

2018
undergraduate
research day



University of Wyoming
April 28, 2018

Student Abstracts

**Oral Presentations: Classroom Building,
University of Wyoming Campus
8:30 - 5:00 PM**

**Poster Presentations: Family Room, Wyoming
Student Union
3:30 - 5:30 PM**

ACKNOWLEDGEMENTS

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Working Group

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Tom Smith, Wyoming EPSCoR

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Assessment of Cardiac Function of Rbm 20^{-/-} Rats Using Pressure-Volume Loop Analysis After 28 Days of Angiotensin II Treatment

Hanna Ahuja with Bud Chew Ph.D.

Department of Biology

Western Wyoming Community College

In Collaboration with Dr. Wei Guo, UW Animal Science

Oral Presentation

INBRE

Rock Springs, WY

RNA binding motif 20 (Rbm20), a splicing factor for titin, affects diastolic and systolic properties of the heart per the Frank-Starling mechanism. Failure to alter titin isoform expression from the fetal N2BA to adult N2B in Rbm20^{-/-} (KO) rats, impairs cardiomyocyte relaxation, increases ventricular compliance, and dilates the myocardium. Angiotensin II (All) causes vasoconstriction, and cardiac hypertrophy, with increased wall stiffness. We hypothesized that 28 days of All treatment would increase myocardial stiffness, improving cardiac function in KO rats. KO rats and wild type (WT) controls were fitted with subdermal osmotic pumps, delivering All continuously for 28 days. After All exposure, cardiac function was assessed *in vivo* using pressure-volume loop analysis. Under isoflurane anesthesia, loops were recorded under baseline, brief inferior vena cava occlusion, and hypertonic saline infusion conditions. The rat was then heparinized, and blood collected for cuvette calibration. No group differences were found in cardiac output, heart rate, and stroke volume. However, significant reductions were found in contractility (preload recruitable stroke work), stroke work, and ejection fraction in KO rats. KO rats were able to maintain stroke volume, despite impaired contractility, due to a significant increase in preload and decrease in afterload. Compliance was reduced in both WT and KO rats, when treated with All. We conclude that KO rats failed to improve contractility with 28 days of All treatment, but maintained normal cardiac output through compensatory changes in preload and afterload. We also demonstrated compliance could be altered by All treatment.

ROCKY MOUNTAIN POWER MICRO-GRID

Mohammed Alkahtani

Victor A. Bershinsky, Dongliang Duan, and Forrest A. Selmer

Electrical and Computer Engineering

University of Wyoming

Oral presentation

Rocky Mountain power

Saudi Arabia

The goal of this project is to develop islanding scheme in which co-generation and battery storage options allow the city of Laramie to sustainably operate indefinitely. It is the goal of this project to study the economics of the proposed solution and generate high-level cost estimates for it. Initially, a design incorporating a mix of co-generation, wind power generation, solar power generation, and battery storage was proposed. Analysis of the initial design took into account various critical factors: power consumption levels, location and system stability and reliability. The analysis concluded that solar generation and wind generation should be eliminated. Instead, a system based on cogeneration was found to be optimal. Therefore, options of different types of generation were researched: diesel generation, steam generation and natural gas generation. Further analysis are planned to be conducted in the near future. That include a full modeling of the design, testing, and full economic work-up, based on which final results and recommendations will be reported in April 2018.

Yoga and Trauma

Andrea Alzalde

Many individuals will experience trauma in their lifetime, and though there are many treatments aimed to target trauma, those treatments are, for some, insufficient. Preliminary research suggests that yoga is a practice that may be able to reduce residual adverse effects due to trauma. This study will direct attention towards the use of yoga as an adjunctive treatment towards decreasing symptoms of trauma-related distress. The study concentrates on adult female participants who will be recruited from sexual assault survivor advocacy organizations, and other adult females of the local community who respond to advertisements for the yoga sessions for trauma survivors. The yoga sessions will be free of charge and held at an actual yoga studio. The study will use a wait-list control group comparison. Many studies have investigated the use of yoga as an adjunctive intervention, but much more research is needed to clarify the benefits of yoga as treatment to those who have been exposed to trauma.

The History of U.S. Copyright Law and Disney's Involvement in Copyright Term Extension

Clarissa Anderson with Dr. Kimberly Schweitzer
Criminal Justice
University of Wyoming
Oral Presentation

Honors Program

Arvada, CO

Copyright term extension is often a contentious topic among copyright owners, corporate lobbyists, and opponents of copyright extension. The history of copyright law spans more than 225 years and has always been an ever-evolving process. The Copyright Act of 1790 was the first statute to identify definite provisions of copyright law and permitted authors the right to their intellectual property for a duration of 14 years. Today, depending on the type of work, copyright terms can reach up to 120 years. Historically, the Disney Corporation has been extremely protective of their intellectual property and is a prominent supporter and lobbyist for copyright term extension. Disney's involvement in copyright extension originates from their goal to prevent their copyrights from entering the public domain, specifically their Mickey Mouse character. This article will ultimately examine the history and evolution of copyright law in the United States, Disney's involvement in copyright extension, and the various arguments for and against copyright term extension.

R as a Valuable Data Analysis Tool in Biosciences Research

Jelard T. Aquino with Vikram E. Chhatre
Wyoming INBRE Bioinformatics Core
University of Wyoming
Oral Presentation

INBRE

Fort Washington, MD

A crucial aspect of the scientific research process is the statistical analysis of data, followed by interpretation of the results using visualizations. Given the rise in the size and scope of data sets in recent years, analysis is routinely performed using computational tools. Many computational tools are available to researchers such as SPSS, SAS and MATLAB. These tools often require expensive licensing and may not always provide extensive functionality to address all complex data analysis issues. More often than not, they are also closed source, which limits the pace of their development. R is both a programming language and statistical data analysis software, which addresses many of these issues. Researchers and data scientists have adopted this freely available, open source and versatile programming language to facilitate their work. R is now routinely implemented in data processing and statistical analysis. It is capable of efficiently handling large-scale data sets to produce and visualize results in a short amount of time. The functionality of R is expanding rapidly, thanks to an active community of scientists who contribute new packages. There are currently over 16,000 R packages available on various R repositories such as CRAN and Bioconductor. We introduce the audience to the successful implementation of R in a wide-variety of biological sub-disciplines including genomics, phylogenetics, natural sciences, neuroscience and biotechnology. We highlight the use of R packages including examples of complex data analysis and visuals to demonstrate the impact of R on research and education.

