, bioaccumulate, and toxic (PBT). According to the Environmental Protection Agency there is a known list of health risks, including hormone disruption and even cancer. This has led to widespread concern over water resources and human health. The main source of these chemicals is found to be from the heavy use of Aqueous Film Forming Foam used to extinguish fires mainly at airports and air force bases. These events have created the need for alternatives to PFAS chemicals in AFFF. Due to the great environmental threat of these chemicals, this research began for alternatives. This research has been composed of finding possible alternatives, looking into government specifications, and assessing what is known about these alternatives. Although universal standards exist many counties and industries require various certifications and standards. While these standards and certifications are necessary to ensure safety and quality of products, the existence of so many requirements make it difficult and expensive to achieve multiple. Part of this research is to evaluate alternatives for their risks, in the past there has been implementation of regrettable substitutions. This is the larger obstacle with this research. Many companies that offer alternatives and fluorine free products have an assortment of European standards and certifications but these are different from the U.S. military standards. The future of this research will determine if there are possible alternatives that meet these regulations.

Poster # 156

Creating an Erosion Vulnerability Map for the Columbia River Basin to Determine Reservoir Susceptibility to Sedimentation Before and After Wildfires

Presented by: Patrick Robichaud

Mentor: Jennifer Adam **Campus:** Pullman

Major: Civil Engineering

Category: Engineering and Physical Sciences

Co-authors: Jianning Ren

Sedimentation is important issue to most rivers and reservoirs especially in watersheds with extensive agricultural or wildfire activity. These human and natural induced disturbances have the potential to increase runoff-induced erosion and sediment load to rivers; downstream sedimentation can decrease the life expectancy of reservoir and consequently the dam. This is particularly critical in snowmelt-dominant regions because, as rising temperatures reduce snowpack as a natural reservoir, humans will become more reliant on reservoir storage. In the Northwest U.S., the Columbia River Basin (CRB) has more than 60 dams, which were built for irrigation, hydropower, and flood control, all of which are affected by sediment to varying degrees. Determining what dams are most likely to be affected by sedimentation caused by post-fire erosion is important for future management of reservoirs, especially as climate change is anticipated to exacerbate wildfire and its impacts. The objective of this study is to create a sedimentation vulnerability map for reservoirs in the CRB. There are four attributes of a watershed that determine erosion potential; soil type, topography, vegetation (such as forests, shrubs, and grasslands), and precipitation (although precipitation was excluded in this analysis). In this study, a rating system was developed on a scale of 0-90 (with 90 having the greatest erosion potential). The different layers in a Graphical Information System were combined to create an erosion vulnerability map. Results suggest that areas with agriculture have more erosion without a wildfire but that forested areas are most vulnerable to erosion rates following a fire, particularly a high severity fire. Sedimentation in dams is a growing problem that needs to be addressed especially with the likely reduction in snowpack, this vulnerability map will help determine which reservoirs in the CRB are prone to high sedimentation. This information can inform managers where post-fire erosion mitigation efforts might be prioritized.

Poster # 157

What are the Impacts of Corporate Social Responsibility (CSR) on Financial Performance of a Corporation Based on Its Size

Presented by: Blessing Adaramola

Mentor: Olusola Adesope **Campus:** Pullman

Major: Accounting

Category: Humanities

Corporate Social Responsibility (CSR) has been a growing topic over the last few decades and has been researched extensively and implemented mostly among large corporations. The CSR concept has garnered the attention of stakeholders, sponsors, investors, and media outlets. These different entities now focus more extensively on the CSR of a corporation before developing extensive business relationships with it. The focus of the present research is to understand the reasons why corporations engage in CSR and the degree to which it benefits them financially or not.

In addition, little is known on the impact of the size of a corporation on the effects of CSR and financial performance. Hence, a secondary goal of the present study is to identify, based on the size of a corporation, the effects of CSR on financial performance. Specifically, the research will examine whether CSR results in financial benefits or not. In my study, I will analyze three large profit corporations, three medium profit corporations and three small profit corporations.

I will examine studies on each firm to analyze its CSR report using two or more measures (environment sustainability, human right advocacy etc.) of CSR to examine its financial performance. Some of these measures include corporation's focus on human right diversity, climate protection, empowering employee growth, health and safety of individuals connected with the corporation.

In synthesizing these measures, I will compare each measure from each organization relative to its impact on financial performance of the corporation. I will examine the most influential measure (if any) and its effects on financial performance of the corporation. After analyzing these measures, I will examine if there are major differences between the three classifications of corporation (large, medium, and small). In a case where there are differences, each classification will then be analyzed for its differences relative to financial performance.

In sum, I hope to uncover if there are any major reasons why companies engage in Corporate Social Responsibility and in addition disaggregate the data based on the size of the corporation.

Poster # 158

The Role of The Dorsal Hippocampus in Early-Stage Cocaine-Associated Memory Reconsolidation

Presented by: Shi Tan

Mentor: Rita Fuchs **Campus:** Pullman

Major: Neuroscience

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Taylor Brown, Jessica Higginbotham, Jaclyn Roland-McGowan, Jennifer Wang

In drug users, exposure to cocaine-associated environment following abstinence often leads to drug relapse. This is a major public health problem given that mortality related to cocaine overdose has been steadily increasing in recent years (NIDA, 2017). Exposure to a cocaine-associated context results in the destabilization of context-cocaine associative memories. Such labile memories must undergo protein synthesis and gene transcription-dependent reconsolidation into long-term memory stores in order to be maintained over time. Interference with memory reconsolidation weakens drug-associated memories, and thus it may reduce the probability of drug relapse. Our laboratory has shown that the dorsal hippocampus (DH) plays a requisite role in cocaine-memory reconsolidation, likely by maintaining labile memories while these memories are reconsolidated in another brain region. A prediction of this hypothesis is that neural activity in the DH is critical during early-stage memory reconsolidation. To test this hypothesis, we assessed the effects of transient optogenetic inhibition of the DH during the first hour of memory reconsolidation on cocaine memory integrity as measured based on propensity for drug context-induced cocaine seeking. Male rats (n=11) received intravenous catheters, bilateral adeno-associated viral (AAV) infusions into the DH, and optic fibers. The AAVs were used to express the inhibitory opsin, halorhodopsin (eNpHR3.0), or a control construct, yellow fluorescent protein (eYFP) in the DH. The rats were trained to lever press for cocaine reinforcement (0.15 mg/ml per infusion, IV) in a distinct chamber during ~10 daily sessions. They then received seven daily extinction training sessions in a different chamber, where lever presses were not reinforced. Next, the rats were re-exposed to context A for 15 mins to reactivate cocaine memories and trigger reconsolidation. Immediately after, the rats received intermittent laser stimulation (10mW, 5 seconds on 1 second off) or no stimulation (LIGHT OFF). After ~2 extinction sessions, cocaine-seeking behavior (non-reinforced lever presses) was assessed in context A. Laser stimulation of eNpHR3.0 in the DH attenuated context-induced cocaine-seeking relative to laser stimulation of eYFP or no laser stimulation. This finding is consistent with the idea that the DH facilitates early-stage reconsolidation of context-cocaine memories that can drive drug seeking.

Poster # 159

Reactivation of Quiescent Ranavirus Infections in Xenopus

Presented by: Ana Trejo

Mentor: Jesse Brunner **Campus:** Pullman

Major: Spanish, Zoology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Erica Crespi, Mitch Le Sage

Ranaviruses are emerging viruses of ectothermic vertebrates that are often highly virulent, causing massive, seasonal die-offs in a variety of taxa around the world. While many animals die from ranavirus infections, some survive and can retain infections for at least several months. Studies on the African clawed frog (Xenopus laevis) have shown that these quiescent infections can reactive, even leading to lethal and thus highly transmissible infections. However, the ecologically relevant mechanisms that lead to this reactivation are largely unknown. We hypothesized that physiological stress or elevated testosterone associated with breeding might be responsible for this reactivation in natural populations. We investigated these hypotheses in X. laevis by exposing subclinically infected adults to exogenous corticosterone, a key "stress" hormone, and testosterone, alongside relevant controls (a vehicle [ethanol] and unhandled negative controls and a positive control of intraperitoneal injection of heat-killed bacteria). Cardiac blood samples were collected after the 90 day procedure to examine blood hormone levels, while peritoneal leukocytes and organ tissues were collected to measure viral titers using qPCR. Preliminary results suggest that the exogenous treatments successfully elevated the targeted hormones. Almost no mortality was observed. We are still gathering data on the viral titers in the frogs. If we find that the animals experiencing higher hormone levels also harbored a higher concentration of virus, then we may be able to develop interventions that prevent the reactivation of infections in captivity or trade, or perhaps intentionally cause them to reactivate during quarantine periods.

Poster # 160

Cabernet Sauvignon Berry Quality from Vines Irrigated through Direct Root Zone Irrigation

Presented by: Gillian Hawkins

Mentor: Pete Jacoby **Campus:** Pullman

Major: Winemaking (Viticulture and Enology)

Category: Applied Sciences

Co-authors: Xiaochi Ma

Water availability is a growing concern as the wine industry continues to grow. Washington irrigation sources are dwindling but with the use of efficient, water conservatory irrigation, we can reduce the amount of water used in vineyards while producing commercial quality grapes. Cabernet Sauvignon grape vines at Kiona Vineyards in the Red Mountain AVA were subjected to reduced water application during the 2017 growing season. Water was delivered directly to the lower root zone of each vine at 0 and 2-foot depths through one-inch diameter PVC piping at 80, 60, and 40% of commercial irrigation. Direct Root Zone (DRZ) irrigation remained at a commercial rate for the beginning of the growing season until fruit set where water application rates were reduced to specified percentages for the remainder of the growing season. Through DRZ irrigation, no significant differences were observed in pH, tannin concentration, anthocyanin concentration, or degree Brix. Berry diameter was reduced as water application was reduced. Further experimentation with these water rates and irrigation depth should be done to understand the long-term effects of water stress on the productivity of the vines. The vines subjected to DRZ irrigation produced clusters that were comparable to commercially irrigated clusters, showing promising results for water conservation efforts in the vineyard.

Poster # 161

The Effects of ACES on Cognitive Control

Presented by: Haley Delgado, David Saldivar

Mentor: Amy Nusbaum, Paul Whitney, John Hinson **Campus:** Pullman

Major: Biology

Category: Social Sciences

Co-authors:

Adverse Childhood Experiences (ACEs) such as abuse, neglect, exposure to violence at home or in the community, or unstable caregiving can result in significant mental- health problems such as anxiety disorder, depression, and post-traumatic stress disorder. ACEs that involve aspects of deprivation, such as neglect and poverty, have additionally been linked to difficulties in cognitive control, i.e., the ability to coordinate cognitive resources to achieve a goal, and cognitive flexibility, i.e., the ability to adapt to changing environmental circumstances. Cognitive control is a vital component of adaptive human functioning and decision making. Prior studies have found ACEs to be detrimental to cognitive control; however, we do not yet know the extent to which other factors, such as stress, contribute to this phenomenon. Past research suggests that high levels of current stress and inadequate coping strategies may contribute to ACEs having negative effects on cognitive control. This becomes particularly important in adulthood, where stress is more frequent and intense, and developing successful coping strategies is necessary. This study intends to look at the effects of ACEs on cognitive control, while also examining the coping strategies used by participants. Cognitive control will be assessed using the AX-CPT task, a widely used task for examining proactive and reactive cognitive control. Proactive control is defined as sustained and anticipatory maintenance of information prior to making a decision, while reactive control is defined as retrieval of information on demand, only when a conflict is detected (Braver, 2012). Coping strategies will be assessed using the Brief-COPE questionnaire. We hypothesize that individuals with higher instances of ACEs will use proactive cognitive control less than those that have fewer ACEs. However, we predict reduced proactive control will only be present in groups who also demonstrate poor coping strategies. If our prediction is confirmed, this would suggest that improving coping strategies could be a beneficial treatment option for individuals who experienced adverse events in childhood.

Poster # 162

Anticipating the Transition to University: Parents' Concerns and Values

Presented by: Sophia Hilsen, Aaliyah Hong, Chen Jiang, Kendall Johnson

Mentor: Matthew Bumpus, Eleanor Dizon **Campus:** Pullman

Major: Human Development

Category: Social Sciences

For many families, the transition to university is a major milestone; often, parents and students experience this transition with a great deal of ambivalence: excited about the future and, at the same time, anxious about different aspects of the transition. Most research on the university transition has focused on students' expectations and adjustment; relatively little is known about how parents anticipate this change. Given that (a) parents and students communicate frequently across the transition to college and (b) parents remain very important to their students post-transition, it is important to better understand this process from parents' perspectives, especially given the lack of research on parenting across the college years. Specifically, addressing how parents are concerned about the college transition may be helpful for our understanding of this developmental period and for university personnel who develop and implement programming for students and parents.

In this study, we present data collected during a WSU Alive! parent presentation conducted throughout the summer of 2016. Parent attendees were invited to respond to a series of prompts via texting, using polling software. Here, we focus on parents' responses to two questions. One prompt asked parents to consider and respond to the following question: "As you think about your student's transition to WSU, what is one concern that you have?" The second asked parents to "reflect back on the concern you identified earlier: what is the value that is driving that concern?"

Of parent attendees, 675 identified a concern that they had regarding their student's transition; researchers identified several themes that described parent concerns. These themes include:

- Academics (e.g., "he won't be able to keep up with classes");
- Health/wellbeing (e.g., "is he happy? Oversleeping? Gaining weight?")
- Decisions/choices (e.g., "too much partying")

Regarding values, 484 identified a value that was linked to their concern about their student. Similarly, researchers identified themes with regard to parent values. Some themes include:

- Success
- Maturity
- Relationships
- Health
- Safety

Our next steps include identifying the linkages between parents' concerns and values in order to better understand how parents are anticipating the university transition.

Poster # 163

Women in the Beijing Opera as Told Through the Novel *Farewell to My Concubine*

Presented by: Samantha Nelson

Mentor: Lydia Gerber **Campus:** Pullman

Major: Civil Engineering, Journalism and Media Production

Category: Humanities

This project investigates the role of women in the field of Beijing Opera, an art form that has played a significant role in Chinese culture since the 18th century. Using the opera-themed novel *Farewell to My Concubine*, by Lilian Lee (originally published in 1985) and, to a lesser extent, the highly acclaimed cinematic version of the novel by Chen Kaige (1993) as central primary sources, this project argues, based on qualitative analysis, that the representation of women in Beijing Opera mirrors, in many ways, the representation of women in Chinese society at large. While there is very limited space and attention given to them on stage, their contributions are, in fact, critical to the success of both Beijing Opera and Chinese society at large. In highlighting the significance of women's contributions in the field of Beijing Opera and examining women's effective use of, on the surface, minor roles to support their own and their families' interests, this project contributes to a deeper understanding of women's agency within the Chinese cultural context.

Poster # 164

The Use of a Subcutaneous Injection of NDX-1001 to Reverse Scopolamine-induced Amnesia in Rats

Presented by: Bailey Frankovich

Mentor: Joseph Harding **Campus:** Pullman

Major: Neuroscience

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Kevin Church, Jewel LeValley, Beatriz Mateo-Victoriano, Brett Vanderwerff

Current FDA-approved pharmaceutical treatments for Alzheimer's Disease (AD) slow or stop disease progression with questionable efficacy. Unlike current treatments, neurotrophic factors like Hepatocyte Growth Factor (HGF) show promise for repairing cellular damage and recovering lost function through stimulation of synaptogenesis and neurogenesis. While the inability of HGF to cross the blood-brain barrier hinders its clinical utility, our lab has developed an HGF mimetic, NDX-1001, that effectively passes this barrier to facilitate synaptogenesis in the hippocampus. Past studies have demonstrated its efficacy when administered orally or intracerebroventricularly. Here, we aimed to determine if subcutaneous administration of a pharmacokinetically-determined dose of NDX-1001 would improve cognition in rats with scopolamine-induced amnesia, a well-characterized AD model. The subcutaneous injection administration route will potentially be used in future human clinical trials to enhance target delivery. A secondary objective was to determine whether chronic NDX-1001 administration alters blood HGF levels in a manner suggesting activation of a systemic negative feedback loop. To examine differences in cognition, we utilized Morris Water Maze testing to compare memory and learning abilities between treated and untreated dementia model rats and injection controls. Relative to the untreated dementia group, the drug treatment group exhibited significantly improved cognition. Blood results showed no significant difference in pre- and post-study circulating HGF levels, which suggests the absence of negative feedback loop activation. Collectively, these data support the subcutaneous administration of NDX-1001 at a pharmacokinetically verified dose in human clinical trials for the treatment of Alzheimer's Disease.