A Portable System that Can Detect Differences in Seated Balance Between Beginner and Advanced Horseback Riders in Rural Settings

Shelby Arambel, Joseph Kilpatrick, Aaron Thomas, Perri Freeman, Dr. Susan Marion
Department of Natural Sciences, Laramie County Community College
Poster Presentation

INBRE

Cheyenne, WY

Infrared cameras are classically used to track motion, but rarely in rural settings. Inertial sensors are portable, relatively inexpensive, and have accurately detected differences in posture. Dynamic seated balance during active sitting on both machine and subject controlled devices has not been measured with inertial sensors. This combination of devices could identify the effects of horseback riding on balance. Therefore, we developed this controlled system to quantitate kinematic differences in seated balance between beginner and advanced horseback riders. The system consists of inertial sensors, a stability ball, and a mechanical horse. Beginner and advanced horseback riders performed seated balance tasks on the ball and the mechanical horse while wearing inertial sensors. The sensors were strapped to the ball and horse, and the subject's thighs, pelvis, upper trunk, and head. For both tasks the participants could not touch any stationary object, including the ground. While sitting on the ball the subject rotated and flexed to pick up and move a cylinder to new locations. While on the mechanical horse the subject attempted to maintain initial seated posture as the machine moved through its bucking cycle, tilting along its length at two different speeds. Three-dimensional skeleton models, animated with calculated joint angles, aided in identification of differences between riders. Statistical analyses of kinematic variables showed correlations with rider expertise. Therefore, this system can identify differences in seated balance and could be used to monitor training effects and equine therapy in the field.

Drug Recycling: Counties Without Wyoming Medication Donation Program Show More Bacterial Antibiotic Resistance In Wastewater Per Person

Emily Armitage, Kathryn Moncrief and Natasha Radosevich

Rachel Watson, MOLB

Oral Presentation

Honors

Cheyenne and Casper, WY

Bacterial antibiotic resistance is a rising problem in medicine, leaving many infections untreatable. The Centers for Disease Control estimates that 23,000 deaths have resulted from this growing issue (Centers 2017). Disposing of antibiotics incorrectly amplifies the problem. In response to improper drug disposal, Wyoming implemented the Wyoming Medication Donation Program (WMDP). WMDP was established to recycle or correctly destroy donated medications, including antibiotics. To our knowledge, there are no previous data to support the claim that the WMDP reduces the extent of antibiotic resistant bacteria in Wyoming's wastewater. Preliminary data indicates that some Wyoming counties have donated a significant amount of antimicrobials, keeping them out of the wastewater, and other counties have not. We hypothesized that counties in Wyoming that donate fewer pounds of antibiotics will have a higher rate of antibiotic resistant bacteria per person than counties that donate more. Through this research, witnessing our own growth as scientists and as individuals, we questioned how undergraduate research, specifically through the Microbiology Senior Capstone Course aids in the development of students and prepares them for careers in and out of the field. This question encouraged us to seek out previous Capstone students and interview for their experiences through this course, past and present. Through these interviews, with our own research and experiences we have aimed to answer the question, what do the courses we take in our undergraduate studies prepare us for our futures?

Exploring sterol function in the bacterium *Gemmata obscuriglobus*

Emily Armitage with Sean Stettner, Dr. Naomi Ward

Department of Molecular Biology

University of Wyoming

Oral Presentation

WRSP

Cheyenne, WY

Unlike eukaryotic cells, bacterial cells generally lack membranes that enclose their nucleus, do not contain organelles, and lack cellular compartmentalization altogether. However, members of the Planctomycete-Verrucomicrobia-Chlamydiae (PVC) bacterial superphylum challenge the traditional view of eukaryotes vs. prokaryotes as they contain some of these eukaryotic-like features. An interesting bacterium in this group, *Gemmata obscuriglobus*, has been shown to have a complex endomembrane system, highly condensed nucleoid region, and segregated transcription and translation. *G. obscuriglobus* has also been found to produce sterols, which are essential for structure and function of membranes in eukaryotic cells. Sterols only have been detected in a subset of bacteria, however the function remains enigmatic. To explore the function of sterols in *G. obscuriglobus*, our lab has developed a chemical approach using the drug terbinafine to begin to determine sterol function. We have shown that sterol depletion by terbinafine causes replication defects, suggesting sterols are necessary for survival, the first instance in a bacterium. We are conducting RNA sequencing on treated vs. untreated cells to determine the global effect of sterol depletion. This will allow for the identification of genes responding to sterol depletion. I will conduct quantitative real time polymerase chain reactions on the best hits to verify the RNA sequencing reads. We will utilize a recently developed genetic approach to further elucidate the RNA sequencing best hits function in response to sterol depletion. There may be a relationship between the eukaryotic-like features of *G. obscuriglobus* and sterol synthesis, and understanding bacterial sterol function could elucidate this.

Basic Income in the United States
Madison Ashworth with David Finnoff
Department of Economics
University of Wyoming
Oral

Honors

Alpine, WY

Technological advances in digitalization and automation have begun to change the labor market in the United States. Automation is expected to replace a percentage of low and middle-income jobs in the United States. The changes in the labor market are predicted to result in job loss and displacement, increased inequality, and lower consumer demand. The social insurance programs currently employed in the United States are ill equipped to handle the changes in the labor market. This paper examines the effects of replacing unemployment benefits currently funded by states with a federally funded universal basic income. Existing and proposed basic income trials were examined to determine the effects on inequality. A universal basic income was also analyzed in both a labor market model and aggregate demand – aggregate supply model in order to determine the effect on wages and consumer demand. The research has indicated that the implementation of a basic income would raise wages as a result of increased bargaining power, lower inequality, and secure consumer purchasing power in the face of labor insecurity.

MATHCOUNTS Timing System
Danielle Badger with Dr. Jeffrey Anderson
Department of Electrical and Computer Engineering
University of Wyoming
Oral & Poster Presentation

Department of Electrical and Computer Engineering

Litchfield Park, AZ

MATHCOUNTS is a non-profit organization that provides engaging math programs to middle school students to build confidence and improve their attitudes towards math and problem solving. One of MATHCOUNTS programs is MATHCOUNTS Competition Series; which is a national program that provides students the opportunity to compete in live person contests against and alongside their peers. Each level of competition is comprised of four rounds: Sprint, Target, Team, and Countdown Round. This project focuses on the Countdown Round. The Countdown Round is a competition with two contestants battling head to head to answer questions within a time constraint. The goal of this project was to moderate the Countdown Round of the Wyoming State MATHCOUNTS Competition. This device was designed to keep track of the time and score of the Countdown Round. The device contains a large display which lets the contestants and the audience aware of the current time and score. This was accomplished by using several MSP430G2553 microcontrollers, seven segment displays, LEDs, and CC110L RF BoosterPacks.

An analysis of peptidylarginine deiminase (PAD) activity and citrulline concentrations in the murine estrus cycle

Sarah E. Bailey¹, Dr. Heather Rothfuss¹ and Dr. Brian Cherrington¹

¹University of Wyoming, Department of Zoology and Physiology

Poster Presentation

INBRE

Laramie, WY

Rheumatoid arthritis (RA) is a systemic autoimmune disease marked by chronic joint inflammation and is induced by antibodies that target citrullinated proteins in synovial tissue. Of the 1.3 million RA patients in the United States, women not only have a higher incidence but also develop the disease earlier than men, typically during childbearing years. The presence of citrullinated proteins at a mucosal site promotes the production of anti-citrullinated protein antibodies (ACPAs), which eventually become systemic. Citrullination is carried out by peptidylarginine deiminases (PADs), a class of calcium dependent enzymes that post translationally convert peptidyl-arginine to peptidyl-citrulline. Given the 3-fold higher incidence of RA in women, the cervico-vaginal (CV) mucosa is a potential site of initial sensitization to citrullinated proteins. In CV fluid from healthy women, our collaborators have demonstrated that ACPA concentrations peak in early proliferative phase of the menstrual cycle. Our data shows that highest PAD activity coincides with the ACPA peak. We hypothesize that hormone fluctuations during mouse estrus induce a PAD activity peak in the early proliferative phase. To test this, CV fluid samples were collected and PAD activity was quantified throughout the murine estrus cycle. Additionally, citrullinated proteins were specifically detected to examine changes in peptidyl-citrulline profiles in CV samples over the course of the cycle. By evaluating the trend in hormone induced PAD activity in mouse CV compared to that of women, we seek to develop a murine model for studying RA development at the CV mucosa.

Three Keys to an Effective Classroom

Kathryn C. Baker

University of Wyoming, Art Education

Oral

Honors

Powder Springs, GA

My presentation will discuss the three keys to teaching in an elementary as well as in the secondary classroom settings. Learning how to teach within the no-risk confines of a college classroom is entirely different than learning how to teach in a real world classroom. As a college student, I learned teaching techniques and strategies that would hypothetically work. Additionally, I learned about developmental and pedagogical theories. As an art teacher in training, I have also observed and taught mock lessons to my peers. In short, I believed that I was thoroughly prepared to teach in a real classroom setting. However, I quickly realized that I was anything but prepared. During student teaching I learned that there are three keys to establishing a successful classroom. These keys include building relationships, implementing classroom management, and instilling organization, all of which are interrelated. In other words, without any one it is hard to develop the others. During the course of my student teaching experience, I have been able to experiment with various techniques to achieve these three keys to successful teaching. I believe that building positive relationships with the students will facilitate classroom management. In turn, effective classroom management enables organization of the classroom setting. During my presentation, I will discuss the various ways I have implemented these three keys in the classroom to optimize my student teaching experience.

Pilot Peak Consulting

Joseph Baldauff, Brandon Minske, Tyler Menger, Robertson, Ciara,
Tawfik Abdelrahman Elshehabi
Petroleum Engineering
University of Wyoming
Oral Presentation

The finalized project for the field development of Charlton 30/31 is a proposal created by the team at Pilot Peak Consulting for Petroleum Engineering Senior Design, describing a process, which is believed to lead to augmented oil production in Charlton 30/31. The team at Pilot Peak Consulting intends to implement this amended five-phase plan in order to further develop the Charlton 30/31 field. The five phases of the plan are as follows: retrieving of background information, data interpretation, drilling of a new borehole, completions, and finally analyzing the economics. In order to ensure tasks are accomplished properly and on time, the team created a workflow and Gantt chart. To ensure the safety and risk of the project are properly accounted for, the team also looked up the corresponding state laws and created an additional chart for risk analysis. By following this five-phase plan, the team at Pilot Peak Consulting believes the Charlton 30/31 will experience a drastic increase in oil production.

Assessment of Cardiac Function Using Pressure-Volume Loop Analysis in Mice Chronically Exposed to Volatile Organic Compounds

Katelin Banks, Isabel Leininger, Austin Houskeeper with Bud Chew Ph.D

Department of Biology

Western Wyoming Community College

In Collaboration with Dr. Jun Ren, UW Pharmacy School

Oral Presentation

INBRE

Katelin Banks, Rock Springs, WY

Isabel Leininger, Green River, WY

Austin Houskeeper, Fort Bridger, WY

Volatile Organic Compounds (VOCs) are ubiquitous, common in mining operations, herbicides, household products, and food. We are likely exposed to VOC daily; chronic exposure causes health problems, especially respiratory. OSHA and WHO set exposure standards for VOCs. However, little research has examined the relationship between VOC and cardiac dysfunction. Our collaborator Dr. Jun Ren (UW Pharmacy School), has observed impaired fractional shortening, upregulated inflammation, and apoptosis in isolated cardiomyocytes exposed to vinyl chloride for five days. We hypothesize that exposure to vinyl chloride will lead to cardiac dysfunction in living mice. Pressure volume (PV) loop analysis allows for beat-by-beat heart parameters including: cardiac output, heart rate, stroke volume, preload, afterload, compliance, ejection fraction, and contractility. A transducer is inserted from the carotid artery into the left ventricle. Baseline loops are collected; then the inferior vena cava (IVC) is exposed. IVC occlusions are performed to obtain preload recruitable stroke work (PRSW), a plot of stroke work over a range of end-diastolic volumes. The slope of this line is the load independent measure of contractility. A saline calibration is performed by transiently flushing the heart with hypertonic saline; allowing for subtraction of conductance by the myocardium (parallel conductance). The animal is heparinized, sacrificed, and blood is allocated into wells of known volume; measuring the conductance allows for conversion to volume units (cuvette calibration). Data collection and analysis will be completed by the end of Spring 2018 semester.

Song Divergence Among Songbird Species

Christina Barajas with Libby Megna
Department of Zoology and Physiology
University of Wyoming
Poster

CO-WY Alliance for Minority Participation

Camarillo, CA

One reproductive isolating mechanism that can cause differences in songs between bird species is behavioral isolation, which contributes to species diversity via sexual selection by females. However, this barrier is not always complete, and hybridization between species reveals information on which reproductive barriers have failed and which reduce the ability to mate. We studied song divergence in six songbird species: Lazuli Bunting (*Passerina amoena*), Indigo Bunting (*Passerina cyanea*), Varied Bunting (*Passerina versicolor*), Painted Bunting (*Passerina ciris*), Ultramarine Grosbeak (*Cyanocompsa brissonii*), and Blue Bunting (*Cyanocompsa parellina*). Lazuli and Indigo buntings are sympatric and hybridize, but Varied and Painted buntings—despite breeding in sympatry—do not hybridize. We wanted to determine whether song variables correlate with reproductive isolation or hybridization in these species. We also compared the *Cyanocompsa* species, which are completely allopatric. We used song recordings from the Macaulay Library to compare the songs of each of the species. We compared two hypotheses relating song divergence and hybridization: (1) females choose mates based on songs and thus, species with similar songs are more likely to hybridize; and (2) songbirds can learn songs from closely related species, resulting in cases where a young bird learns the wrong song and thus hybridization does not relate directly to song divergence. We found that the hybridizing species' songs are about as similar to each other as are the sympatric but non-hybridizing species' songs to each other, indicating that song similarity does not explain hybridization in this system.