Poster # 165

Retention of Learning Through Life Stages in *Xenopus laevis*

Presented by: Eric Navarro

Mentor: Erica Crespi **Campus:** Pullman

Major: Zoology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors:

The environment experienced during early life stages when the brain is developing can affect behavior throughout life, and more recently studies have shown that the quality of the early environment can affect cognitive ability later in life, such as the ability to learn. We tested the hypothesis that experiencing a stressor during early development negatively affects associative learning in the South African clawed frog, *Xenopus laevis*. To do this, we will expose tadpoles to a cue (calf liver) at the time of feeding either with or without a predator cue to determine if this stressor impedes associative learning during this early life history stage. We will also give individuals this cue after metamorphosis to determine whether they remember that this cue is associated with food availability with and without the presence of a stressor. If adverse environmental conditions disrupt associative learning pathways, we predict that tadpoles not exposed to the predator will associate the food cue with feeding faster than those exposed to predator cues. In addition, if the predator cue does not inhibit associative learning as tadpoles, we might find that experiencing the predator cue during associative learning will negatively affect the ability to remember the association between the cue and food availability after metamorphosis. These findings will enhance understandings on the importance of the early environment on later cognitive function in amphibians, but also because neural processes associated with basic forms of learning are evolutionarily conserved across vertebrates, our findings could relate to similar phenomena in humans.

Poster # 167

Determination of the Adsorption and Desorption Coefficients for Manganese (II) Phthalocyanines on a Gold Thin Film

Presented by: Wynn Miller

Mentor: Kerry Hipps **Campus:** Pullman

Major: Chemistry

Category: Applied Sciences

Co-authors:

A series of experiments were performed to determine the adsorption and desorption rates of manganese (II) phthalocyanine (abbreviated MnPc) on a thin film of gold at different concentrations and temperatures. A variety of MnPc solutions in absolute ethanol were made up on the order of 10^{-5} M. To measure the adsorption and desorption rates, SPRI (surface plasmon resonance imaging) was used. SPRI is an optical analytical technique that is able to detect small changes in the index of refraction for a metallic thin film as molecules adsorb or desorb from the surface. The solution was allowed to flow over the gold film at a constant temperature and flow rate. Using this technique, plots of the light intensity versus time were created. Thus, it was possible to measure the adsorption and desorption of the manganese (II) phthalocyanine in real time. To find the adsorption and desorption rates, the isothermal Langmuir adsorption equation was applied to the gathered data. Preliminary calculations suggest that the desorption rate is approximately 2.35×10^{-4} s^{-1} M^{-1} and the adsorption rate is 1.40 s^{-1} M^{-1}. Further SPRI experiments are needed to get consistent rate data.

Poster # 168

Effect of Electron Donor Position in Bilayer OSCs

Presented by: Michael Anderson

Mentor: Brian Collins **Campus:** Pullman

Major: Mathematics, Physics and Astronomy

Category: Engineering and Physical Sciences

Co-authors: Thomas Ferron

Organic solar cells produce power by converting light into usable electricity. Light waves are absorbed in the cells to generate excitons, which are electron and positive hole pairs. The most important layer for absorption in a bilayer organic solar cell is the electron donor material because it contributes most to the photocurrent. Light waves that enter a bilayer device will form a standing wave of electric field. These standing waves are more likely to be absorbed and create excitons when their electric fields are of greater magnitude. The goal of this research was to improve the efficiencies of solar devices by positioning the electron donor layer in the maximum of the standing wave. It was found that the most current, and thereby best efficiency, can be obtained from devices by changing the electron acceptor layer thickness to an optimal value that indeed places the electron donor layer in the maximum electric field.

Poster # 169

Yellow Fever: The Roots of Africa's Struggle with the Disease

Presented by: Elizabeth Wilson

Mentor: Clif Stratton **Campus:** Pullman

Major: Chemistry

Category: Humanities

In "Yellow Fever: The Roots of Africa's Struggle with the Disease", I argue that the distribution of the Yellow Fever Vaccine has failed to make significant progress toward elimination in African countries since its creation nearly 90 years ago. As I examined some more recent outbreaks of the fever, in places such as Angola and Kenya, it became clear the virus is still present today. Although the common beliefs about the impact of Western medicine around the world are positive, a history of Western colonialism in Africa reveals neglect for the impacts of diseases like Yellow Fever on African populations. They instead selectively distributed the vaccine to colonial settlers, soldiers, and merchants with little consideration of native African people. When the vaccination was first used in 1937, it's clear purpose was to protect the American soldiers as they travelled to countries in Africa to fight. The newspapers, such as The New York Times, were able to convince the American people that the virus was no longer an issue because of the vaccine. Stories of unorganized and ineffective African healthcare systems were told to Westerners, but much of the disorganization stemmed from their colonization, and the continued control they had through the 1960's. Thus, the broken unity of African countries and the large gap in healthcare systems comes colonialism and neo-colonialism. Today, many countries are still struggling to bring about organization to their government and healthcare system, and until then, the Yellow Fever vaccination will never successfully be distributed to all of the people in need. What all of this comes down to is that the vaccination is the only way to fully protect people, and without the world's attention, there is not enough money, supplies, or worry to distribute.

Poster # 170

Thermal Inactivation and Survival of *Listeria monocytogenes* in Milk Powder and Surrogate Suitability of *Listeria innocua* and *Lactobacillus plantarum*

Presented by: Jillian Nordness

Mentor: Meijun Zhu **Campus:** Pullman

Major: Food Science

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Hsieh-Chin Tsai

Listeria monocytogenes can survive dry conditions for long time periods. Despite numerous studies addressing *Salmonella* inactivation in low-moisture foods, there is a lack of knowledge regarding *L. monocytogenes* inactivation in low-moisture foods during thermal processing and factors impacting survival in low-moisture food. The objective is to evaluate the thermal resistance of *L. monocytogenes* in milk powder, investigate impact of water activity (a_w) on its survival in milk powder, and test *Listeria innocua* and *Lactobacillus plantarum* suitability as surrogates for *L. monocytogenes* milk powder thermal inactivation. A surrogate's "D-value" should be like the pathogenic target *L. monocytogenes*. D-value is the time needed for 1 log bacterial population reduction at a specific temperature, therefore a larger value indicates greater thermal resistance. Validation using a non-pathogenic surrogate provides safe methodology for determining the thermal processing effectiveness against foodborne pathogens within food processing facilities. If the surrogate bacteria's behavior under thermal processing conditions is like its pathogenic target, a food process' kill-step is determined safe. D-values for *L. monocytogenes*, *L. innocua* and *L. plantarum* in milk powder at a_w 0.25 and 0.45 were determined through thermal inactivation at 70, 75, and 80°C. Frozen *L. monocytogenes*, *L. innocua*, and *L. plantarum* cultures were twice activated individually in nutrient media before inoculation onto TSAYE for lawn inoculum. Milk powder samples were inoculated with 10^9 CFU/g bacterial lawn inoculum, equilibrated in a_w chambers to 0.25 or 0.45, and inactivated using thermal death treatment cells. Survivors were enumerated for thermal-inactivation parameters. Thermal inactivation data from different temperatures at target a_w showed a log-linear trend; thermal resistance of *L. monocytogenes* is a_w -dependent. At a_w 0.25, D-values were 31.81 and 19.47 minutes at 75°C and 80°C respectively. For a_w 0.45, D-values were 17.85 and 7.52 at 70°C and 75°C. *L. innocua* and *L. plantarum* inactivation revealed *L. innocua* to be a suitable surrogate. *L. innocua* had similar D-values at a_w 0.25 (37.96 and 13.99) and a_w 0.45 (19.27 and 7.65). *L. plantarum* had an a_w 0.25 D-value of 36.93 at 80°C and a_w 0.45 D-values of 55.8 and 11.34 at 70°C and 75°C, which are much larger than *L. monocytogenes*.

Poster # 171

Omecamtiv Mecarbil: A Potential Therapeutic Agent for Heart Failure

Presented by: Thinh Kieu

Mentor: Bertrand Tanner **Campus:** Pullman

Major: Biochemistry

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Peter O. Awinda

Heart failure is a life-threatening condition that occurs when the heart muscle becomes weakened, thus, inadequately circulating blood and oxygen around the body. In the United States, approximately 5.7 million adults suffer from heart failure. A recent development in the treatment for heart failure includes the drug omecamtiv mecarbil (OM), a small, cardiac myosin activating molecule. The target of this drug was found to be the actin-myosin cross-bridge, which transforms chemical energy from ATP hydrolysis into mechanical energy to power cardiac muscle contraction. Prior studies have shown that OM increases force production in cardiac muscle fibers at concentrations greater than one micromolar. However, the detailed mechanism for how this drug influences contractility has only been partly defined. Our work set out to measure the effects of OM on calcium (Ca^{2+})-activated cross-bridge kinetics in skinned rat papillary muscle strips, at physiological temperature (37˚C). Our data shows an increase in Ca^{2+}-sensitivity of force production in OM treated fibers. Moreover, myosin cross-bridge recruitment and detachment rates were slowed as OM concentration increased, at both submaximal and maximal Ca^{2+}-activation levels. Being able to increase cardiac force development without having to also increase intracellular Ca^{2+} concentration suggests that OM may become a promising treatment for heart failure. However, OM's effect in decreasing cross-bridge kinetics may lead to poor relaxation dynamics of the heart, which could be detrimental to ventricular filling with each heartbeat. Ongoing experiments will further solidify these findings, and help explain how OM affects cross-bridge activity to modulate contraction in the heart.

Poster # 172

Don't Forget to Exercise: The Effects of Different Forms of Exercise on Memory

Presented by: Emma Wilsie

Mentor: Christopher Connolly **Campus:** Pullman

Major: Sport Science

Category: Social Sciences

Co-authors: Carrie Cuttler, Emily LaFrance

Acute bouts of exercise have been shown to positively affect memory. Although the majority of previous research has focused on the effects of exercise on retrospective memory, recent findings suggest resistance exercise may enhance prospective memory. The impact of yoga on prospective memory has not been previously examined. **PURPOSE**: This study examined the effects of different forms of exercise on prospective memory (i.e., the ability to remember to execute tasks in the future) and retrospective memory (i.e., the ability to remember previously learned information). **METHODS**: 145 students were randomly assigned to one of four groups: 1) treadmill running (R) (n=37), 2) kettlebell resistance exercise (K) (n=32), 3) yoga (Y) (n=35), or 4) sitting (S) (control group) (n=41). After exercising or sitting, participants completed a one-hour battery of neuropsychological tests that included two prospective memory tests: 1) an episodic prospective memory test (the reminder test) and 2) a habitual prospective memory test (the difficulty ratings test). To assess retrospective memory participants completed 1) a verbal memory test (CVLT-II) and 2) a visuospatial memory test (BVMT-R). Participants in the R, K, and Y groups performed video-guided exercise at a moderate level of intensity (50-70% of HHR) for 20 minutes, with a 5-minute warmup and a 5-minute cooldown. Participants in the S group watched an exercise video while sitting for 30 minutes. **RESULTS**: There was no significant effect of exercise on the habitual prospective memory test [$F(1,140)=.64$, $p=.59$], but there was a significant effect of exercise on the episodic prospective memory test [$c(3)=8.30$, $p=.04$]. Follow-up tests indicate that aerobic exercise led to fewer episodic prospective memory failures (11%) than resistance exercise (41%), yoga (31%), or sitting (27%). No significant effects were detected on either retrospective memory test [CVLLT-II, $F(3,141)=.71$, $p=.55$; BVMT-R, $F(3, 141)=.48$, $p=.70$]. **CONCLUSION**: Prospective memory is positively affected by exercise among college students. In contrast to previous findings, aerobic exercise specifically (but not resistance) appears to enhance prospective memory. This discrepancy may be due to differences in the time at which the prospective memory instructions were administered in the two studies.

Poster # 173

Development of New Canning Models for Home Food Preservation

Presented by: Heidi Holubetz

Mentor: Stephanie Smith **Campus:** Pullman

Major: Food Science

Category: Applied Sciences

Co-authors: Peter Gray, Frank Younce

Home food preservation is becoming popular once again, especially as the local foods movement continues to grow. One of the major concerns with home food preservation is improper canning of foods that can cause illnesses, such as botulism, as a result of *Clostridium botulinum* bacteria surviving, growing, and producing toxin in canned foods. This research expands the number of home food preservation recipes using fruits commonly found in the Pacific Northwest. Two USDA-validated canned pie filling recipes were adapted to various fruits. A recipe for fresh blueberry pie filling was used with frozen blueberries, blackberries, raspberries, and strawberries, as well as fresh blackberries, raspberries, and strawberries. The peach pie filling recipe was tested using frozen peaches. Once a recipe was adapted, pie filling was prepared, and the pH and water activity of the final product were measured prior to thermal processing to determine if the values would inhibit or encourage growth of food microflora. Subsequently, the cold spot heat penetration temperature was recorded during the cooking process to determine microbial inactivation. The accumulated lethality was calculated for each heat penetration curve, to verify the safety of the food process. The heat process required to control the microorganisms in a food product is a function of pH. All trial recipes resulted in pH values below 3.9. The acidic nature of these foods requires less thermal processing time. A pH of less than 3.9 requires 0.1 F-value minutes at z=200˚F. All heat penetration trials reached the 0.1 F-value minutes in less than the suggested recipe processing time of 30 minutes. The results of this study expand the number of approved recipes for home canning to preserve fresh and frozen fruits for use in cooking and baking.

Poster # 174

Ground State Structures of Water-Ammonia Mixtures at High Pressures

Presented by: Kenny Haak

Mentor: Jeffrey McMahon **Campus:** Pullman

Major: Physics and Astronomy

Category: Engineering and Physical Sciences

Co-authors: Andrew Cannon

Of the thousands of exoplanets that have been discovered, planets similar to Neptune make up a sizeable portion. Despite that we know such planets are comprised primarily of ices, such as water and ammonia, the precise compositional details have remained unknown. For example, what molecular structures are being formed within the interiors has been a mystery until now. In this work, structures of water-ammonia mixtures were predicted by first-principles computations. An exhaustive search for candidate structures of varying water:ammonia ratios was first performed, looking at pressures up to 750 GPa (representative of these interiors). Stabilities, for a given composition, were determined by comparing energies; in other words, phase transitions over the entire pressure range were predicted. Stabilities towards decomposition were also determined, by comparing the energies of the mixtures with those of the components. Together, the results show that water-ammonia mixtures (in particular, in the ratio 1:2) are stable up to 500 GPa. This indicates it is thermodynamically favorable for molecular mixing to occur in such planetary interiors. Given the ground-state (candidate) structures predicted in this work, we can now begin to better understand issues such as planetary formation, and accurately predict and explain the observed properties of these types of planets.

Poster # 175

Young Adult Literature for Sixth Grade Classrooms: Culturally Responsive and Social Justice Pedagogy

Presented by: Rachel Roloff

Mentor: Ashley Boyd **Campus:** Pullman

Major: English

Category: Humanities

During the 8-week period of the grant award I read a variety of texts to inform my understanding and planning for culturally responsive teaching in a middle school setting. Specifically, I read: informational texts (e.g., journal articles) about young adult literature (YAL) and culturally responsive teaching; three to four YAL books per each of the five themes I set out to explore (racial identity, cognitive illness, physical disability, sexuality, and gender); books from the English canon to pair with the culturally responsive books; the Springboard ELA Grade 6 textbook (a workbook currently under adoption across classrooms in Washington State); and books on pedagogical practices. Throughout the 8-week period I spaced out my reading and writing by theme. I considered each book, not only for middle school but also for high school, although the lesson plans I wrote were solely for middle school students. While I was reading the novels and contemplating teaching them, I completed research on the content of the novel itself as well as on poetry, short stories, and novels that fit the certain themes. After I finished all four novels I wrote a lesson in the format required in Teacher Performance Assessment EdTPA, the structure I am required to use in my teacher education program. I used the Springboard ELA Grade 6 textbook to pair the novels I read with lessons they have in their textbook, in order to create a resource that I and other teachers can actually use in their practice. These themes, although much more difficult to find more middle school students, were still found. They may be trickier, but I was able to find at least one novel that would work in a middle school classroom. These topics are rarely brought up in classrooms but are necessary to be brought up in the classroom.