Rock the Blockchain Vote

Adrian Barberis, Kyle Clayson, Adam Coggeshall, Kip DeCastro, Wyatt Emery, Jackie Hess, Mason Johnson, Matthew Lehmitz, Kyle Mitchell, Lucas Nicodemus, Raylyn Pettigrew, Danny Radosevich, Marcus Rieker, Michael Schwindt, Kay Seidel, Joshua Sloan, Lisa Stafford, Nicholas Stegelman, Jacob Wild, Jagadish Bapanapally, Rafer Cooley, Archana Satyamurthy and Shaya Wolf with Dr. Mike Borowczak

Computer Science

University of Wyoming

Oral & Poster Presentation

Cybersecurity Education And Research Center (CEDAR)

Laramie, WY

Due to recent controversies regarding election integrity, the State of Wyoming needs a secure and efficient mechanism for modernizing the election system in the state. Therefore, our team has built a practical election system that uses blockchain technologies to ensure voter integrity, facilitate increased election participation, and provide polling certainty using secure, proven algorithms. We constructed this system using two different methodologies that cohesively show a completed voting system. We were not only able to compose a smart contract with Ethereum, but we also were able to build an independent blockchain that is able to cast and tally votes. In total, we created a comprehensive front and back-end system, that spans voter registration to vote submission and tallying.

Pricing in the Coffee Industry
Alex Belser with Dr. David Aadland
Economics
University of Wyoming
Oral Presentation

Honors

Casper, WY

Coffee has integrated itself into the daily lives of people all around the globe, bridging two hemispheres of the Earth. Producers—mainly in the South—depend upon the commodity for their livelihood. Millions of daily consumers—mainly in the North—depend upon their cup of joe to enliven their morning. The global coffee industry plays an important role in the economies of countries that produce the commodity as well as the countries that consume it. As worldwide coffee production and consumption steadily increases, coffee's impact on the worldwide economy has experienced much growth. Along with this growth comes developing concerns over the prices paid to growers in regions around the globe. Acknowledging the crucial role that farmers play in the coffee supply chain, the aim of this project was to better understand pricing dynamics in the coffee industry and how they affect the prices paid to growers. An econometric model was built to help explain the factors which influence the prices paid to growers in producing countries around the world. The insight gained from the econometric modelling of prices paid to growers paired with economic theory was used to determine which factors might be most significant in impacting the prices farmers receive. The findings also serve as conduit for discussing potential ways to improve the quality of life for producers of coffee around the world.

Mycorrhizal Fungi and Conifer Regeneration in Beetle Kill Forests
Becky Benjamin with Liana Boggs Lynch and Dr. Linda van Diepen
Ecosystem Science and Management
University of Wyoming
Poster Presentation

Ecosystem Science and Management

Nyssa, OR

Bark beetles (*Dendroctonus spp.*) are a source of major disturbance in western North American forests causing widespread tree mortality. Bark beetles substantially change forest structure, composition, and impact above and belowground biogeochemistry. Microorganisms are responsible for soil organic matter decomposition and nutrient cycling in soil. Mycorrhizal fungi form mutualistic relationships with many plant species, including conifer trees, by providing nutrients to the host plant in exchange for carbon. These nutrients are derived from soil organic matter. Mycorrhizal fungi also provide a mechanism for mature trees to transfer nutrients to new seedlings. Higher tree regeneration rates have been observed in beetle infested stands compared to non-infested stands. The goal of this study was to determine if there is a relationship between tree regeneration in beetle-kill stands and mycorrhizal fungi growth. It also attempts to correlate regeneration with the amount of mycorrhizal fungi in the soil. Ingrowth bags were buried at the dripline of mature trees and seedlings in infested and non-infested stands from July to October to estimate mycorrhizal fungal growth after beetle infestation in the No Name watershed in Medicine Bow-Routt National Forest. Our preliminary results indicate that there is more mycorrhizal hyphal growth in the dead tree stands than the live tree stands, which suggests that mycorrhizal fungi are supporting tree regeneration.

Transient Receptor Potential Vanilloid Subfamily 1 (TRPV1) activation Alleviates Non-Alcoholic Fatty Liver Disease

Jane Bennis, Padmamalini Baskaran and Baskaran Thyagarajan
Molecular Signaling Laboratory, School of Pharmacy, University of Wyoming

Non-alcoholic fatty liver disease (NAFLD) is a comorbidity of diet-induced obesity. The imbalance between energy intake and expenditure leads to excessive fat accumulation in adipose tissues during obesity. NAFLD is one of the greatest health risks and currently, around 25% of the US population is affected with NAFLD. Research work has identified that activation of transient receptor potential vanilloid subfamily 1 (TRPV1; capsaicin receptor) is an effective strategy to counter obesity and metabolic dysfunctions associated with obesity. To analyze the effect of TRPV1 activation on HFD-induced NAFLD, we fed wild type and TRPV1^{-/-} (genetically lack TRPV1) mice normal chow diet (NCD) or HFD [\pm capsaicin (0.01% in HFD)] for thirty-two weeks and analyzed the expression of TRPV1, sirtuin-1, PPAR α and PPAR γ coactivator 1 α (PGC-1 α) in the liver tissues isolated from these mice at the end of 32 weeks of feeding the diets. We also analyzed the phosphorylation of sirtuin-1 (metabolic sensor) in these tissues. Our data show that capsaicin 1.) Suppressed lipid accumulation and steatosis of the liver; 2.) Enhanced the expression and phosphorylation of sirtuin-1 at Ser 25 and Ser 45 positions by activating CaMKII; 3.) Induced Sirtuin-1-PPAR α interaction and deacetylation of PPAR α ; 4.) Enhanced the expression of PGC-1 α , stimulated mitochondrial fatty acid oxidation and mitochondrial UCP-2; 5.) Increased insulin sensitivity and antagonized HFD-mediated insulin resistance. Our research will stimulate the development of novel TRPV1 agonists as molecules to combat NAFLD in humans.