Poster # 176

Understanding the Substrate-enzyme Interactions of Aldehyde Oxidase-catalyzed Reactions

Presented by: Karen Vo

Mentor: Jeffrey Jones **Campus:** Pullman

Major: Biochemistry

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Carolyn Joswig-Jones, Erickson Paragas

Aldehyde oxidase (AOX) is a cytosolic molybdenum-containing enzyme responsible for the metabolism of some drugs and drug candidates. AOX plays a significant role in human Phase I drug metabolism, as it catalyzes the oxidative hydroxylation of substrates including several aliphatic and aromatic aldehydes, and nitrogen-containing heterocyclic compounds. AOX is an important player in drug metabolism, however, its role in drug clearance is not fully understood. AOX activity varies widely in established *in-vitro* systems used, including liver cytosol, pure AOX enzyme, and primary and cultured hepatocytes. Variability is also observed between different species, and between individuals of different gender and age, making drug design more difficult. AOX metabolite standards are also often difficult to chemically synthesize due to the chemo- and regio-selectivity of the enzyme. These challenges may lead to to higher rate of clinical failures due to unpredictable or underestimated drug metabolism by AOX. Recently, we described a simple, economical, *Escherichia coli* system (ecoAO) that expresses human AOX. ecoAO can be used for activity screening, biosynthesis, and determination of pharmacokinetics data of compounds metabolized by AOX, such as anti-tumor agent XK469. In this study, the application of ecoAO to known AOX drug substrates including XK469 and other various quinoline substrates are presented.

Poster # 177

The Effect of Colostrum Quality on Calf Heath and Pathogenic Transmission

Presented by: Acacia Neveux

Mentor: Amber Adams-Progar **Campus:** Pullman

Major: Zoology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Casey Beksinski, Lindsey Dearmin, Briah Parchment

Failure of passive transfer causes up to a 16% death rate in neonatal dairy calves due to insufficient IgG concentrations. Feed supplements are currently available, such as Celmanax® to improve a cow's ability to cope with stress during the transition period. The benefits from this supplement are focused on the cow; however, no data exists on how this supplement affects calf health. In theory, this supplement would allow for greater IgG levels in the colostrum.

The objectives of this study was to determine if feeding Celmanax® to cows affects pathogenic transmission to calves and if Celmanax® affects colostrum quality. Thirty-six Holstein cows were assigned to one of two treatments. Both groups were given no vaccinations after the dry-off period and one group (n=18) was fed Celmanax®. Upon calving, each cow's colostrum quality was determined and each calf was followed from day of birth to weaning at 42 days of age. Fecal samples were collected at birth, days 7 and 14 and tested for *E-coli* O157:H7 and Salmonella. Bedding samples were collected on days 7 and 14 and submitted for pathogen detection. All data were analyzed using PROC LOGISTIC in SAS.

We detected no significant difference between colostrum quality and treatment ($P = 0.73$). There was a significant difference in colostrum quality and bedding pathogen detection ($P = 0.05$). The odds ratio for colostrum quality and pathogen detection was 1.62. Both treatment ($P = 0.74$) and age ($P = 0.70$) did not appear to affect the presence of bedding pathogens. Only one case of both *E-coli* O157:H7 and Salmonella was detected in the samples analyzed. Additional fecal samples will be obtained and analyzed for further diagnosis. These will be paired with clinical records in order to determine if colostrum quality affects pathogenic transmission. This, in turn, will help future dairy farmers make more calf health-conscious decisions regarding immunity and pathogenic responses.

Poster # 180

Extracellular ATP is an Essential Signaling Molecule Conserved from the Most Ancient Plants, Bryophytes

Presented by: Misumi Sano

Mentor: Jeremy Jewell **Campus:** Pullman

Major: Agricultural Biotechnology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Kiwamu Tanaka

ATP is a central molecule of life and essential for basic cellular processes. Once outside the cell, it functions as a signal modulating a broad range of cellular functions, often as a damage-associated molecular pattern. Through activation of purinergic receptors in the plasma membrane, extracellular ATP induces a series of immune responses such as production of reactive oxidative species, activation of MAPK signaling cascades, and increase of cytosolic calcium concentrations. In a flowering plant, Arabidopsis thaliana, extracellular ATP is recognized by a lectin receptor kinase known as DORN1. However, the presence of such a receptor is currently unknown in other plant species. In this study, we produced an aequorin-expressing line of the model bryophyte, Physcomitrella patens, to monitor dynamic changes in cytosolic calcium concentrations in response to extracellular ATP. Aequorin is a bioluminescent calcium sensor. As a result, we found that extracellular ATP did induce a calcium response in the moss plants in a similar manner as seen in Arabidopsis plants, suggesting the existence of an orthologous extracellular ATP receptor in moss. Since modern angiosperms diverged from moss more than 400 million years ago, our result highlights the importance ofdamage-associated signaling for plant fitness and implies its conservation in descending modern plants.

Poster # 182

Assessing Hydrogen Sulfide's Inhibition Profile on Prostate Specific Membrane-antigen (PSMA)

Presented by: Zachery Browne

Mentor: Cliff Berkman **Campus:** Pullman

Major: Biochemistry

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Brian Backer

Prostate specific membrane antigen (PSMA) is an ideal biomarker for targeted cancer therapy and imaging. PSMA is a glutamate carboxypeptidase II transmembrane protein with restricted expression to prostate cancer cells, whereas healthy cells have negligible expression. Hydrogen sulfide is a dichotomy in the medicinal chemistry field to whether it inhibits cancer progression or is responsible for uncontrolled cellular growth. Hydrogen sulfide's inhibition and reversibility on PSMA will be determined by performing reversed-phase high performance liquid chromatography (RP-HPLC). RP-HPLC allows for precise detection of the enzyme-substrate complex. The instrument uses an isocratic solvent condition allowing for separation of the substrate and product. The elution of the substrate and product are then visualized by a chromatogram. Therefore, allowing the determination of the IC-50 and reversibility of hydrogen sulfide on PSMA.

Poster # 183

The Evolution of Plastic Expression as an Explanation of Invasion Success

Presented by: Madison Armstrong

Mentor: Mark Dybdahl **Campus:** Pullman

Major: Biology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Abby Hudak, Mark Smithson

Invasive species and populations pose major threats to biodiversity and cause extensive ecological disruption and economic damage (Lee, 2002). The question remains how invasive populations attain their success in so many novel environments, and one prominent explanation is phenotypic plasticity, where genetically identical individuals develop varying traits in different environments (Fierst 2011, Lande 2015). Theory suggests plasticity should be greater at early stages of invasion, but there is not empirical evidence about how trait plasticity evolves and varies during invasion. To address this gap in our knowledge, I am studying the New Zealand mudsnail (*Potamopyrgus antipodarum*) and plasticity in shell shape at different stages of invasion. This is a successful invader of the western US and Great Lakes regions, but these populations are genetically uniform (US 1 clonal type). Nevertheless, shell shape is adapted across populations to different environments (water current speed and depth) (Kistner and Dybdahl 2013, 2014), suggesting plasticity. I previously documented shell shape variation in US 1 clonal type between 3 populations from both recently established and older populations. The shell shape differences were quantified with measures of shell length, width, and width of the shell opening (aperture) on the ImageJ program. Here, I test how shell shape is related to performance in a water current by placing individual snails into a pipe with water flow for 3 minutes, and measured the distance traveled upstream (Levri & Clark, 2014). The results suggest that performance variation was related to shell shape variation. Based on these preliminary results, I will expand this work to 8 additional populations of US1 collected from Maryland to Wisconsin to Washington state, and compare the plasticity of shell shape in response to water current using recently established and older populations.

Poster # 184

Examining Mindfulness and Body Image in the Context of Yoga

Presented by: Veronica Garcia

Mentor: Anne Cox **Campus:** Pullman

Major: Sport Science

Category: Social Sciences

In previous studies, negative body image has been associated with low self-esteem, eating disorders, and mental illnesses. Many young girls are dissatisfied with their bodies even at an early age, and this has been shown to continue and worsen over time. Individuals with negative body image have a tendency to have adverse thoughts about their body and appearance. The purpose of this study is to examine the relationships of mindfulness and self-compassion to body surveillance and body appreciation in women during a 16-week yoga course. It was hypothesized that higher mindfulness during yoga classes and greater increases in self-compassion will predict decreases in body surveillance and increases in body appreciation over the 16 weeks. Understanding the relationships among these variables is essential so that women can begin to work on implementing strategies that would support more positive body image.

Poster # 185

Inside Ice Giants from First Principles

Presented by: Andrew Cannon

Mentor: Jeffrey McMahon **Campus:** Pullman

Major: Physics and Astronomy

Category: Engineering and Physical Sciences

Co-authors: Kenneth T. Haak

Over the past decade, nearly two thousand confirmed exoplanets have been discovered, many of which are so-called ice giants, planets similar in composition to Neptune and Uranus. In order to accurately model such planets, it is necessary to understand their interior composition. In this presentation, our recent efforts towards the determination of an accurate model for the interior of Neptune-like planets from first principles will be discussed. There are currently two models for the interior of ice giants: one in which layers are separated, and one in which they meld into each other, forming what is known as the compositional gradient model. Previous models have utilized the layered model—however, recently it has been discovered that water and hydrogen can mix in the liquid state. We therefore set out to investigate if this mixing continues into the solid phase, which would lend support to the compositional gradient model. Our work utilize first-principles quantum mechanical calculations, starting with random collections of hydrogen and water molecules, and relaxing them computationally to determine their lowest energy states.

We have calculated detailed enthalpy vs. pressure curves for hydrogen-water mixtures at varying ratios. Now, we are calculating detailed enthalpy vs. pressure curves for separated water and hydrogen, in order to compare the two and see which has lower enthalpy. Preliminary results suggest that the mixed phases may have lower enthalpies, which would mean that current planetary models are in significant error.

In the future we will investigate properties of the mixed layer model, including the possibility that it can explain the anomalous magnetic fields of the ice giants. These results are expected to greatly improve our understanding of Neptune-like planets, and the impact on the fields of planetary and high-pressure physics is anticipated to be significant.

Poster # 186

Association of TNXB with Milk Production in Dairy Sheep Breeds

Presented by: Kaneesha Hemmerling

Mentor: Michelle Mousel **Campus:** Pullman

Major: Animal Sciences

Category: Molecular, Cellular, and Chemical Biology

Co-authors: M. U. Cinar, M. K. Herndon, T. W. Murphy, D. L. Thomas, S. N. White,

With the world population growing by 83 million people annually, it is important to select for livestock that produce a large volume of high quality products to meet the worldwide growing nutritional demands. A variation in the Tenascin X (TNXB) gene, E2004G, has been associated with mature bodyweight and subjective milk score in domestic sheep. In the present study we evaluated 207 sheep from one U.S. location comprised of the dairy breeds East Fresian (E), Lacaune (L), Awassi (A), and Katahdin (K) to asses if there is an association between TNXB E2004G and individual milk yield, fat yield, protein yield, fat percentage, and protein percentage. Ewes were 2 to 6 years old and data was cumulative. DNA was isolated from 3-10 mL of blood using GeneCatcher gDNA 3-10mL Blood kit from Invitrogen, amplified using published TNXB forward and reverse primers, and genotyped by PCR- restriction fragment length polymorphism assay. A reduced mixed statistical model was used to test the effects of age, breed composition, and TNXB genotype. Milk yield and fat yield were significantly ($P<0.002$) greater in 4 year old than 2 and 5 year old ewes and milk yield was greater in EL crossbred ewes than ELA ewes ($P<0.007$). Fat and protein percentage was higher in 4 year old ewes compared with 2, 3, and 5 year old ewes ($P<0.02$). Protein yield was greater in ewes 4 years old than 2, 3, and 5 year old ewes ($P<0.006$) and in EL ewes compared with ELA ewes ($P<0.03$). More interestingly, protein yield was approaching significance ($P<0.1$) between the TNXB E2004G AG and GG genotypes, with AG having more protein yield, but this could not be confirmed due to low frequency of AA (13.64%) genotype. Further studies need to be conducted with more sheep with the minor allele in order to validate the impact on protein yield and further assess association with other milk traits. Understanding how TNXB E2004G impacts milk production could allow producers to use this genetic marker as a selection tool to improve sheep production.

Poster # 187

The Modification of a Ministat to Measure Ammonia Production in Response to Altered Carbon Concentrations in *Azotobacter* Populations

Presented by: Cassidy Peru

Mentor: Chandra Jack **Campus:** Pullman

Major: Biochemistry, Genetics and Cell Biology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Maren Friesen

Due to the growing population and increase in food consumption, there is a need to increase farming and agricultural production. However, plants are unable to access atmospheric nitrogen, which limits overall plant production. Although some plants, such as legumes, have established mutualistic relationships with nitrogen-fixing bacteria and are able to obtain nitrogen through biological nitrogen fixation (BNF), most plants do not. As a result, chemical fertilizers have become prominent in the agricultural industry. However, in addition to having harmful effects on the environment, chemical fertilizers inhibit BNF, only making the problem worse. If bacteria can be induced to non-symbiotically fix nitrogen in response to plants, we can decrease the need for chemical fertilizers. Using a miniaturized chemostat (ministat), we experimentally evolved nitrogen-fixing *Azotobacter* in the presence of varying carbon levels to determine if we can alter ammonia production. We predict that nitrogen fixation, will be enhanced for low levels of carbon, which also increases the fitness of the *Azotobacter* population. Our results can be used to minimize the ecological and economic costs of chemical fertilizers by encouraging increased use of biological nitrogen fixation.

Poster # 188

Experiential Learning and High Impact Practices in Undergraduate Education: A First Person Account of Undergraduate Research in Criminal Justice

Presented by: Sarah Sherrod

Mentor: Melanie-Angela Neuilly **Campus:** Pullman

Major: Criminal Justice and Criminology, Psychology

Category: Social Sciences

Co-authors:

Undergraduate research is an area that is often overlooked by students when seeking involvement at the university level, despite the wealth of research establishing its multiple benefits. Criminal justice research in particular can provide many vital skills and in-depth knowledge needed to ensure academic as well as professional success at the undergraduate level. This presentation will provide a first person translation of the extant literature on Experiential Learning and High Impact Practices through the lens of undergraduate involvement in criminal justice research. I will offer a meta-level perspective using autoethnography as a methodological framework.

Poster # 189

Investigating Palouse Region Streamwater Patterns with Sediment and Isotope Analysis

Presented by: Zara Guzman

Mentor: Jan Boll, Christian Guzman **Campus:** Pullman

Major: Civil Engineering

Category: Engineering and Physical Sciences

Co-authors: Sam Ferguson, Alexis Guzman, Raul Rodriguez, Alex Rogel

There are many factors that contribute to the water quality and quantity surrounding Pullman, such as agricultural practices, urban development, wastewater treatment plants, and shifting rain and snow patterns. The Department of Ecology in the state of Washington and the Idaho Department of Environmental Quality have listed the South Fork Palouse River as exceeding water quality standards for nutrients and sediments. Studying the water surrounding the Palouse Region through field work and laboratory analysis provides a better understanding of the water chemistry present in the nearby creeks. Paradise Creek and Missouri Flat Creek are two streams within the South Fork Palouse River network at which research is being conducted on nutrients, sediments, and water source identification (isotopes). The goal of this research is to test the assumption there is a quick response (one to four-hour arrival of maximum) of sediment concentration to rainfall and snowmelt events. This work uses various methods to obtain stream water samples through manual and programmed collection with an Isco Automatic Water Sampler during the snow and rainy season. Between 500-800 mL of water are collected and sediments are determined using 47 mm-diameter filter paper (<0.7 micrometer pore size). Finally, these samples are also analyzed for isotopes. After calculating the sample sediment concentrations, data is correlated with USGS data for the Palouse Region and analyzed for stream flow rate and stream sediment concentration patterns. The outcome of this research will allow us to help organizations that are working to address water quality problems in the Palouse area by providing information on how sediments and other pollutants are being transported in the stream network.

Poster # 190

Campylobacter jejuni Adapts to Life in the Intestine

Presented by: Kyrah Turner

Mentor: Michael Konkel **Campus:** Pullman

Major: Biochemistry

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Colby Corneau, Steven Huynh, Nicholas M. Negretti, Craig Parker

Introduction: *Campylobacter jejuni* is a Gram-negative, highly-motile bacterium that is the leading cause of gastroenteritis in the United States, accounting for 1.2 million cases annually. *C. jejuni* most commonly infects the human intestinal tract through consumption of undercooked poultry, unpasteurized milk, and contaminated water. The symptoms of *C. jejuni* infections include diarrhea, abdominal pain, fever, headache, nausea, vomiting, and in rare cases, Guillian-Barré Syndrome, a form of flaccid paralysis. In the human digestive system, bile is periodically secreted into the small intestine to aid with digestion. Bile also serves as a defense against the colonization of disease-causing bacteria, including *C. jejuni*. High levels of the bile salt sodium deoxycholate, which is found in the human intestine, are known to inhibit *C. jejuni* growth.