Sustainable Power Solutions with the Universal Micro-Hydro Generator

Owen Bense with Kevin Kilty
Mechanical Engineering
Oral Presentation

Honors

Ranchester, WY

As demand for electricity continues to grow and more people are equipped with electricity every day, a very significant portion of the global population is still without reliable electricity or even any electricity at all. Inconsistent grid power caused by natural disaster, prohibitively expensive utility costs or simply isolation from grid access prevents many people around the world from enjoying the benefits of reliable electricity. Often, these issues can be addressed through simple, easy to implement solutions such as generators and solar panels, but these solutions can be prohibitively expensive and come with several hurdles such as fuel transportation and extensive battery storage that must be addressed in order to get affordable power. The goal of the universal micro hydro project is to take an affordable path towards reliable electricity. Through small-scale hydroelectric generation, users can utilize continuously-generated electricity. Additionally, users will benefit from the fact that a direct drive hydro electric generator can be hand-built using commonly available materials and components without utilizing much specialized equipment. This enables users to greatly reduce the materials and labor costs associated with similar micro-hydro products. As a result, the micro-hydro team has developed a micro-hydroelectric generator featuring a permanent magnet converted Toyota 22R alternator, scrap metal and other universally available materials. This universal micro-hydro generator, complete with a free instruction manual open to all, aims to make the path to affordable, consistent electricity more attainable for those who need it.

A Survey Taken of Immune Systems on *Ovis canadensis* in Regards to Selenium in Plant Nutrients

Karl D. Berg ^{1,2}, Kayla M. Harakal ², Dr. Micah Humphreys ¹, Eric C. Atkinson ², ¹Department of Agriculture, Northwest College, ²Biology Department, Northwest College

INBRE

Columbus; Laurel, MT

To assess Bighorn Sheep (*Ovis canadensis*) health, we are collecting soil, forage, and fecal samples to characterize an important mineral concentration, namely, Selenium. This survey will be conducted in three different locations including: The Bighorn Mountains (Devil's Canyon), the North Fork of the Shoshone River, and within the Whiskey Mountain Range. In studying the soil, it will reveal whether adequate Selenium is present for plants inhabiting the area. Plant samples will determine if the mineral is taken up and then we will determine if the Bighorn Sheep, by their fecal samples, are ingesting Selenium. Environmental factors, especially soil pH and precipitation pH, may impact Selenium availability. Therefore, we will characterize these variables. Then with the pH of the soil determined we will find whether the Selenium concentrates have been taken up by the plants to be available to the animals. After all soil samples have been tested we will be observing and testing the fecal samples to see if they contain Selenium. If they do contain trace amounts of Selenium it will portray, in theory, that when Selenium is present within the body of the Bighorn Sheep, the number of parasites (nematodes including lungworm [*Protostrongylus* spp.] and coccidia [*Eimeria* spp.]) will be low. This is our working null hypothesis. Also, overall animal health may be strongly correlated with adequate Selenium instead of having it is missing all together. I hope to continue this study in the future.

Identification of analogous gene properties in *Escherichia coli* and *Homo sapiens* ABH blood group system

Anna Bergslien with Bernardino Madsen, MS, MT (ASCP)
Medical Laboratory Technology
Casper College
Poster Presentation

INBRE

Casper, WY

Homo sapiens ABH blood group system includes three antigens: A, B, and H antigen. These antigens are created by glycotransferase enzyme activity which converts the H antigen to the A or B antigen. The antigens are attached to a sequence of oligosaccharide chains linked to lipids and proteins within the erythrocyte membrane, and predict whether the antigen will be A or B. The blood group system produces a corresponding antibody for the antigen projected, in a lock and key fashion. Current research suggests some strains of *E. coli* bacterium within the intestinal microbiota develop analogous antigen structures to that of the human ABH blood group system. Because the gut bacterium is suggested to have a similar antigen structure, *E. coli* may also create similar immunizations to that of the ABH blood group which may disrupt the digestive system (Yang & Boettcher, 1992). The goal of this research was to determine if *E. coli* has comparable gene products to that of the ABH blood group system. To begin identification of the antigens, *E. coli* is cultured on blood agar with noted lactose fermentation. DNA extracted from the isolated growth of the bacterium is then exposed to ABH primers, and amplified with polymerase chain reaction analysis. After amplification of the DNA, gel electrophoresis can be used to visualize the amplified PCR products. Analyses of the gel is performed and sent to an outside laboratory for verification of comparable properties. Information gathered from this research is used verify if *E. coli* has similar nucleotide sequencing to that of the *Homo sapiens* ABH blood group system.

Undergraduate Research Day

Alaenna Bieganski,
Secondary English Education and English as a Second Language

My research will focus on the methods of instruction and assessment for student learning and understanding of “bias,” “stereotyping,” and “racism.” This project will focus on a seventh grade reading classroom at Dean Morgan Middle School in Casper, Wyoming. The research will be based on a three-day learning unit, which introduces each topic and guides students toward the formulation of an argument regarding the presence of bias in an influential photograph from TIME’s list of the “100 Most Influential Photos of All Time.” I will present evidence gathered from the classroom and video recordings of lessons in order to assess students’ prior knowledge on the subject, as well as the most beneficial methods for instructing and assessing student learning. Finally, I will bring in knowledge obtained through the English as a Second Language program at the University of Wyoming, exploring how diversity and the lack thereof impact student learning, especially in regards to the aforementioned topics.

Water distribution system design for EWB project in Guatemala

Nick Blume, Presleigh Hayashida, Tristan McKenzie, Brandon Wilde

with Michael Urynowicz

Civil Engineering

University of Wyoming

Oral Presentation

Chemical Engineering

Rock Springs, WY

Rock Springs, WY

Parker, CO

Worland, WY

For the past 5 years, the University of Wyoming’s chapter of Engineers Without Borders (EWB-WYO) has worked with a small community in Guatemala to renovate the town’s water distribution system. Comunidad Maya has always received its supply of potable water from two spring box systems installed into nearby hills, but has suffered lately from insufficient water delivery. EWB-WYO has sent multiple teams to analyze the predicament from various angles and to ascertain the primary causes of the water shortage. These trips have been followed by periods of design and redesign, as we have sought the best long-term solution for the community. In recent months, a team of 4 students has compiled all available data and created a functional model of the entire pipe network, seeking to discover the regions of most critical loss within the system, and propose implementable changes. Various alternative designs were investigated and processed through multi-criteria decision and cost-benefit analyses. The most cost-effective, sustainable modifications were then selected for implementation, which is expected to take place in upcoming months.

Why Give? The Behavioral Economics of Charitable Giving

Brackett, Samuel with Finnoff, David

Economics Department

University of Wyoming

Oral Presentation

Honors

Marbleton, WY

Donations are important for the long-term survival of many institutions. However, it is still uncertain exactly why it is that people choose to donate. Behavioral economics combines economics with psychology to better understand how humans make choices in markets. This research project focuses on the psychology of charitable giving, nudges, and how to increase the donations which institutions receive. Nudges are policies implemented which policy makers use to try and “nudge” the population into behaving as they want them to. Different nudges have been tried to varying effects in attempting to increase the amount of charitable giving institutions receive; some nudges show greater effectiveness than others. Institutional policy works to best choose what nudges to implement to increase donations received.

Parental care in a tropical bird species on varying time scales: the importance of rainfall, temperature, and parental traits

Sarah Brannon with Dr. Corey Tarwater

Zoology and Physiology

University of Wyoming

Oral Presentation

Honors, WRSP

Westminster, MA

The factors that influence parental care vary depending on temporal scale. Temporal variation is important in understanding and predicting changes in parental care and in turn changes in juvenile survival and population growth. We examined what factors influence the parental care of a tropical bird species on two time scales (daily and hourly). We collected data from March to August of 2015 and 2016 in central Panama on a population of antshrikes (*Thamnophilus atrinucha*). Video data was collected on nests in both the incubation (eggs) and nestling (after hatched) period and analyzed to determine attentiveness (incubation period) and total food (nestling period). We examined how parental traits (age and sex), offspring traits (age of young and time of year), and climate (rainfall and temperature) influence parental care during the incubation period (attentiveness) and nestling period (total food). We compared how the relationships between different traits and parental care vary with temporal scale. By collecting and analyzing data on varying time scales, we evaluated how scale alters our understanding of what traits impact parental care and the role of the environment (from hourly changes in rainfall to large scale ENSO events) in altering care.

Structural and Genetic Characterization of FZO1-Suppressor in *Saccharomyces cerevisiae*

Lachlan Brennan¹, Karen White¹, Dr. Peter E. Thorsness¹, Dr. Mary K. Thorsness¹

¹Department of Molecular Biology, University of Wyoming, Laramie WY

Oral and Poster Presentation

INBRE

Laramie, WY

Mitochondria are integral to many important cellular events. Their purpose is to mainly function as the long-term powerhouse of each cell thus becoming responsible for cell longevity. Because of these important cellular events, developing a greater understanding of how complex networks of genes regulate cell viability and organelle function is an increasingly important topic in biomedical research. In *Saccharomyces cerevisiae*, there exists a four-protein tethering complex termed the endoplasmic reticulum mitochondrial encounter structure (ERMES), which consists of at least four proteins: Mdm12, Mdm34, Mmm1, and Mdm10. Mutations that contain a deletion of the MMM1 gene generally remain able to produce viable offspring, but these offspring experience slow growth and poor respiration on nutrient rich media. The Thorsness lab has identified mutations in several genes including VPS13 and FZO1 that suppress, in part, the extreme growth defects found in strains lacking the gene MMM1. The major components of this research study concern comparisons between FZO1-suppressor and VPS13-suppressor mutations, structural changes in mitochondria that occur through introduction of these suppressors as measured through confocal microscopy, and strain viability. Furthermore, the study plans to assess possible changes in FZO1 localization within suppressor containing cells. It is hypothesized that FZO1-supp mutants might experience redistribution of FZO1 in the endoplasmic reticulum compared to wild type FZO1 strains, possibly contributing to an increased association between organelles due to greater levels of cellular tethering. To test this hypothesis, a fluorescent protein will be attached to the FZO1 gene in FZO1-supp and wild type FZO1 strains along with a mitochondrial fluorescent marker in order to determine potential differences in FZO1 distribution as well as to indicate any changes in the proximity between mitochondria and the FZO1 protein that may occur.

The Effect of Dancers' Clothing on Perception of Performance Ability

Mariah Brewer, Jennifer Deckert

Department of Theatre and Dance

University of Wyoming

Oral and Poster Presentation

Honors

Rapid City, SD

Dancers spend several hours a day training in studios where mirrors are present. Observations in the mirror serve as feedback for establishing line, unison, and clarity, and may also impact their perceived performance. As such, clothing may also influence perception of performance ability. This study explores clothing as a potential contributing factor to a dancer's perceived self-confidence and performance ability while executing movement. This descriptive research study is expected to have 8-10 participants and will ask participants to perform a two movement phases in a dance studio with mirrors under two different clothing conditions. Immediately following **each** of the participant's performances with each clothing condition, they will be asked to take a questionnaire to evaluate their perceived performance. Participants will be asked to arrive a week later to view a video of each phrase for each condition and given the questionnaire again, after viewing their performance. Although usable data has not been collected, a pilot study has been conducted. The hypothesis of the study is that the tighter fitting clothing option, compared to the loose-fitting clothing, and regardless of movement type, will have a negative effect on dancer's perception of their performance ability. The data from this research will enhance current knowledge and promotion of dancer wellness, regarding psychological health and overall dancer well-being.

Designing the North Laramie Connector
Colin Brinkman - Senior Design Capstone
Department of Civil and Architectural Engineering
University of Wyoming
Oral Presentation

Honors

Detroit, MI

Given the parameters of the senior design project for civil engineering, my design team was tasked with designing a multi-disciplinary road project and development area. As the lead of the transportation team, my involvement ranged from alignment and profile design, to roadway specifications and requirements. This is an overview of my contribution to the team effort.

Reaching to the Sky: Research and Design Process of a Skyscraper

Jessica Brist with Anthony Denzer
Architectural Engineering
University of Wyoming
Oral presentation

Honors

Billings, MT

The design and construction of skyscrapers has rapidly increased in the last decade. This project results in the architectural design of an iconic hotel on the beach of Barcelona, Spain. Consideration for the surrounding Barcelona architecture, means of egress, structural system, mechanical system, shading design, and heating and cooling loads is incorporated within the floor plan and three-dimensional design of the building. Precedent examples are used to support design decisions. While the hotel is designed in detail, this project also includes the masterplan for the vacant site surrounding the hotel lot.

The Fisheries Crisis and its People:

An econometric Sustainable Livelihoods application for low-income artisanal fishers in Sierra Leone

Nathan Brock with David Finnoff
Economics
University of Wyoming
Oral Presentation

Honors

Monument, CO

The global fisheries crisis is a topic of significant research across fields, including economics. It is evident that the current global fish stocks are declining, which has motivated environmental protection measures to be implemented. Low-income countries and their inhabitants are unevenly harmed by these environmental impacts, as artisanal fishing villages are dependent on fisheries for subsistence and livelihood. This case is particularly true in Sierra Leone, where poverty is evident, artisanal fishing communities exist, and dependence on fisheries is high (Kassam, et al. 2017; Teh, et al. 2016). Policy makers in these countries are faced with the challenge of mitigating environmental disasters while still ensuring that livelihoods of local people are protected. The present paper argues that an econometric model would provide useful, empirical evidence to these policy makers as to the specific factors of livelihood, responding to the question: which factors in the livelihoods of low-income artisanal fishers are most significant, and therefore should be considered in policy decisions? The econometric model in this paper follows the Sustainable Livelihoods Approach to environmental protection and poverty reduction (Krantz 2001). Livelihood, measured by the United Nations Development Programme Human Development Index, is explained by economic, social, and environmental variables in a sustainable livelihoods framework. Results and viability of this model are discussed, followed by a discussion of further research to sharpen these results.