Hypothesis: We hypothesize that in response to exposure to deoxycholate, *C. jejuni* acquires mutations in its genome that promote its survival to this host defense factor.

Methods: In this study, two *C. jejuni* clinical strains 81-176 and 87-95 were serially passaged in medium supplemented with increasing levels of sodium deoxycholate. Following continued passage, the *C. jejuni* 'adapted' isolates were isolated and then analyzed for the presence of point mutations (single nucleotide polymorphisms).

Results: Specific mutations were identified in the genome of *C. jejuni*-adapted isolates that conferred a growth advantage of the bacterium in deoxycholate-supplemented medium when compared to non-adapted isolates.

Conclusions: Future work will analyze the efficiency of *C. jejuni* deoxycholate-adapted and non-adapted isolates to colonize chickens (the natural host for this bacterium). Analyzing the ability of *C. jejuni* to adapt to and survive in bile salts will allow for a greater insight into the adaptive evolution of highly pathogenic bacteria.

Poster # 191

Therapeutic Potential for Improving Mobility and Exercise Performance in a Mouse Model of Limb Girdle Muscular Dystrophy

Presented by: Jay-J Yarbrough-Jones

Mentor: Bertrand Tanner, Jennifer Eldridge **Campus:** Pullman

Major: Sport Science

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Yemeserach Bishaw

Limb-Girdle Muscular Dystrophy (LGMD) is a group of genetic disorders that causes weakness and progressive loss of muscle function, primarily around the hips and shoulders. LGMD type 2I (LGMD2i) specifically, is caused by a mutation in the Fukutin-Related Protein gene, which affects glycosylation of the alpha-dystroglycan complex linking the extracellular matrix in muscle to the cytoskeleton. In humans, LGMD2i is typically diagnosed in late childhood and impedes oxidative actions such as walking and running. The P448L mouse is a knock-in transgenic mouse model that displays symptoms of LGMD2i that are similar to the phenotype observed in humans. Typically, muscular dystrophy is characterized with an increase in chronic inflammation, a decrease in oxidative muscle fibers, and increased muscle fibrosis. In previous studies, simvastatin has been suggested as a beneficial therapy for Duchenne Muscular Dystrophy (DMD) in the transgenic *mdx* mouse. Simvastatin is a drug that is typically used in humans to lower low-density lipoprotein levels in the body and decrease the prevalence of cardiovascular disease. If simvastatin is a beneficial therapy for LGMD2i, then we anticipate measuring improved exercise performance in the P448L mice that were administered simvastatin. Using treadmills within metabolic chambers, we exercised the LGMD2i mice until exhaustion and measured their maximum volume of oxygen utilized. This is accomplished by comparing oxygen and carbon dioxide entering and leaving the chamber at 20-second intervals to measure respiratory exchange. We also recorded distance traveled and time passed until exhaustion for each mouse. Preliminary findings show that the simvastatin and LGMD groups have no significant difference. This suggests that LGMD2i and DMD may have different responses to simvastatin as a therapy, potentially due to the different etiologies of these dystrophies. Ongoing measurements may suggest otherwise, as our studies and our collection of the data are ongoing.

Poster # 192

Expressive Language of Toddlers as Influenced by Siblings

Presented by: Allison Saur

Mentor: Mark VanDam **Campus:** Spokane

Major: Speech and Hearing Sciences

Category: Social Sciences

Co-authors: Jenna Anderst

Linguistic complexity is an indicator of language development in young children. Complexity of a child's linguistic productions have been shown to increase with development, but may be affected by factors such as disability or environmental variables. Here, we look into the role of family composition as a possible influence on a child's developing ability to use increasingly complex language. In particular, we ask if a toddler's mean length of utterance (MLU) is affected by the presence of siblings in the family and whether the sex of the child may play a role. MLU values were extracted from the public HomeBank database [http://homebank.talkbank.org] of transcribed natural child speech for both the target toddler and for siblings present in the recordings. Results indicate a main effect of increased MLU in children without siblings, but interaction effects suggest that differences may be driven by the boys without siblings alone. There was no correlation between the MLU of the target child and the MLU of the sibling. Findings are discussed in terms of family dynamics and joint attention.

Poster # 193

Investigation of Negative Group Velocity Harmonic Waves Associated with Backscattering of Ultrasound Off Submerged Cylindrical Shells

Presented by: Sterling Smith

Mentor: Phillip Marston **Campus:** Pullman

Major: Physics and Astronomy

Category: Engineering and Physical Sciences

Co-authors: Timothy D. Daniels, John C. Stotts

The purpose of this experiment is to investigate the significance of negative group velocity waves when scattering ultrasound in water off submerged cylindrical shells as the frequency and angle of illumination are changed. Prior experiments show that such waves can greatly influence the backscattering of ultrasound off empty steel spherical shells in water provided the frequency is high and is properly selected [1]. Computations suggest that related processes should be significant for cylindrical steel shells [2]. Such interaction processes are relevant to the interaction of ultrasound with flat plates in water [3]. In the present experiments two cylinders were studied using a circular transducer setup in a tank of water. Strong backscattering features were visible, some attributed to negative group velocity waves on the shells, for a range of frequencies and angles on both an aluminum cylinder and a Poly(methyl methacrylate) (PMMA) cylinder. Both cylinders are 127 mm long with 63.5 mm diameters, the aluminum cylinder had 6.35 mm thick walls and the PMMA cylinder had 3.25 mm thick walls. The ultrasonic frequencies ranged from 350 kHz to 650 kHz, limited by the bandwidth of the transducer, and the cylinder's tilt angle only needed to range from 0 to 90 degrees due to the symmetry of the cylinders. In this experiment the negative group velocity wave was most easily observed as a build-up in amplitude a few cycles after an initial reflected response. It is because of that timing and the observed conditions on the frequency, calculations can be done to confirm the negative group wave velocity is the best explanation for the associated scattering mechanism. [Research supported in part by the U. S. Office of Naval Research.]

[1] G. Kaduchak, D. H. Hughes, and P. L. Marston, J. Acoust. Soc. Am. 96, 3704-3714 (1994).

[2] G. Kaduchak and P. L. Marston, J. Acoust. Soc. Am. 98, 3501-3507 (1995).

[3] P. L. Marston, J. Acoust. Soc. Am. 113, 2659-2662 (2003).

Poster # 194

Campylobacter jejuni: The Food-Borne Pathogen that Causes Severe Gastritis by Manipulating Human Intestinal Cells

Presented by: Sarah Fahr

Mentor: Michael Konkel **Campus:** Pullman

Major: Zoology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Nicholas Negretti

Campylobacter jejuni is the leading bacterial cause of foodborne disease in humans. Symptoms include severe diarrhea, fever, nausea, abdominal pain, and it is especially dangerous in vulnerable populations, such as the very young or the elderly. Infection with *C. jejuni* is most frequently acquired from consumption of contaminated foods, such as undercooked poultry. Illness with *C. jejuni* results when the bacteria invade cells of the small intestine.

Intestinal epithelial cells regularly sample the environment and take-in particles from outside of the cell, a process called endocytosis. Normally, when an epithelial cell endocytoses a particle, the particle becomes engulfed inside a vesicle that acquires various protein markers that direct the vesicle to fuse with a degradative lysosome.

Many pathogenic bacteria that replicate within vesicles harbor mechanisms for manipulating vesicle trafficking to evade destruction by a host cell lysosome. We hypothesize that *C. jejuni* synthesizes proteins that manipulate the trafficking pathway to avoid vesicle fusion with lysosomes.

To test our hypothesis, human epithelial cells were infected with *C. jejuni* and the association of specific vesicle trafficking-markers with *C. jejuni* was determined using confocal microscopy in the absence or presence of chloramphenicol. Chloramphenicol is an antibiotic that prevents bacterial protein synthesis. Association with LAMP1, a marker of the cell-lysosomal trafficking pathway, and cathepsin D, a protein associated with lysosomes and the degradation of material inside vesicles, were visualized and quantified.

We observed a high level of association of vesicles containing *C. jejuni* with LAMP1 with and without bacterial protein synthesis. However, we observed more *C. jejuni* in vesicles marked with cathepsin D when bacterial protein synthesis was inhibited compared with *C. jejuni*-infected cells not treated with chloramphenicol. These results support the hypothesis that *C. jejuni* synthesize proteins that alter vesicle trafficking and prevent lysosomal fusion in epithelial cells.

Work is currently in progress to further identify the protein markers that define the vesicles in which *C. jejuni* reside. The ultimate goal of this research is to define the strategy that *C. jejuni* utilizes to manipulate human epithelial cell behavior in order to identify potential bacterial targets for vaccine development.

Poster # 195

Home Range Size Analysis of American Pikas at Craters of the Moon National Monument And Preserve

Presented by: Jenna Chapman

Mentor: Meghan Camp, Lisa Shipley **Campus:** Pullman

Major: Wildlife Ecology and Conservation Sciences

Category: Organismal, Population, Ecological, and Evolutionary Biology

American pikas (Ochotona princeps) are small, alpine lagomorphs that typically inhabit high-elevation talus slopes in mountain ranges of the western United States. This charismatic animal is sensitive to hot temperatures, so it is typically restricted to alpine environments. However, some populations exist in atypical habitats at lower elevations and warmer environments where they use behavioral flexibility to buffer their exposure to hot temperatures. One such population exists at Craters of the Moon National Monument and Preserve (hereafter, "Craters"), an extensive lava flow in Idaho. To gain a better understanding of behavioral differences between pikas at Craters and pikas in a typical alpine habitat, we compared home range sizes at Craters with those at Grays Peak, in the Pioneer Mountain Range, a more typical subalpine habitat. Because vegetation is patchier and thermal refuges are more widespread at Craters compared to Grays Peak, we predicted that home ranges would be relatively larger at Craters. Using GPS data collected during direct observations, the home range sizes of nine focal pikas were estimated by constructing a minimum convex polygon for each. We used a 2-sample t-test to compare home range sizes between the two sites with a significance level of $\alpha = 0.1$. The average home range size at Grays peak was smaller than the average home range size at Craters of the Moon ($t = -1.61$, $p = 0.07$). Given that home range is often determined by resource distribution and quality, our results suggest the typical, high-elevation habitat at Grays Peak is higher quality relative to the atypical, low-elevation lava habitat at Craters. Pikas at Craters likely use a larger area to find food relative to pikas at Grays peak and have ample access to thermal refuges across the pahoehoe lava for thermal insulation and security cover. This study represents an important step in understanding how pikas at Craters use behavioral modifications to inhabit a highly atypical habitat.

Poster # 196

Expression and Purification of Chimeric Tropomyosin Peptides for Binding Site Identification

Presented by: Trenton Williams

Mentor: Dmitri Tolkatchev, Alla Kostyukova **Campus:** Pullman

Major: Bioengineering

Category: Molecular, Cellular, and Chemical Biology

Tropomyosin and tropomodulin are proteins crucial for determining the length of actin filaments. Knowing structure of a complex formed by these two proteins will help to understand how they function. The overall goal of this study was to find conditions for expression and purification of tropomyosin chimeric peptides containing 19, 26, 33 or 44 residues of short α-tropomyosin. Most importantly, we are looking for the ideal length of a peptide to be used in nuclear magnetic resonance (NMR) experiments. The process for purification of these peptides involved transforming a plasmid coding a tropomyosin peptide of the varying lengths into BL21(DE3) *Escherichia coli* cells. The cultured cells producing the desired peptide fused with a tag protein were lysed using sonification, leaving the tagged peptide and some organic remnants free from the confines of the cellThe peptide was bound to a column packed with a Ni-NTA affinity resin via the His-tag. After washing with different solutions the isolated peptide was eluted. For further purification of the peptide, cyanogen bromide digestion was used to remove tags and the peptide was isolated using a two-step purification: a Sep-Pak column and high performance liquid chromatography. Overall, the peptides with 19 and 26 tropomyosin amino acid residues were completely purified during this study. Additionally, crude Sep-Pak preparations of peptides with 33 and 44 residues were obtained. After purification, these peptides will be tested for their ability to form a coiled coil and to interact with tropomodulin 1 to finally find the best one for NMR studies.

Poster # 197

Strategies and Effectiveness of Education and Outreach on PCB Awareness and Action in the Spokane River Basin

Presented by: Brenden Campbell

Mentor: Kara Whitman **Campus:** Pullman

Major: Environmental and Ecosystem Sciences

Category: Social Sciences

Polychlorinated biphenyls (PCB's) are a human-made toxic compound that persist in the environment and bioaccumulate in animals. PCB's are not just a legacy pollutant, as per US EPA regulations (under Toxics Substances Control Act or TSCA) the production of inadvertent PCB byproducts from chemical manufacturing is still allowed. The Federal allowance is 50ppm and the Washington water quality standard is 0.0000007 ppm. The Spokane River falls in the category of being contaminated by PCB's. With this information, the Department of Ecology opted out of the long TMDL process and instead for a collaborative task force to attack the issue. The Spokane River Regional Toxics task Force (SRRTTF) is an organization with the goal of reducing toxic compounds in the Spokane River. The Spokane River Regional Task Force is A Collaborative Group Of Governmental Agencies, Private Industries And Environmental Organizations. The SRRTTF has concluded that a large amount of contamination comes from non-point source pollution, which led them towards public outreach. Public outreach is hopefully the avenue in which non-point source pollution can be reduced. The members of the task force have developed a comprehensive plan laying out the goals of the SRRTTF. This includes a large amount of outreach to educate the public on what toxics are present in the environment, specifically PCB's, and how to reduce the amount entering the environment. The research conducted surfaced from this outreach and compiling what was going on with these different agencies in the SRRTTF. The goal was to collect as much data about outreach from all the different agencies. While the study was limited, the data collected was enough to help answer this question and provide information about what these members were doing. The next step was to find leverage points and overlap between the members doing outreach. From the research, interviews, and webpages, a couple conclusions were made. These included a possible regional messaging campaign, potential leverage for funding, sharing resources, and deciding if it is best to talk PCB's or toxics in general.

Poster # 198

Cannabis-Induced Feeding Behavior: A Mechanistic View

Presented by: Joanne Kunze

Mentor: Jon Davis **Campus:** Pullman

Major: Neuroscience

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Julianna Brutman, Pique Choi, Peyton Wahl

The recent popularity and state-by-state legalization of cannabis for both medical and recreational purposes has renewed interest for its therapeutic potential. Whereas it is widely accepted that cannabis induces appetite, relatively little is known about its mechanistic control of feeding behavior. Previous studies have examined individual cannabinoids, particularly delta-9 THC, for its appetite-stimulating effects. However, few have examined these effects following exposure to dry cannabis plant matter, the most widely consumed form of cannabis. In this context, ghrelin, a gastrointestinal (GI) derived "hunger hormone," stimulates appetite through actions in the central nervous system. Notably, ghrelin is the only peripherally produced feeding peptide that stimulates food intake, making it a logical candidate to control cannabis-induced feeding behavior. Here, we hypothesized that cannabis-induced feeding behavior is dependent on ghrelin signaling. To address this, we utilized a novel vapor chamber system to administer plant matter cannabis to male rodents. After establishing a dose-response for cannabis, rodents were passively exposed to vaporized cannabis and placed in BIODAQ metabolic chambers to measure feeding microstructure. Plasma levels of acyl-ghrelin were quantified post-exposure and subsequently blocked using an effective dose of L-cysteine. Finally, experiments to measure motivated and anxiety-driven behavior were performed. Results indicate that cannabis exposure increased meal frequency in free feeding rodents, an effect accompanied by elevated levels of ghrelin and delta-9 THC in the blood. Cannabis exposure also stimulated hedonic feeding from a palatable food in behaviorally-sated rodents. Interestingly, cannabis exposure did not alter motivated or anxiety-driven behavior. Blockade of GI ghrelin secretion attenuated the initiation of cannabis-induced feeding behavior. Collectively these data indicate that vaporized cannabis plant matter increased meal frequency and hedonic feeding, and that these behaviors are regulated in part by elevated levels of plasma ghrelin. Further exploration is necessary to elucidate the signaling pathway between cannabinoids and ghrelin-secreting cells to fully provide more targeted appetite-controlling therapies.

Poster # 199

Validation of Candidate Genes Under Selection by the Environment Through Gene Expression Analyses in Tasmanian Devil Populations

Presented by: Samantha Kallinen

Mentor: Joanna Kelley, Andrew Storfer, Alexandra Fraik **Campus:** Pullman

Major: Zoology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Understanding how populations of organisms have higher fitness in some environments as compared to others is crucial in our understanding of local adaptation. This is specifically important for species with populations that occupy a wide range of environmental conditions such as the Tasmanian devil (*Sarcophilus harrisii*). Tasmanian devils serve as a model system for studying local adaptation as they are well sampled across their entire geographic range, which is highly heterogeneous and have been consistently monitored. A previous landscape genomics study of Tasmanian devils found that they appeared to exhibit genetic structuring and variation that was correlated to differences in their local environment. We hypothesized that the abiotic variation in the environment driving genetic variation across the populations of devils sampled would also lead to differential gene expression of those candidate genes. Therefore, in this study, we explicitly test for changes in gene expression of these published candidate genes that have variation that is correlated to that abiotic environment. Examining patterns of differential expression at these genes across Tasmanian devils sampled from different environments will provide further evidence of whether these genes are involved in local adaptation in Tasmanian devils. Raw RNA sequences were aligned to a reference genome using HiSat2 for nine male devil samples collected from three different distinct geographic locations across Tasmania. Variation in gene expression of the candidate genes was analyzed using Ballgown. We expect to find differential expression of these genes correlated to differences in the abiotic environments from which our devils were sampled.

Poster # 200

Hypersexualized Asexual Black Bodies and the Journey to Self Identification

Presented by: Terlona Knife

Mentor: Pamela Bettis **Campus:** Pullman

Major: Comparative Ethnic Studies, Psychology

Category: Social Sciences

The sexualization of women, or femme people in various forms of media has been increasing. Historically, Black women's bodies have been hypersexualized, and recent studies have examined the effects of this imagery. At the same time, the concept of asexuality has been given more attention in the social sciences and popular press. This paper seeks to tie together two seemingly separate topics to uncover the experience of people who live in the intersection of asexuality and having a body that is often hypersexualized because of their race. Through a narrative qualitative study, asexual Black people will be asked questions pertaining to their identity, and how institutions, ideology, or personal interactions have shaped their experience. The participants responses will be documented and analyzed through the theoretical frameworks of Black Feminist Thought and Black Queer Theory to highlight the lives of this specific marginalized group.

Poster # 201

Preliminary Investigation of Waste Cooking Oil-based Bio-asphalt and Reinforcement with Lignin-based Epoxy

Presented by: Alexa Antalan

Mentor: Jinwen Zhang, Junna Xin, Ran Li **Campus:** Pullman

Major: Mechanical Engineering

Category: Engineering and Physical Sciences

Traditional asphalt binder is residue obtained during the crude petroleum refining process. Increased environmental regulations for new drilling, dwindling existing resources, modifications to the refining process that maximize the fuel quantity while minimizing asphalt residue have increased the cost of asphalt in recent years. Petroleum-based asphalt also has low resistance to rutting and cracking due to extreme temperatures. With this impact in mind, waste cooking oil (WCO)-based bioasphalt is an affordable and sustainable alternative with higher temperature resistance. Our research optimized WCO-based bioasphalt to ensure that its properties were comparable or better than the properties of petroleum-based asphalt.

Bioasphalt was created by polymerizing WCO with maleic anhydride. The reaction conditions were optimized and the properties of bioasphalt were characterized. To further improve the characteristics of this WCO-based bioasphalt, it was modified using lignin-based epoxy. Lignin is a byproduct of the pulping process in paper-making with great structural properties. When lignin-based epoxy was added to modify bioasphalt, the resulting epoxy bioasphalt is more resistant to rutting and cracking caused by extreme temperatures and normal wear. Our lignin-based epoxy was synthesized by reacting kraft lignin with epichlorohydrin. We tested the epoxy value using titration and Phosphorus-31 nuclear magnetic resonance (P NMR) spectroscopy, and the structure of the lignin-based epoxy was characterized using Fourier transform infrared (FTIR) spectroscopy. The optimized product was used for the bioasphalt modification.

The lignin-based epoxy-modified bioasphalt was characterized three ways: The curing behavior was tested using differential scanning calorimetry (DSC), the structure of the product was interpreted using FTIR, and the rheological properties were observed using a parallel-plate rheometer. Then the effects of the epoxy content on the lignin-epoxy-modified bioasphalt were studied. -Our preliminary results show that the epoxy-modified bioasphalt has improved rheological properties and higher resistance to temperature-deformation.

Poster # 202

Comparing Efficiency of Two Methods of Site-directed Mutagenesis

Presented by: Ryder Matanane

Mentor: Dmitri Tolkatchev, Alla Kostyukova **Campus:** Pullman

Major: Bioengineering

Category: Molecular, Cellular, and Chemical Biology

Site-directed mutagenesis is an important tool in biochemistry-based laboratories. It is used to change individual residues within a protein primary structure. This can be done to study effects of disease-related mutations or to alter protein properties. By studying the structure and function of wild-type and mutated proteins, researchers can isolate disease factors and construct novel proteins. Though many methods of site-directed mutagenesis exist, few emphasize efficiency while providing multiple DNA mutagenesis capabilities. This project compares the standard QuikChange™ site mutagenesis protocol with an approach featuring PCR and a partially overlapped primer design. Use of PCR incorporates newly synthesized DNA as a template in amplification, which results in exponential production of DNA insert. Primers designed with partial overlap effectively prevent primer-to-primer annealing, thus improving rates of correct annealing and amplification. In the completion of both processes, a cysteine residue was successfully mutated to a lysine residue within a myosin regulatory light chain protein. It was concluded that the PCR based procedure was viable, and more cost-efficient than its standard counterpart. Further, the unique primer design has potential for more diverse mutations such as large site insertions, deletions, and multiple site-mutations. Applications of this new method will lead to quicker genetic engineering discoveries for clinical applications.

Poster # 203

What's in the Soil—Invasive Earthworms and their Effect on Soil Organic Matter Beneath Indigenous and Non-native Grasses

Presented by: Claire Popke

Mentor: Raymond Evans **Campus:** Pullman

Major: Biology

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Ayobami Adegbite, Rebecca Evans, Benjamin Harlow, Jodi Johnson-Maynard

Invasive species have consistently been a source of ecological disturbance from local to global scales[2,3]. Many consider aboveground organisms to be the main drivers of change but fail to consider those that live below the soil. Invasive earthworm species are prominent across North America, impacting soil structure, carbon (C) and nitrogen (N) cycling, and plant growth[4,7,8]. Detrimental effects of invasive earthworms in hardwood forests have been widely researched, but their effects on grassland and steppe ecosystems needs exploration[2,3,4]. A growth advantage to non-native plant species has been linked to invasive earthworm presence, but it is unclear if invasive earthworms promote growth of non-native grass species, such as those in the Palouse region[4,7]. Individual treatments containing non-native vs. indigenous grass species, grown with the invasive earthworm *Aporrectodea trapezoides* were used to explore this interaction between invasive earthworms and native versus non-native grass species. We hypothesize that higher C and N soil contents will be observed when earthworms are grown with invasive grass species compared to native grasses. In comparing treatments, we found mean soil carbon and nitrogen contents, as well as mean carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotope compositions, were not significantly different between plant species. Stable isotope analyses reveal that the worms are consuming soil, rather than litter, in this short-term experiment. This suggests that there are no significant interactions between earthworms and non-native and native grass species. However, there was an effect of depth, suggesting that the presence of invasive earthworms and their movement within soil may alter the soil C and N content. In the future, this could lead into research focusing on the differential impacts of invasive earthworm species on the growth of graminoids, herbaceous, and hardwood plants.

Poster # 204

Identifying Verbal Deceptive Cues within Interrogations of Serial Killers

Presented by: Kayleena Roberts

Mentor: Nancy Bell, Lynn Gordon, Guy Carden **Campus:** Pullman

Major: French, Humanities: General Studies

Category: Social Sciences

An interrogation is a unique type of communication in that both parties are believed to be lying and that there is a mutual distrust (Cane, 2015). Prior research on interrogations primarily focuses on non-verbal over verbal deceptive cues. Homeland Security's START program has a handbook listing all the verbal cues used to deceive within interrogations (Gamson et al. 2012; Matsumoto et al., 2011), which include speech stumbles, increased filler words, and stalling for time. This list of verbal cues is much shorter than compared to that of non-verbal deceptive cues. Research has been done in the past of verbal deception cues, but much of it has been disproven with recent advances in forensic linguistics (Shuy, 1998; MacDonald & Michaud, 1992). Therefore, this project focuses on finding verbal cues of deception within interrogations of serial killers.

Specifically, this presentation examines violations of Gricean Maxims within interrogations of 3? serial killers to determine if these might serve as a signal of verbal deception. To converse with anyone, a speaker follows conversational norms, and Gricean maxims are parameters typically followed by speakers in everyday conversation. The four maxims are the maxim of quantity (all information is given, but not overly informative), quality (be truthful and do not say anything that cannot be backed by evidence), relation (be relevant and say things that are related to the conversation), and manner (be as brief, clear, and orderly as possible while avoiding obscurity and ambiguity). (Dravling, n.d.) The methodology requires extensive research of the serial killer; looking at the evidence used within the courts and investigations, background knowledge, and fact checking to verify everything said throughout the transcript. In order to assess the function of violations of the maxims, I coded over 500 of pages of transcripts of serial killer interrogations for all apparent violations of Gricean maxims and used court and investigative evidence to fact-check that these were indeed violations. My findings suggest that Gricean violations are in fact linked as deceptive verbal cues. With my recent findings, perhaps another verbal deceptive cue can be recognized and useful to law enforcement agencies.

Poster # 205

Prism_Array Integrated Smartphone Micro-plate Reader for Point-of-care Colorimetric Assays

Presented by: Misganaw Demissie

Mentor: Lei Li **Campus:** Pullman

Major: Mechanical Engineering

Category: Engineering and Physical Sciences

Due to the limitation in available resources for clinical validation, most mobile health (mHealth) diagnostic devices re-main within the confines of the research setting. Few are advancing to clinical translation and validation. In this study, we conducted a clinical validation of a smartphone immunodiagnostic platform (Smart-IP) for infectious disease serology testing. The Smart-IP high-throughput colorimetric sensed 96 samples in a microplate at one time. A total of 771 de-identified patient samples in 12 serology assays for bacterial/viral infections were tested. The Smart-IP and the clinical instrument blindly read and analyzed all tests in parallel. The analytical accuracy and the diagnostic performance of the Smart-IP both demonstrated across the clinical re-portable categories by comparison with clinical laboratorial testing re-sults

Poster # 208

Determining the Effect Oncogene-induced Replication Stress has on APOBEC-mediated Mutagenesis

Presented by: Mikayla Engstrom

Mentor: Steven Roberts **Campus:** Pullman

Major: Biochemistry

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Tony Mertz

Cancer is the second leading cause of death in the United States and is caused when mechanisms that control cell proliferation are defective or dysregulated. The acquisition of mutations affecting tumor-suppressors and oncogenes is the primary, underlying means by which cells become tumorigenic. Mutations also contribute to metastasis and resistance to chemotherapeutics. One major source of mutations in approximately 20% of tumors are APOBEC cytidine deaminases that cause mutations by converting cytosine bases to uracil (C to U) within single-stranded DNA (ssDNA). Our lab previously found that tumors with similar levels of APOBEC expression have significant differences in the frequency of APOBEC-induced mutations, which indicates cellular processes that modulate APOBEC enzyme activity may differ between tumors. Dysregulated oncogenic pathways are ubiquitous in tumors, but differ significantly among individual tumors, which makes them an interesting candidate. Additionally, oncogene activation causes cells to proliferate faster and generates replication stress, consequently causing more ssDNA to be produced. Since APOBECs act on ssDNA, we have proposed that ssDNA caused by oncogene-induced replication stress is a significant contributor to APOBEC mutagenesis. To test this hypothesis, we will express APOBEC enzymes and oncogenes at physiological levels using lentiviral vectors within cell lines that lack cancer-associated APOBEC genes and normally exhibit low levels of replication stress. A synergistic increase in mutagenesis caused by APOBEC expression and oncogene activation would confirm our hypothesis. We have been able to construct and test vectors for expression of APOBEC enzymes in human cells. We are nearly done constructing lentiviral plasmids that will ultimately be used to express of oncogenes c-Myc, k-Ras, CyclinE, and Her2 from a promoter variant that allows for constitutive expression at cellular levels. We are preparing to test these vectors using qRT-PCR to determine expression levels of transfected oncogenes and will measure markers of replication stress, such as gamma H2AX, via western blot. Once this is done, we will test our hypothesis by measuring the rate of APOBEC-induced mutations in the cell lines we create. Completion of this project will further our understanding of processes responsible for the etiology of mutations in cancers.

Poster # 209

Improving Maternal Healthcare for Syrian Refugee Women in Lebanon

Presented by: Alisa Smith

Mentor: Bill Smith **Campus:** Pullman

Major: Journalism and Media Production, Political Science

Category: Social Sciences

This project assesses three potential ways to improve maternal medical care for Syrian refugee women in Lebanon: training midwives, distributing Safe Birth Kits, and using mobile medical clinics. Maternal healthcare is a necessary yet expensive area of service. Pregnant refugee women are oftentimes turned away from multiple hospitals before they find one that will admit them. Since childbirth is an immediate need, families must scramble to collect enough money to pay hospital fees. Due to the dramatic population increase following the Syrian refugee crisis, Lebanese hospitals are overcrowded and there is little room for a comfortable delivery. A lack of incubators and high costs for Cesarean section delivery makes it even more difficult when complications arise. Only six percent of Syrian refugee deliveries happen at home, which means that most women can give birth with a trained medical professional. The problem, however, is that there is a lack of quality in the care they receive at the hospital. Each of these solutions would impact the healthcare system, and I have analyzed each policy to explain how their outreach differs and which would be most feasible, based on cost and the number of women served. Once I chose the best solution, I explained the logistics in more detail and how to implement the solution. I decided to focus specifically on Syrian refugees living in Lebanon because they are currently a vulnerable population without many resources. While I chose to focus on this specific group as a case study, the solutions can also be considered for other refugee populations around the world, including the Palestinian refugees in Lebanon who face many of the same struggles as the Syrian refugees. More than 65 million people around the world have been forced to flee their homes and are considered refugees, so these solutions have large-scale potential outreach.

Poster # 210

Production Strategies for Tailored Source Material Used in High Efficiency Solar Cells

Presented by: Seth McPherson

Mentor: Kelvin Lynn **Campus:** Pullman

Major: Materials Science and Engineering

Category: Engineering and Physical Sciences

Co-authors: Santosh Swain

The current existing crystalline silicon-based solar cells are approaching their maximum theoretical efficiency. Fortunately, second generation cadmium telluride (CdTe) thin film photovoltaic technologies have demonstrated their potential to enable low cost solar electricity with efficiencies rivaling those of current available energy sources. The physical properties of CdTe are ideal for absorbing the most intense regions of the solar spectrum within a thin layer of material, while simultaneously converting it to electricity. CdTe technology also leaves a smaller carbon footprint and was the first solar electricity technology to reach less than $1/watt. Presently, the efficiency of CdTe remains below its theoretically predicted efficiency, indicating that there is significant opportunity for improvement and cost reduction. This can be achieved with the help of a high-pressure Bridgman (HPB) furnace. The HPB furnace is a robust, easily scalable system which provides solar producers with a cost-effective method for feedstock production. Due to the furnace design, high vapor pressure dopants may be incorporated into the melt without risk of explosion. The HPB furnace also allows for the rapid synthesis of materials within 12 hours. This presentation discusses the synthesis of CdTe materials using the HPB furnace, which allows for increased carrier density to be exhibited in thin film CdTe. The synthesized material was then used to create a thin film solar cell which successfully incorporated arsenic as a dopant. Furthermore, the technique proved to be suitable in growing other alloys of CdTe that have recently been used to fabricate high efficiency CdTe solar cells.