Spatial Distribution of Soil Geochemical Properties throughout the Laramie Valley, Wyoming

Jenna Brown with Dr. Karen Vaughan
Ecosystem Science and Management
University of Wyoming
Poster Presentation

UWYO Pedology

Cheyenne, WY

Soil health and quality have become increasingly important as human activity has significantly altered the natural soil ecosystem. The elemental composition of soil is one of the most fundamental factors that affects multiple soil properties and can ultimately help in understanding the overall soil quality. We are interested in learning more about the variability of soil properties in an urban environment. The goal of this research is to determine the trends and distribution of the biogeochemical properties in soil around the Laramie Valley. The students of the spring 2018 Introduction to Soil Science class at the University of Wyoming collected surface soil samples from the yards outside their houses, apartments, dorms, etc.. Students noted the latitude and longitude of their residences to allow for sample geolocation. The elemental composition of the soil samples was determined by using a portable X-ray fluorescence spectrometer. In addition to determining the elemental composition, the color of each sample was obtained by using a Nix Pro digital colorimeter. The RGB color system data acquired from the colorimeter was converted to the Munsell color system that is commonly used in soil science. By improving our understanding of the distribution of physical properties as well as the elemental composition in soil, we will elucidate how the quality of the soil affects and has been affected by many human activities such as agriculture, urbanization, habitat and land restoration, as well as recreation.

The Effects of Negative Appraisals on Behavioral Inhibition and PTSD

Tara Brunner
Psychology Department
University of Wyoming
Poster

Honors

Colorado Springs, CO

Many factors contribute to the development of PTSD in trauma victims. One of which could be behavioral inhibition. Studies demonstrate that behavioral inhibition refers to a personality trait that features aversion to punishment rather than motivation to gain rewards. It is probably a vulnerability factor that contributes to the development of PTSD. A possible explanation for why this relationship exists would be the mediating factor of negative appraisals. According to the cognitive model of PTSD, a tendency for negative appraisals contributes to the development of PTSD. It is likely that individuals high in behavioral inhibition also are more vulnerable to negative cognitions due to the factors like contribute to behavioral inhibition, like neuroticism, anxiousness, and aversion to punishment. This study examined whether negative appraisals mediated the relationship between behavioral inhibition and PTSD. Data was analyzed using Hayes' Bootstrapping. Negative Appraisals about self-worth were found to have a significant relationship with both Behavioral Inhibition and PTSD. Negative appraisals regarding self-control and the benevolence of the world were not found to mediate this relationship.

Mars Ice Resource Extractor
Geoffrey W. Buck, Shad P. Moir, Daniel Wille
Dr. Kevin Kilty, Mechanical Engineering
University of Wyoming
Oral and poster

Mechanical Engineering

*Lacombe, Alberta CA
Baggs, WY
Cody, WY*

The Mars Ice Resource Extractor (MIRE) team designed a device to remove water ice from a subsurface deposit in ambient Martian conditions. NASA and other groups interested in landing humans on Mars consider development of this capability critical. MIRE is an ice core drill on a long (approximately 1 meter) driveshaft. The shaft also drives a hollow auger for digging through overburden above ice deposits. When MIRE reaches the ice layer with the auger, the driveshaft uncouples from the hollow auger and continues to penetrate ice with the core drill. After MIRE drills a core between 7-16 centimeters long, the drill string pulls the ice core out of the hole, through the top of the hollow auger, and deposits the core into a separate melting and filtration system. MIRE repeats this procedure until the ice column is exhausted or the maximum drillable depth is reached; then the driveshaft couples to the hollow auger, removes it from the overburden, and MIRE digs a new hole. MIRE has limited applications beyond extraterrestrial resource extraction. More energy-efficient means of resource collection exist for ambient conditions farther from the triple point of water than experienced on Mars. The MIRE team established baseline operating torque and power requirements using consumer grade hole saws and a drill press. Prototype design work is complete for the ice core drill and the University of Wyoming CEAS shop is working on fabrication. The team has completed the hollow auger concept and started its design.

Understanding the Mechanical Behavior of Carbon Fiber Reinforced Geopolymers

Camron Bunnell with Dr. Kam Ng
Civil Engineering
University of Wyoming
Poster Presentation

McNair

Pine Haven, WY

This study will examine the mechanical properties of carbon fiber reinforced geopolymers (CFRGs). The elastic modulus, poisson's ratio, peak stress, and shear strength parameters will be determined and compared to portland cement. It is hypothesized that CFRGs will have comparable mechanical properties to portland cement, and thus potential as an alternative construction material. A minimum of nine cylindrical CFRG samples measuring 2" in diameter and 4" in height will be tested under three confining pressures, one room temperature, and at three curing periods (i.e., 3, 7 and 28 days). A minimum of three similar CFRG samples will be tested under a uniaxial compressive condition at the three curing periods. The servo-controlled triaxial testing system housed in the Engineering Building at the University of Wyoming will be used to simulate these 12 different environments. The CFRGs are manufactured using the waste material from coal combustion, fly ash. If CFRGs can be widely implemented in place of portland cement, the heavy metal pollutants within will be effectively sequestered from the environment. Reduction in the use of portland cement will also decrease CO₂ emissions from its production, and from the setting of the cement.

Perineuronal nets may have time-dependent modifications on action potential patterns in the prefrontal cortex following cocaine conditioned place preference

Delta J. Burchi^{1,2}, Emily T. Jorgensen², Barbara A. Sorg³, and Travis E. Brown²

²Department of Neuroscience, University of Wyoming

³Department of Integrative Physiology and Neuroscience, Washington State University, Vancouver

Wyoming Research Scholars Program

Chronic relapse in drug addicts can be partially attributed to recurrent and persistent drug-related memories after repeated drug use. Our lab uses behavioral models and electrophysiological techniques to study how the extracellular matrix and associated proteins surrounding neurons contribute to the development and persistence of drug-associated memories. Our studies focus on specialized extracellular matrix structures known as Perineuronal nets (PNNs). PNNs are known to provide protection from oxidative stress, help regulate the ionic microenvironment, and play a significant role in synaptic stabilization. Previous experiments with our collaborators have shown that degradation of the PNNs disrupt drug related memories. For our experiment, male rats were trained for cocaine conditioned place preference (cocaine CPP). Following cocaine-CPP, brain slices were prepared and whole-cell recordings were performed in the medial prefrontal cortex. Results suggest that cocaine-CPP decreased the firing patterns of PNN surrounded neurons, depending on different time points following memory reactivation in the CPP chamber. Specifically, the 2hr and 30min time points significantly decreased firing patterns compared to t=0 and saline controls. Interestingly, 24hrs following memory reactivation, firing patterns return to looking like t=0 and saline controls. This suggests that neurons with PNNs may be sensitive to intrinsic adaptations within a specific window of time following memory reactivation of cocaine associated contexts. With this information, we hope to identify functional relationships between PNNs and cocaine exposure, which may lead to novel therapeutics for the treatment of drug addiction.