Poster # 211

Disruption of Cone Photoreceptor Cyclic Nucleotide-gated Channels in Zebrafish Using CRISPR/Cas9 Genome Editing

Presented by: Lindsey Morey

Mentor: Michael Varnum **Campus:** Pullman

Major: Genetics and Cell Biology, Neuroscience

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Pete Meighan, Tshering Sherpa

Cone photoreceptor cyclic nucleotide-gated (CNG) channels help convert light responses into electrical signals that can be interpreted by the brain. These channels are essential for vision and retinal health, as mutations in the genes encoding them are implicated in many visual disorders, including inherited macular degeneration and achromatopsia. We used CRISPR/Cas9 genome editing to disrupt the genes encoding cnga3a and cnga3b, two of the subunits of cone CNG channels in zebrafish. Zebrafish are an excellent model organism for visual function and disease because, like humans, they have cone-dominant vision. We confirmed the successful disruption of *cnga3a* and *cnga3b* using the T7 Endonuclease 1 (T7E1) test and DNA sequencing, and then characterized the effect of the mutation on visual function. We used a behavior test called the optomotor response (OMR) test to assess visual function and found that the mutated fish experienced diminished visual performance as compared to wild type fish, but fish with disrupted *cnga3a* experienced a larger deficit in visual function than those with disrupted *cnga3b*. We confirmed these results by examining the electrical field potential of the retina using electroretinogram (ERG) recordings, which revealed that *cnga3a* fish had diminished responses to light. Immunostaining of retinas from *cnga3a*-edited fish revealed that the disruption of *cnga3a* disturbed retinal morphology and caused mislocalization of the CNG channels. These studies provide insight into the importance of specific zebrafish CNG channel subunits for cone photoreceptor function and offer novel models for human mutations leading to blindness, which ultimately may be used to develop therapies for these diseases in the future.

Poster # 212

Influencers of Undergraduate Students' Degree Choice

Presented by: Dane Schwartz

Mentor: Candis Carraway, Kari Sampson **Campus:** Pullman

Major: Animal Sciences

Category: Social Sciences

Understanding the reasoning behind undergraduates degree choices was the main goal in this study. This study sought to explore why undergraduates at Washington State University within the College of Agriculture, Human, and Natural Resource Science (CAHNRS) chose the degrees in which they are pursuing. CAHNRS ambassadors were the subjects of this study. The CAHNRS ambassadors represent every major within the college and there was no more than two for each major. Interviews were conducted following 15 guiding questions. The guiding questions included questions that related to choice of major, choice of university, and demographics. The interviews were audio recorded, transcribed word for word, and sent to the individual to get approval and validation of accuracy of the intended meaning. All ambassadors were invited to participate in the study. In the end, twelve interviews were conducted and used to develop emerging themes. Three researches read each transcribed interview individually and identified themes. Then all three researchers came together and compared themes to come to a consensus on final emerging themes. Four major themes appeared from the transcripts. The first theme was the participants' believe that the major they chose would lead to a career with a lot of job opportunities. Participants liked the idea of having a high job outlook for when they graduate. The second theme was the desire to make an impact in the world. Participants choose majors that they believed would enable them to make a difference in the world. The last two themes are related to people who influenced participants to choose their major. The third theme was high school teachers influence undergraduates' choice of major. The final theme was that university faculty influenced participants' choice of a major. These are people that participants met at WSU. After analyzing the four main themes it was concluded that undergraduates will look at majors that lead to careers with a high job outlook and that will make a difference. Undergraduates are also influenced by the teachers they had in high school and university faculty. Information gained in this study can be useful in university recruiters recruitment strategies.

Poster # 213

Using Relative Dielectric Constant for Time-dependent Non-destructive Estimation of Water Content in Mortar

Presented by: Fatima Pantoja

Mentor: Somayeh Nassiri, Milena Rangelov **Campus:** Pullman

Major: Civil Engineering

Category: Engineering and Physical Sciences

The water content in concrete is important in durability considerations, determination of the transport rate of detrimental chemical, and characterization of concrete drying. Currently, there is no non-destructive method to determine water content for in-situ concrete. To address this need, time-domain reflectometry (TDR) sensors, typically used in soil, were tested as a new method to measure time-dependent water content in a mortar by monitoring the relative dielectric constant (RDC). RDC is the measure of the electrical change that can be stored in the material. In cement composites, the liquid phase presents substantially higher RDC (~80) in comparison to the solid (RDC ~7-8) or gas phase (RDC~1). Therefore, it is hypothesized that changes in RDC primarily reflect changes in water content. In this study, specimens cast out of 12 mortar mixes were instrumented by TDR sensors. Mixtures featured various water-to-cement ratios, and cement replacement rates with fly ash, slag and silica fume. Instrumented specimens were kept in sealed conditions throughout the 90-day period and monitored for RDC development. Simultaneously, 50-g mortar samples kept in zip-lock bags were opened and oven dried on designated test dates (1, 7, 14, 28, 49, 70 and 90 days) to establish the changes in water content of hydrating mortar with curing time.

Using the experimental data, two models for determination of water content were established and calibrated for practitioners: Yu's empirical model, and Power Mixing Law, based on the volumetric content of different mortar phases. Satisfactory agreement ($R^2>0.9$) between measured and predicted water content was obtained for a total of 10 mixes for both models. Recommended values of calibration constants were given as a function of mix design. TDR sensors demonstrated promising potential as a tool for non-destructive in-situ water content monitoring which can improve service life predictions for concrete infrastructure.

Poster # 214

Dissecting the Molecular Biology of the Understudied Bacterial Pathogen *Providencia alcalifaciens*

Presented by: Maya Howell

Mentor: Jessica Klein **Campus:** Pullman

Major: Agricultural and Food Systems

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Leigh Knodler

Providencia alcalifaciens is an under-studied organism in the family Enterobacteriaceae; a family that houses numerous human pathogens. For many of the Enterobacteriaceae, the type III secretion system (T3SS), a molecular nanomachine, is imperative in pathogenesis. Pathogens use the T3SS to transport effector proteins into the cytosol of the host cell, which then hijack normal host cell function, promoting virulence. *P. alcalifaciens* encodes 2 T3SSs: T3SS1a and 1b. We measured *P. alcalifaciens* virulence properties including motility, virulence gene expression kinetics, and invasion efficacy. We also compared wild type and T3SS mutants' ability to invade epithelial cells to determine if the organism's pathogenesis is dependent on either secretion system, similar to that of *Salmonella* Typhimurium (a model Enterobacteriaceae), in which such proteins may be imperative to infection. We found that compared to *S. Typhimurium*, *P. alcalifaciens* has a low internalization rate and low motility. This suggests that despite *P. alcalifaciens* having a similar secretion system and functional homologs of *Salmonella*, pathogenesis may not ensue in the same manner as in other Enterobacteriaceae.

Poster # 215

The Economic Effectiveness of Livestock Risk Protection

Presented by: Emily Fogarty

Mentor: J. Shannon Neibergs **Campus:** Pullman

Major: Agricultural and Food Business Economics

Category: Social Sciences

Co-authors:

Cattle producers face significant risk management challenges due to extreme price volatility in recent years. In 2015, the cattle market crashed with the largest decrease in nominal cattle prices ever recorded. Managing cattle price risk is challenging due to the limited availability of price risk management options, lack of understanding and trust in the risk management tools available, and scale issues that prevent small producers from effectively using the futures market to hedge price risk. To offset these challenges, the USDA Risk Management Agency (RMA) has developed Livestock Risk Protection (LRP) insurance as a tool for price risk management and expanded its availability as part of the 2014 Farm Bill. Although the cost of purchasing a LRP policy is subsidized by 13 percent, cattle producers have not widely adopted LRP. The purpose of this research is to evaluate the economic effectiveness of LRP as a price risk management tool with a focus on feeder cattle operations.

LRP is designed as an insurance product that offers producers the option to lock in a percentage of future expected market prices (70% to 100%) for a set number of weeks in advance to their actual sale date (13 to 52 weeks). Producers pay a LRP premium and receive an indemnity payment if actual market prices on the contract end date fall below their elected insured price. Producers can purchase LRP for up to 2,000 heads of cattle per year. Information from daily LRP contract offers, including specifications, premium payments and actual ending value data from 2012 to 2017 were provided by the USDA RMA. The actual net return of LRP contracts were calculated by analyzing the provided data by policy length and by coverage level. Results identify that coverage levels above 90% lead to a higher chance of protection against falling prices. A second finding shows that longer policy lengths tended to end in higher indemnity payments than shorter policy lengths. If used consistently, LRP can be an effective way for producers to protect their profit against market price volatility.

Poster # 216

Voltage Controlled Color-tuning of Printable Organic LED Pixels

Presented by: Zachary Croft

Mentor: Brian Collins **Campus:** Pullman

Major: Physics and Astronomy

Category: Engineering and Physical Sciences

Light-emitting diodes (LEDs) are everywhere in our life: electronic displays, lighting, signs, cell phones, and many other devices. In the last thirty years LEDs made from organic semiconductors (OLEDs) have been gaining attention because they can be used to make inkjet printable, flexible, lightweight displays which have better picture quality than LCD displays and are cheaper to manufacture. OLEDs may someday completely become the standard for solid-state displays, but currently not much is understood about how they work. One desired outcome of OLED research is to be able to color-tune a single OLED pixel. We predict that color-tuning is possible for certain device nanostructures. In our study, we made OLEDs from blends of blue-emitting and green-emitting organic polymers. By crystallizing one of the polymers we changed the activation voltage for its emission, thus enabling voltage-dependent color-tuning of a single pixel.

Poster # 217

Drosophila melanogaster are Used to Identify Novel Components of the Innate Immune Response to West Nile virus

Presented by: Grace Carrell

Mentor: Alan Goodman **Campus:** Pullman

Major: Microbiology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Laura R.H. Ahlers

In 2017, over 2,000 human clinical cases of West Nile virus were reported in the United State by the CDC. Of these cases, 13 were reported in Washington State, and 10 were neuroinvasive. West Nile virus is transmitted by mosquitoes classifying it as an arthropod-borne virus, or arbovirus. Arboviruses can be detrimental to the health of people all over the world, and include viruses such as yellow fever virus, dengue virus, and Zika virus. These diseases cause fever, headache, rash, muscle and joint pains, and in extreme cases, death. Since its arrival in the United States in 1999, West Nile virus has made a debut in every state and is endemic to the United States. At this time there are no treatments, only limited prevention methods such as avoiding mosquito bites. New methods of prevention and treatment are needed to treat viruses like West Nile virus. We propose to study the innate immune response to Kunjin virus, a naturally attenuated West Nile virus subtype, using *Drosophila melanogaster* as a model organism. To do this, we used the *Drosophila* Genetic Reference Panel (DGRP), an inbred panel of fly lines with fully sequenced genomes derived from a natural population, to identify polymorphisms that may affect fly survival to Kunjin virus. Our data shows that certain fly lines from the DGRP have either enhanced or reduced susceptibility to Kunjin virus. We conducted a genome-wide association study (GWAS) using the mortality data from the infected DGRP lines to identify candidate genes with putative susceptibility to Kunjin virus. This data revealed novel innate immune response components and the pathways involved to Kunjin virus infection. Our analysis has identified significant gene variants in *insulin receptor, TGF-β activated kinase 1,* and *Dim γ-tubulin 1,* and we hypothesize that these genes are utilized in the innate immune response to Kunjin virus. Our focus is to identify the mechanism of action for these genes in the immune response to Kunjin virus is the focus of our current studies. This research can lead to developing breakthrough treatments that will help those who suffer from West Nile virus.

Poster # 218

Linguistic Type-frequency in Young Children With and Without Hearing Loss

Presented by: Jenna Anderst

Mentor: Mark VanDam **Campus:** Spokane

Major: Speech and Hearing Sciences

Category: Social Sciences

Co-authors: Paul De Palma, Daniel Olds, Allison Saur

Linguistic type-frequency, how many different lexical types are used, has been examined in usage-based models of child language acquisition. In general, it has been shown that exposure to greater type frequencies increases children's productive use of language and that language in turn bootstraps later development including language and literacy. It is not currently known if pediatric hearing loss impacts the type frequency of those children's early communicative productions. In this study, we used a public database available via HomeBank [http://homebank.talkbank.org] to examine the type frequency in 53 cognitively intact children, 37 with mild- to moderate hearing loss (HL) and 16 peers who were typically-developing (TD). For each child, we analyzed 15 minutes of high volubility from a representative daylong recording collected in a natural family setting via an audio recorder worn by the child. Results indicate a main effect of sex favoring girls, but no main effect of HL. There were, however, interaction effects in which TD-boys had a greater type-frequency than HH-boys, but TD-girls were lesser than HH-girls. Within the HH group HH-girls had greater type-frequency than HH-boys, but within the TD group TD-boys had greater type-frequency than TD-girls.

Poster # 219

Validation of the Empirical Models for Drying Shrinkage of Mortar

Presented by: Rebecca Polsin

Mentor: Milena Rangelov **Campus:** Pullman

Major: Civil Engineering

Category: Engineering and Physical Sciences

Co-authors:

After the concrete is mixed and cast, it will shrink due to moisture loss due to hydration (autogenous shrinkage) and external drying (drying shrinkage). Characterization of shrinkage is important because it can ensure the longevity of concrete-based infrastructure since shrinkage can cause premature deterioration.

The primary goal of this project is a validation of the current empirical shrinkage models from American Concrete Institute (ACI) Standard 209, using experimental data for eight mortar mixes. The tested mixtures varied in the water-to-cementitious ratio (w/cm) and contents of slag and fly ash and were characterized for the length change due to autogenous and drinking shrinkage. Autogenous shrinkage was tested as the length change of sealed prisms, while the drying shrinkage was measured as a length change due to one-dimensional drying created by opening one side on the prism to an environment with 17 percent relative humidity. Results suggest that decrease in w/cm causes a decrease in shrinkage, both autogenous and drying for mortar mixes. The use of fly ash resulted in less drying and autogenous shrinkage comparing to control mix. The autogenous shrinkage of slag mixes was higher than the control, while the drying shrinkage was lower than that of the corresponding plain mix.

The modified model B3 from ACI 209 was found to give the best fit for drying shrinkage data for the tested mortar mixes. The proper recommendations for the parameters of this model based on mix design parameters were given. Enhanced understanding of trends in shrinkage with changes in mix design and improved shrinkage predictions will improve the material selection and provide durability of materials and structures.

Poster # 220

Radiation Effects on Electronics

Presented by: Mark Brauer, Ebony Collins, Alisa Smith, Kevin Wolfrom

Mentor: Howard Davis, Marie Mayes, Mark Clemens, Jr. **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Semi-conductors are essential to almost any electronic, from cell phones, to computers. However, these devices are extremely sensitive to neutron interaction. Disruptions can range from anywhere small as a light switch to as catastrophic as a complete system cut off. This is of concern to the aerospace industry as the higher elevation leads to an increased chance of collusion. Semiconductors are very susceptible to these particles and they polarize after a collusion. Once polarized, a semiconductor's ability to send signal can be modified. This modification is known as a single event upset (SEU). SEUs pose a major problem to the aerospace industry and have the potential to cause catastrophic failures. Our business, MAKE, will be responsible for performing radiation testing and analytics services for various products occupying the aerospace and defense industry so that companies may reduce the occurrence of upsets. MAKE plans to form a partnership with WSU Reactor Facility in that the facility will be our primary source of radiation exposure. Aerospace and defense industries are extremely attractive to MAKE, as projections for Research and Development, along with Acquisition funds, for the Department of Defense alone are expected to increase by an additional $22 billion within the next 9 years. This budget is not exclusive to this form of testing; however, a percentage of funds will be used towards this area.

Poster # 221

Media Dialogue and Representation of Latinx Athletes in the Olympics

Presented by: Teresa Zaragoza

Mentor: Simon Licen **Campus:** Pullman

Major: Sport Management

Category: Social Sciences

Media representation amongst Latinx athletes competing in the Olympics is scarce. The representation of these athletes competing does not compare to those whom are of other ethnicities. This study will examine the dialogue of Latinx athletes through two media outlets. Television broadcasts of the Olympics has the widest range of mass audience. With television selection of whom is represented in the media, how often they are represented, and who is excluded plays a role in the representation of these Latinx athletes. The second outlet is newspaper articles in which the dialogue communicated can limit the representation of Latinx athletes. Over 200 countries and over 11,000 athletes competed in the 2016 Rio Olympics. However, the representation of Latina/-o athletes in the Olympics and in the media is scarce, often leaving little to no focus within the television broadcasts and newspaper articles. The outcome of this research will identify how often Latinx athletes are represented and misrepresented compared to other ethnicities.

Poster # 222

Drosophila STING Mediates a Host Defense during *Listeria* Infection

Presented by: Marina Martin

Mentor: Alan Goodman **Campus:** Pullman

Major: Basic Medical Sciences, Social Sciences: General Studies

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Aoi Hiroyasu, Rosa Marena Guzman

While the innate immune system is important for defense against bacteria and microbes, the immune response must be regulated to avoid autoimmune disease. One component of the innate immune system is the cytosolic protein Stimulator of Interferon Genes (STING). During Listeria infection, cyclic dinucleotides are secreted as part of the bacterial life cycle. These molecules are sensed by STING, which leads to activation of the NF-kB transcription factor and interferon induction. However, the STING response must be kept in check. Mutations in STING resulting over-expression lead to STING-associated vasculopathy with onset in infancy (SAVI), an inflammatory condition most particularly affecting the skin, blood vessels, and lungs. While STING was discovered in mammals and shown to be a critical signaling component of the innate immune response, we have identified a homolog in the fruit fly, Drosophila melanogaster, termed DmSTING. We hypothesize that the evolutionarily conserved protein STING plays a role in the Drosophila innate immune response, and that we can use the fly model to study both immune deficiency and autoimmunity caused by mutations in DmSTING. We used Listeria monocytogenes, an invasive Gram-positive bacterium, to study DmSTING function following thoracic injection of Drosophila. Through knockdown and overexpression of DmSTING, the magnitude of the innate immune response was comparable to the ability of the flies to combat infection. Together, we show that DmSTING has evolved from Drosophila to function as a host defense mechanisms against pathogenic infections.

Poster # 223

Effect of the Proteasome Inhibitor Bortezomib on Herpes Simplex Virus Infection of Primary Human Fibroblasts

Presented by: Chasity Trammell

Mentor: Anthony Nicola **Campus:** Pullman

Major: Microbiology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Seth Schneider

Herpes simplex virus (HSV) causes latent viral infections in humans that affects most of the population. Most infections are asymptomatic, but can cause the formation of cold sores or lesions near the site of initial infection. Both species, HSV-1 and HSV-2, are primarily spread through direct skin-to-skin contact. Rare but serious outcomes include disseminated disease, blindness and encephalitis. Herpes simplex is a public health concern due to the asymptomatic and latent features of infection, and presently is a major health disparity issue requiring immediate attention. Current treatment regimens use the acyclovir family of drugs that inhibit the HSV DNA polymerase, thus halting virus replication. New HSV strains resistant to acyclovir emerge readily, particularly within immunocompromised individuals. Host cell proteasome activity facilitates HSV infection at the level of viral entry into host cells. The proteasome inhibitor bortezomib (also known as Velcade or PS-341) is a clinically effective anti-neoplastic drug that is FDA-approved for treatment of hematologic malignancies such as multiple myeloma and mantle cell lymphoma. We propose to re-purpose bortezomib as an off-the-shelf therapeutic for HSV. Our laboratory previously investigated the effect of bortezomib on infection of Vero cells. Here, we will determine the effect of the drug on HSV infection of primary human foreskin fibroblasts (HFFs), a pathophysiologically relevant cell type. We conducted lactate dehydrogenase (LDH) assays to determine the cytopathic effect of this drug on the primary cells. Plaque assays will be used to determine the bortezomib concentration that is effective at reducing infection by 50% (EC50). Most antiviral drugs are designed to target viral proteins to ensure specificity and avoid toxicity. However, such drugs select for drug-resistant viral mutants. In contrast, antiviral drugs that target cellular proteins required for viral replication such as proteasomal components are not constrained by these limitations. The overall goal of this study is to identify an easily obtainable and more effective therapeutic for the treatment of HSV infections.

Poster # 225

National Security and Nuclear Containment in the Cold War

Presented by: Natalie Kallish

Mentor: Jesse Spohnholz, Jeffrey Sanders, David Bolingbroke **Campus:** Pullman

Major: Chemical Engineering

Category: Social Sciences

Nuclear waste has been a controversial topic since its creation in the mid-20th century. Over past decades, debates by concerned public, policy makers, and industries about radioactive waste resulted when mishaps with the containment and disposal of nuclear waste occurred. Between 1945 and 1989 the Cold War atmosphere shaped the aspects of this debate. Concerns about national security and scientific competition between the United States, the Soviet Union, and their allies led to the secrecy and fear that continue to characterize the debate of nuclear waste and nuclear energy in the modern world. One of the left-over remnants of this time and these ideals is Hanford, Washington. This site was used to produce plutonium and the full extent of production at the site was kept secret from civilians between 1944 and 1986. Today, Hanford is one of the most contaminated places in the Western hemisphere due to its nuclear waste not being contained properly and the containment facilities aging; leading to many spills in recent years. Radioactive waste buried at the facility has leaked into the Columbia River and the ground comprising the Hanford site. Nuclear waste and emissions' effects on the environment led to an upsurge in the 1960s and 1970s of environmentalist protests against the use of nuclear energy, nuclear weapons creation, and nuclear waste. In the context of nuclear products in the United States, and its legacy of secrecy and links to war, all nuclear technology was related back to weapons by the public, so nuclear energy versus nuclear waste were seen as the same. The fear the public had against nuclear waste led to a reluctance of recycling the nuclear waste within the country. This reluctance has led to Yucca Mountain, a dedicated facility for nuclear containment, to be delayed and fought against by politicians and the public and has left no place for nuclear waste located at multiple facilities, such as Hanford, to be sent for proper storage. This and the leftover Cold War mentality of nuclear technology has led to nuclear waste to be stored and left in outdated and insecure containment facilities.

Poster # 226

A Study on Degradation Behavior of 3D Printed Gellan Gum Scaffolds

Presented by: Samantha Kaonis

Mentor: Roland Chen **Campus:** Pullman

Major: Bioengineering

Category: Engineering and Physical Sciences

Co-authors: Ilhan Yu

Gellan gum (GG) is one type of natural hydrogel that has been used as a biomaterial for tissue engineering purposes. Chemical reactions between GG and chemicals within the body fluid during degradation may change the mechanical properties of material because GG is sensitive to the ions that are naturally in the human body. Knowing how the hydrogel will respond to the body is important because it could exhibit different properties over time. Whether the structure becomes stronger or weaker in the body can be critical for both wound dressing and cartilage replacement purposes.

The purpose of this study is to determine how 3D printed GG can be applied to wound dressing or cartilage replacement applications and to determine the effect of surface area per mass on the scaffold's degradation rate. We predicted that with increased surface area, the degradation rate would increase, thus it is controlled through 3D printing parameters.

Two commonly used solutions were used in degradation testing, phosphate buffered saline (PBS) and simulated body fluid (SBF), and the samples were in solution for up to 21 days at 37°C in an incubator. Compression testing was then done to monitor how the strength of the samples changed after degradation.

It was determined that the higher surface area per unit mass led to a faster degradation rate in both solutions, confirming our hypothesis. The mechanical tests revealed significant differences due to interactions of chemicals in the body, with the samples immersed in SBF becoming 14.5 times stronger than the original scaffolds. This result in combination with the degradation data indicates these scaffolds are best used for wound dressing purposes over the cartilage engineering.

This study shows that the degradation rate of gellan gum can be altered by changing the ratio of surface area per mass. Using 3D printing, it is possible to create scaffolds with different surface area per mass ratios to tailor any drug release requirements.

Poster # 227

Evaluating the Efficacy of Cell-mediated Immunity in the Control and Protection against Foot and Mouth Disease

Presented by: Grace Chung

Mentor: Carlos Suarez **Campus:** Pullman

Major: Neuroscience

Category: Molecular, Cellular, and Chemical Biology

The foot-and-mouth disease virus (FMDV) causes one of the most economically devastating diseases of cloven-hoofed animals worldwide due to its widespread tropism for nearly 70 species and high mutation rate during genome replication. Current FMD control methods are mainly based in the use of inactivated or live attenuated viruses that induce short-term stimulation of humoral immunity. However, these vaccines do not provide protection against heterologous viral strains. Therefore, it is critical to find a more efficacious method to control viral infection. An experiment conducted at VMRD, Inc. in 2016 was aimed at further defining PRRSV-specific T-lymphocyte responses and determined that CMI has the potential to provide protection against diverse PRRSV isolates. Whether this is possible with FMDV requires systematic animal testing following proper PBMC collection, however due to experimental limitations a literature review was conducted. It was found that a cell-mediated response is present following FMDV infection. Therefore, the protocol used in the 2016 PRRSV study is applicable to study the role of CMI in the control of FMDV. This experiment would identify specific T-lymphocyte epitopes that could be loaded into an Ad5 vector to create a novel FMDV vaccine. This vaccine then has the potential to provide strong protection against heterologous FMDV serotypes by activating cell-mediated immunity without posing the risk of virulence in susceptible hosts or potential reversal of attenuation as live attenuated pathogen vaccines do. Overall, these results would greatly reduce the negative impact that FMDV has in the agricultural industry.

Poster # 228

Native American Curriculum: Examining Teacher Perception and Implementation in Washington State

Presented by: Dalia Hernandez Farias

Mentor: Brenda Barrio, Ashley Boyd **Campus:** Pullman

Major: History

Category: Social Sciences

With the passing of a recent legislative bill in Washington State, the implementation of Native American curriculum in all public schools has shifted from encouraged to required. This shift has brought a large change in the preparation of pre-service and in-service teachers in K-12 education, as they need more information on how to integrate this curriculum into their teaching. The legislative bill outlines that school districts shall be encouraged to work with a federally recognized tribe in the state and incorporate tribal education in their social studies curricula. Therefore, my research titled, "Native American Curriculum: Examining Teacher Perception and Implementation in Washington State," explores three areas regarding the implementation of the Native American curriculum: (1) current in-service teacher's implementation of Native American tribal history in their curriculum; (2) the resources and training gathered; (3) perceptions and concerns regarding personal views and racial/ethnic backgrounds on teaching tribal history. This research is viewed through a culturally responsive theoretical framework lens in order to draw from different teachers' strategies to effectively implement Native American curriculum. Findings of this study include an expressed lack of knowledge from all teachers in terms of background and history of Native Americans, especially of local tribal history. This was specifically related to the presence of whiteness in both the teachers' themselves and in their broader curricula. We also uncovered a spectrum of integration of supplementary resources, as teachers ranged from utilizing multimedia classroom material that they sought out for classroom use to reliance on the textbook exclusively. Finally, participants also shared concerns regarding a necessity for preparation and professional development for teachers in order to effectively implement tribal education. This research serves as information to further understand the necessary support pre-service and in-service teachers need to effectively and appropriately implement Native American curriculum in K-12 classroom curriculum at this state and beyond. Further research and practice on professional development for teachers in the areas of culturally responsive practices as well as providing better pedagogical preparation on teaching Native American curriculum are needed.

Poster # 229

Engineering Glucose Oxidase for Efficient Ni-NTA Purification

Presented by: Stephen Bone

Mentor: Alla Kostyukova **Campus:** Pullman

Major: Bioengineering

Category: Engineering and Physical Sciences

Co-authors: Kyle Swain, Dmitri Tolkatchev

Enzymatic biofuel cells can use blood sugar to power implantable biological devices. Enzymatic biofuel cells are too large to be efficiently implemented into the human body. Increasing the efficiency of electron transfer from the enzymes to the electron acceptor will reduce the size of the biofuel cell. Glucose oxidase (GOx) from Penicillium amagasakiense (PA) can be produced in Escherichia coli in a non-glycosylated form, which has shown potential for increased electron transfer when used in a biofuel cell, due to the decreased distance between the cofactor and the electron acceptor. Six histidines (His tag) were added on the C-terminal end of the PAGOx so the enzyme can be purified using Ni-NTA affinity chromatography. To work with and optimize the already more efficient non-glycosylated PAGOx, it must be purified and concentrated. However, there was almost no binding of the expressed PAGOx onto Ni-NTA agarose. To enable purification, a specific form of PCR based mutagenesis was implemented to eliminate a stop codon, eliminate an additional unnecessary His tag, and add a glycine-serine-glycine linker between the His tag and the GOx sequence. This specific form of mutagenesis allows for multiple site-directed mutations of a plasmid, including additions and deletions, after only one PCR reaction using partially overlapping primers. The modified plasmid was used to express the new mutated PAGOx (mPAGOx) in E. coli in inclusion bodies. The inclusion bodies were isolated from the cell using centrifugation and dissolved in 8 M urea. The denatured enzyme was refolded in a special renaturation buffer. The mutations allowed the enzyme to bind to the Ni-NTA agarose and mPAGOx was successfully purified. Its activity was confirmed in a glucose oxidizing assay.

Poster # 230

Examination of the nodC Gene Region to Study the Evolution of Host Association between *Trifolium* and *Rhizobium leguminosarum*

Presented by: Amanda Antoch

Mentor: Maren Friesen, Emily McLachlan **Campus:** Pullman

Major: Biochemistry, Microbiology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Chandra Jack

Legumes and rhizobia have a mutualistic relationship in which the legume provides carbon and rhizobia provide fixed nitrogen to the plant. The legumes may have evolved partner specificity, where they only associate with certain strains of rhizobia. In Bodega Bay, California, a single field site is home to eight different species of clover, genus *Trifolium*. According to the competition exclusion principle, species that occupy the same ecological niche should not be able to coexist, yet this is what we observe at our field site. One hypothesis is that their symbiotic partners, *Rhizobium leguminosarum*, have evolved to favor specific hosts, lessening competition between species.

To test this hypothesis, we collected plants from the field and isolated wild rhizobial strains from their nodules to make strain libraries. We sequenced nodC, a highly conserved gene that plays a role in host specificity. We examined the sequence to look for variations in specific positions of the genome. We then grouped the strains into operational taxonomic units (OTUs) which will be displayed in phylogenetic trees to look for relationships between host association and strain cluster. Trends in the variations among OTUs will be used to determine if the location of the variations are related to host species. If we find a positive association it may mean that host specitivity is an evolutionary adaptation due to selective pressures such as resource availability. This experiment will broaden our understanding of evolutionary adaptations of partner choice.

Poster # 231

Self-Efficacy, Negative Life Events, and Trauma Symptoms in American Indian Youth

Presented by: Navjeet Lehal

Mentor: Walter Scott **Campus:** Pullman

Major: Psychology

Category: Social Sciences

Co-authors: Stephen Paup

Introduction: American Indian (AI) youth face adversity on a daily basis, and are more likely to experience traumatic events. American Indian researchers and scholars have emphasized the importance of identifying variables that promote resilience and protect against the development of psychopathology in AI youth. Self-efficacy has been shown to be an important resiliency factor for AI youth, although its protective function for psychopathology has so far been linked only to depressive symptoms and substance use (Mileviciute, & Scott, 2014; Scott & Dearing, 2012; Scott et al., 2008; Tyser, Scott, Readdy, & McCrea, 2014). Self-efficacy is defined as one's perceived capability to perform a task in a given context. In the present study, the relationship between self-efficacy in three different domains (i.e., academic, social, and meeting expectations for self and others), negative life events (including traumatic events), and traumatic symptoms was examined in a sample of AI youth. It is predicted that self-efficacy will serve as a resiliency factor and moderate the relationship between negative life events and trauma symptoms.

Methods: One hundred and fifty 5-8th grade American Indian youth completed measures of negative life events, self-efficacy beliefs, and trauma symptoms. Participants' trauma symptoms were measured using the 44-item alternate version of the Trauma Symptom Checklist for Children (Briere, 1996). The checklist has two validity scales (Under-response and Hyper-response), and five clinical scales (Anxiety, Depression, Post-traumatic Stress, Dissociation, and Anger). The surveys were administered containing the above measures in groups of 10-20 students in September of the school year.

Results: We will use structural equation modeling to test hypothesized and alternative models of the relationship between self-efficacy, negative life events, and trauma symptom variables. We expect the best fitting model will be one in which the relationship between event exposure and traumatic symptoms will be moderated by self-efficacy variables.

Discussion: Although it is well-documented that AI youth are at increased risk for trauma exposure, there are no empirical investigations on self-efficacy and trauma symptoms in AI youth. We hope to provide the first data demonstrating such a relationship, which would point to an important target for future intervention efforts.

Poster # 232

Substituent Effects on Diacyl Phosphate Scaffold as Beta-lactamase Inactivators

Presented by: Samantha Ginter

Mentor: Clifford Berkman **Campus:** Pullman

Major: Chemistry

Category: Engineering and Physical Sciences

Co-authors: Dawanna White

The β-lactamase (BlaC) enzyme is present on the surface of Mycobacterium tuberculosis (Mtb), the causative agent for Tuberculosis in humans. BlaC expresses serine hydrolysis, cleaving the β-lactam ring of penicillin-family antibiotics, rendering them inactive. Mtb has demonstrated increased susceptibility to β-lactam antibiotics upon the inactivation of BlaC; thus, making BlaC a rational protein target for therapeutic agents. The possibility for inactivating BlaC gives rise to the potential for treating Tuberculosis with penicillin-family antibiotics again. The ultimate objective and goal of this research was to synthesize a library of compounds as inactivators, of BlaC. By synthesizing and enzymatically evaluating the library of compounds, inactivation trends could then be observed in order to further optimize a second-generation library. A library of first-generation diacyl phosphate scaffold compounds were synthesized and evaluated enzymatically in respect to the substituent's electrostatic and hydrophobic properties. Within this library, electrostatic effects ($\sigma\neg p$=-0.27-0.78) as well as hydrophobic effects (π = -0.41-1.98) of substituents were examined. The synthesized compounds inactivated BlaC to varying degrees. Based on the trends observed, the rate of inactivation correlates with decreased hydrophobicity.

Poster # 233

Examining Changes in Real-time Euo Transcriptional Activity in *Chlamydia* using Fast Fluorescent Timer

Presented by: Jordan Bolen

Mentor: Amanda Brinkworth, Rey Carabeo **Campus:** Pullman

Major: Microbiology

Category: Molecular, Cellular, and Chemical Biology

Co-authors: Pierce Claassen, Patrick Johnson

Chlamydia trachomatis is one of the most prevalent sexually transmitted diseases in the world. These infections can become chronic and persist despite antibiotic treatment and host immune responses. *Chlamydia* changes its development under stress to increase its chances of survival, thus new antimicrobial drugs that target these stress responses are necessary. *Chlamydia* has two phases to its life cycle. The elementary body is the infectious form and only exists outside the cell, while the reticulate body is the non-infectious form and replicates within the cell. Our goal was to study chlamydial gene expression during normal and stressed development. Using Fast Fluorescent Timer (FFT), a protein which fluoresces initially in the blue spectrum and matures over time to fluoresce in the red spectrum, we monitored transcription of *euo* mRNA in real-time by observing the ratio of blue to red fluorescence. Fast Fluorescent Timer is extremely advantageous to use compared to methods such as RNA-sequencing and quantitative PCR, because we can observe continuous imaging as well as examine single cells throughout the life cycle. The *euo* gene is transcribed very early in the chlamydial life cycle. When Euo protein is made, it acts as a transcriptional repressor, preventing gene products made late in the life cycle from being made too early. If this expression is altered, then the life cycle will not be completed. To date, we have successfully cloned the *euo* promoter upstream of the FFT gene, transformed it into *C. trachomatis*, and isolated a penicillin-resistant colony. By closely tracking *euo* promoter activity under normal *Chlamydia* development using the Fast Fluorescent Timer, we have observed expression early in development as previously described for *euo*. We are currently using this strain to monitor how *Chlamydia* responds to conditions of nutrient deprivation, such as iron and tryptophan starvation. In the future we would like to observe fluorescence with the FFT reporter protein with all the chlamydial promoters in the genome. This research is beneficial to the scientific community because it will enable understanding of how *Chlamydia* survives during normal growth and stress, and may reveal potential targets for development of anti-chlamydial drugs.

Poster # 234

Sorting It Out: An Investigation of Categorization Tasks as Supports for Learning and Transfer

Presented by: Jacob Woodbury

Mentor: Erika Offerdahl **Campus:** Pullman

Major: Genetics and Cell Biology

Category: Social Sciences

Co-authors: Aramati Casper

There is mounting evidence that active learning is more effective than lecture-only instruction both in terms of decreasing course failure rates and increasing student performance in undergraduate STEM. While there is no single definition of what constitutes active learning, there is broad agreement that it includes student-centered instructional strategies that engage students in higher-order, constructive tasks during class. Effective implementation of higher order tasks requires students to leverage their content knowledge about the topic of interest while tackling analysis, synthesis, and/or evaluation activities. In practice, this means students should be afforded opportunities to acquire content knowledge *before class* in preparation for higher-order, constructive tasks *in class*.

Research in cognitive science indicates that activities that require students to actively retrieve (e.g. reading quizzes) or construct ideas (e.g. categorization tasks) are more effective than passive activities (e.g. watching a video), but there is little work to distinguish between active retrieval and constructive activities. Therefore, the overarching goal of this research is to compare the use of two pre-class activities, reading quizzes and categorization tasks, in preparing students for active learning. Students in large-lecture introductory biology took a reading quiz or categorization task as a homework assignment, then developed an argument, interpreting primary literature. Though a preliminary comparison between a categorization task and reading quiz did not reveal a significant difference in argumentation performance, it led us to reflect on how a sort task might be effectively implemented. We further studied student reasoning on categorization tasks to see how students noticed the deep features connecting concepts. Our use of both online and physical categorization tasks led us to reflect on how a sort task might be effectively implemented. Therefore, we tested different platforms where instructors might distribute categorization tasks to see if they diminished student performance. No difference in student performance was seen between a common course platform “Blackboard” and specialized categorization software Proven By Users. Understanding how to effectively implement categorization tasks may better prepare students for argumentation in class, which may lead to increased knowledge transfer to other courses and contexts.

Poster # 235

Effects of Prenatal Cannabis Vapor Exposure on Cognitive Flexibility

Presented by: Collin Warrick

Mentor: Ryan McLaughlin **Campus:** Pullman

Major: Neuroscience

Category: Organismal, Population, Ecological, and Evolutionary Biology

Co-authors: Janelle M. Lugo, Sydney C. Roberts, Hayden R. Wright

Cannabis is the most commonly used illicit substance among pregnant women, yet the effects of prenatal cannabis exposure on cognitive wellbeing remain largely unknown. With recreational cannabis laws now in effect in 8 states and counting, there is growing concern that prenatal cannabis exposure could increase dramatically in the coming years. Thus, there is an urgent need to better understand the impact of maternal cannabis exposure on cognition. We investigated whether chronic exposure to vaporized cannabis during pregnancy alters cognitive flexibility in male and female offspring. Female dams were passively exposed to vaporized cannabis extract (50 or 400mg/mL; 1 puff every 2 min for 1 hr, twice daily) or vehicle vapor throughout mating and gestation. Beginning at postnatal day 50, offspring were trained to press a lever that was paired with delivery of a cue light to receive a food reward. Next, rats had to disregard the previously learned strategy in favor of an egocentric spatial strategy (i.e., ignore the cue and always press the left, or right, lever). Finally, rats were tested in a reversal task that required them to press the lever opposite of the previous task. The number of trials to criterion and errors, along with error type (perseverative, regressive, or never reinforced) and spatial reference of distractor (i.e., toward or away from cue) were tabulated and compared across groups. Preliminary results indicate that prenatal cannabis exposure did not significantly affect cue discrimination learning or reversal learning, but impaired strategy shifting. Moreover, cannabis-exposed offspring made more never reinforced and regressive errors, which indicates an inability to obtain and maintain the new optimal strategy. These data indicate that prenatal cannabis exposure may lead to deficits in cognitive flexibility in adulthood.

Poster # 236

Studying Infant Temperament: Effect of Maternal Pregnancy-related Anxiety

Presented by: Maria Barrera

Mentor: Masha Gartstein **Campus:** Pullman

Major: Psychology, Sport Science

Category: Social Sciences

The purpose of this study is to examine the relationship between maternal prenatal health and infant outcomes, focusing in pregnancy-specific anxiety and infant temperament. Pregnancy represents a unique opportunity for information to be transmitted to the offspring. That is, maternal anxiety impacts the fetus by activating the stress response, changing maternal physiology and inter-uterine environment in turn. Understanding the linkage between mothers' pregnancy-specific anxiety and infant temperament outcomes is important because temperament attributes set the stage for later psychopathology, offering either risk or protection. If maternal pregnancy-specific anxiety is linked with increased reactivity and poorer regulation as expected, children exposed to maternal symptoms *in-utero* are likely to experience emotional/behavioral issues of their own. Using a correlation design, we will follow women from the 3rd trimester until the infants' 2nd month of life, in a short-term prospective longitudinal study. Mothers will answer questions regarding anxiety: fear of giving birth, bearing a handicapped child, and appearance concerns during pregnancy, at 36-weeks, also providing information concerning infant temperament: negative emotionality, positive affectivity/surgency, and regulatory capacity/orienting. Minimal research has been performed regarding this topic with humans to date, and the present study is expected to make an important contribution to this emerging field.

Poster # 243

Chiquinha Gonzaga (1847-1935): Brazilian Composer, Musician, and Catalyst for Social Change

Presented by: Garrett Snedeker

Mentor: Jeffrey Savage **Campus:** Pullman

Major: Music Performance

Category: Humanities

A unique historical figure who provoked social reform and progress was Brazilian musician and composer Chiquinha Gonzaga (1847-1935). Gonzaga was the first professional pianist of the *choro* genre (a Brazilian popular music genre), the first person commissioned to write music for the *Carnaval* celebration, and the first female conductor in Brazil. A new Portuguese word was invented for her title as female conductor: *Maestrina*. While facing discrimination as a divorced woman in Rio de Janeiro, she used music to break barriers between social classes by composing music that mixed class-defined music genres. Gonzaga was also an activist for the Brazilian abolitionist movement, selling her music for donations to free slaves. She even received an arrest warrant for a protest piece she wrote for the Republic movement in 1889. Today, she is virtually unknown outside of Brazil; within her native country, however, she is a timeless icon, famous as a composer, performer, and for opposing the traditional stereotypes associated with a woman's place in a patriarchal society. This poster presentation will present Gonzaga's life and musical works as opportunities to inspire current social change, through music. Sharing the significance of Gonzaga's life brings awareness to the musical history of Brazil, and the differences of Brazilian musical styles. Learning about Gonzaga emphasizes the cultural importance of lesser-known non-European female composers, and gives students a role model of a musical composer that demonstrates true social activism and resilience. In today's social climate, it is important for students to realize the potential for music as a tool to enact social change, and to understand how musicians can be leaders and advocates for causes in the greater community. Since traveling to Brazil to collect sources and have multiple private piano lessons on Gonzaga's music, presenter Garrett Snedeker will perform examples of Gonzaga's compositions on electronic piano.

Poster # 244

Rebooting Electronic Literature: The Challenges of Creating an Open-source Multimedia Tool for Data Collection and Dissemination

Presented by: Katie Bowen, Miriah Gwin, Vanessa Rhodes, Veronica Whitney

Mentor: Dene Grigar, Nicholas Schiller **Campus:** Vancouver

Major: Digital Technology and Culture

Category: Arts and Design

How can we design a research tool for sharing multimedia data collected in live stream performances and that include audience participation via social media?

We encountered the need to answer this question with Rebooting Electronic Literature, our multimedia, open-source book that documents early literary works, circa 1986-2002, that take advantage of the capabilities and contexts provided by computing devices such as stand-alone or networked computers. These works are no longer available to readers today because they were created with software and for hardware now outmoded and/or obsolete. They are important for media scholars to access for the purpose of research. So, our book is aimed at making pertinent information about these works available to the public.

Our method of documentation involves live-streaming performances of a work by a reader via YouTube, capturing and editing this video into small clips, photographing the physical material (e.g. floppy disks, accompanying manuals), and screen capturing the social media interaction with the online audience who attend the performance.

We chose for our tool the open-source Scalar platform because it makes multimedia easily available. Despite its robust presentation of media, however, our design had to address many challenges. First, no current standards for organizing multimedia, open-source books yet exist, so we had to experiment with how to organize the material so that users can easily find what they need. Second, we had to translate the real-time interaction of Twitter, Facebook, and YouTube chat into the static environment of a book without losing the context of the conversation.

Thus far, we have completed the introductory material and first chapter on Sarah Smith's hypertext novel, King of Space (1991), and we are serializing our chapters so that one is delivered each month. In the first week of disseminating our book, we had 119 readers who accessed it. Thus, the lessons learned from our project can benefit others who wish to use open source platforms for data collection and dissemination.

Poster # 246

Perception

Presented by: Norah Alaqeel

Mentor: Raihan M Sharif **Campus:** Pullman

Major: Social Sciences: General Studies

Category: Social Sciences

As we know race and racism will always be a topic because it reinvents itself and manifests in different ways and forms. In the past, it was seen in slavery and more tangible in physical actions, where today it manifests itself in social interactions and the use of a system to show superiority over the less preferred race.

Younger generations are more understanding and work incredibly hard to bridge the gap, but with older generations who are making legislation on a federal level, it's tough to believe that it is possible. It becomes hard to show the effort that people are trying to approach pragmatically. Race is a perception, it is how an individual views another, the question we all fight to change is how we preview others. How can we win a battle against thoughts and preconceptions? This research was based on the perception that if you allowed children to develop their world views, it would result is less instilled racism.

In this research, I would like to contribute the attempt of a person who was careful about how to create the world views of his children, my father.As we know an individual world's view and perception is shaped through experiences; it is also dependent on how they are raised. The reason why I am basing this research on a personal experience is because an experiment like this would take a life time to execute and conduct. But a person who has already gone through this experiment would be a great candidate. This person happens to be myself, and I will include several interviews with my father asking him random questions. This is conducted through a research method known as auto-ethnography, where the analyst performs the research with a simple tool: their life experience.

Poster # 247

VR Controllers Integrated in Complex Emergent Dynamic Systems

Presented by: Spencer Barclay

Mentor: Kshitij Jerath **Campus:** Pullman

Major: Computer Science, Mechanical Engineering

Category: Engineering and Physical Sciences

As further research in control systems circulates, the ability to test control theory's in a realistic environment becomes a more vital step in proving the practicality and efficiency of such systems. Testing in a real-world environment is currently limited by many factors only recently seen as limitations. For example, testing swarming systems is greatly limited by drone endurance (battery life), which in turn limits the ability to collect data on large scale swarms. In order to mitigate or even eliminate such issues, swarms or other control systems can be moved into a virtual photorealistic environment. A computer simulation allows for integration of expected improvements and elimination real world costs. For instance, while testing autonomous vehicle systems, cost efficiency can be juristically improved by utilizing virtual reality headsets with in a computer simulation. Implementing a virtual reality computer simulation as well provides a means of integrating human interaction to many control systems. A drone swarm is very beneficial when bounded to a desired area; however, due to the autonomous and unpredictable nature of swarms, results reliability becomes an issue when implementing swarm applications. This issue can be subdued by a human input variable, but again, testing such systems can be inefficient and difficult due to the unknown behaviors of human controlled swarm. Creating a human controlled swarming system creates a viable solution to many of the issues with in swarm systems and therefore increase appeal to market consumers.

Poster # 253

Analyzing the Effects of Desktop Learning Modules (DLMs) on Student Comprehension of Fluid Mechanics and Heat Transfer Concepts

Presented by: Kitana Kaiphanliam

Mentor: Bernard Van Wie, Negar Beheshti Pour **Campus:** Pullman

Major: Chemical Engineering

Category: Engineering and Physical Sciences

Co-authors: David Thiessen, Di Wu

The use of alternative and complementary learning methods has been explored for the past several decades to aid in student comprehension and retention of engineering concepts. Hands-on learning methods, specifically, have gained notoriety due to their potential for being more applicable to engineering students, as the majority of these students tend to be kinesthetic learners. To support this mode of learning, low-cost Desktop Learning Modules (DLMs) were created by Dr. Bernard Van Wie's group at Washington State University. DLMs are hands-on apparatuses representing small-scale industrial process units; activities associated with the modules may be used to assist student learning of engineering concepts. To determine the effectiveness of these DLMs, four types of modules were tested on two Chemical Engineering undergraduate classes at Washington State University. To account for differences in teaching styles of the professors, the two classes alternated between being treated as the control group and the variable group for each lecture unit. To begin the study, all students were given an articulated pre-test to determine their incoming knowledge of mass and energy balances with respect to the DLM of interest. From there, the control group continued with lecture as normal, while the variable group ran mini-experiments on the DLM and filled out a worksheet corresponding to the experiments. All students were then given the same posttest on mass and energy balances with respect to the DLM used. This process was repeated for the Hydraulic Loss DLM, Venturi DLM, Shell and Tube Heat Exchanger DLM, and Double Pipe Heat Exchanger DLM, respectively. Both the pre- and posttests consist of a mix of multiple choice questions and justification sections. This study will compare the effectiveness of the DLMs to traditional lecture on student comprehension of fluid mechanics and heat transfer concepts by analyzing pre- and posttest data from the control and variable groups.