Wounded Animal Tracker

Thomas Burger, Trevor Halowell, C'Anna, Phillip Vu

Ray Fertig, Mechanical Engineering

University of Wyoming

Oral Presentation

Mechanical Engineering Senior Design

Thomas Burger, Laramie, WY

Trevor Halowell, Tulsa, OK

C'Anna Lundberg, Laramie, WY

Phillip Vu, Laramie, WY

In the United States, roughly 500,000 hunters prefer to use a compound bow instead of firearms when shooting large game. A common problem these bow hunters encounter is an animal running away after being shot with an arrow that didn't inflict a mortal wound. Each year, hundreds of animals shot by bow hunters are never recovered and the hunter kills another animal to fill their tag. This is called accidental double tagging, and it negatively impacts population growth and herd management. To reduce this problem that bow hunters face, our team created a device that allows the hunter to electronically track the wounded animal after it has been shot. When a hunter shoots game using this device on their arrow, the device detaches from the arrow and attaches to the animal. When the wounded animal runs away, the hunter can easily pinpoint the position of the tracking device inside the animal and avoid accidental double tagging. To design the placement, and functionality of the device, we calculated the maximum forces it must withstand, and how the device impacts the arrow's flight. When designing the weight and size, customer requirements were used to perfect the design. We created each prototype using 3D-printing, tested the prototype's ability to meet the customer requirements, and improved the next prototype. The result is a device that can easily attach to an arrow, reliably attach to the animal being shot, and allows a bow hunter to find every animal that he shoots.

Sampling, Quantitative Analysis, and Mapping of Antibiotic Resistant Genes Found in the Environmental Resistome

Hannah Burrough, Dr. John Chase
Casper College Science Department
Casper College
Poster Presentation

INBRE

Newcastle, WY

The emergence and spread of antimicrobial resistant genes poses one of the most threatening health care problems to the global population. Although this issue is significant, little research has been done to assess the environmental factors contributing to the rise of antibiotic resistance. Environmental microbiota represent one of the most diverse reservoirs of antimicrobial resistance, known as the resistome. The resistome includes not only the genes that confer resistance to clinical pathogens, but also to the nonpathogenic species that dominate the environment. While the resistome is ancient, modern day selective pressures are undoubtedly shaping its current form, degree of mobility, and allele frequency. The primary focus of this project is on eukaryote, prokaryote, and viral populations in the environmental resistome. Water samples from aqueous systems, including freshwater, mineral hot springs, and wastewater, throughout Wyoming were sampled. Samples were taken from sixty sites around the state. Metagenomic DNA is currently being isolated for beta-lactamase genes to map genes found throughout Wyoming's water systems. The changes between the microbiome and resistome of these water sources are being analyzed to gain a better understanding of where beta-lactamase genes occur in the environment. The current goal of this project is to finish the ongoing analysis of beta-lactamase genes found in the samples through the creation of metagenomic DNA libraries. Following library creation, DNA will be sequenced followed by bioinformatics analysis. The long-term future goal is to present a more accurate map of the beta-lactamase genes throughout Wyoming.

D-Light Control

Jason Butler, Shelby Ransom, Landon Webb

with Dr. Kubichek

Electrical Engineering

University of Wyoming

Oral / Poster Presentation

Department of Electrical Engineering

Laramie, WY

The idea of having all your home devices such as clocks, speakers, lights, thermostat, locks, etc., connected to the internet via Wi-Fi is motivating home automation to expand and become more of a standard when building homes. The Internet of Things (IoT) is a core component of home automation and the basic idea of having all those devices communicate, send information to the user, and take commands. D – Light Control is an applicable use of these IoT devices in a smart home and is a solution to the exterior lighting issue of home automation. D-Light Control is a user friendly and easy to control home automation system meant for the standard household. Functional capabilities include light switches controlled by a website allowing any user to turn on and off any lights connected to the system. The website will allow the user to see if the lights are on or off. A directional controlled spotlight is also part of the system. The spotlight which sits on a pan-and-tilt platform is controlled by the website. This spotlight will have 2 axis of directional control allowing the user to focus the light on a desired location.

Automotive Sunshade Defroster
Hayden L Cragoe, Grant B Cameron, Cameron M Kelly
Dr. Kevin Kilty and Dr. Paul Dellenback, Mechanical Engineering
University of Wyoming
Oral Presentation

Mechanical Engineering Senior Design

*Powell, WY
Jackson, WY
Torrington, WY*

This senior design capstone project is a remote operated windshield defroster. The product will allow the user to defrost the windshield from the comforts of home without having to start the vehicle. It will also be much more convenient than scraping the windshield and more efficient than defrosting by starting the vehicle. The windshield defroster has a huge market, ranging from businesses that use large fleets of vehicles looking to save money by saving driver time and power costs, all the way up to the average commuter who would like the convenience and savings the remote windshield defroster will provide. The defroster has been designed to defrost an automotive windshield in under one hour from temperatures of -10 degrees Fahrenheit and higher. The product will be storable within the vehicle (similar to a sunshade) and weigh no more than eight pounds, as well as regulate temperature to ensure the safety of the user and the vehicle. So far, the design team has made a Finite Element Analysis model in Abaqus to match experimental data that will be utilized in making a prototype. The team has also fabricated and tested a first iteration of a prototype that will be the basis for a marketable product.

**Cytomegalovirus and Epstein-Barr virus seropositivity and age of onset of human
Huntington's disease**

Reed Campbell¹, David Donley^{2,3}, Dr. Jason Gigley⁴, and Dr. Jonathan Fox^{2,3}

¹Department of Kinesiology and Health, ²Graduate Neuroscience Department, ³Department of
Veterinary Science ⁴Department of Molecular Biology.
University of Wyoming

INBRE

Laramie, WY

Huntington's disease (HD) is an autosomal dominant disorder, characterized by motor dysfunction (chorea) and cognitive decline. HD is caused by a CAG repeat expansion in the huntingtin gene, which results in expression of mutant huntingtin protein. The age of onset (AOO) in HD is significantly and inversely correlated with CAG repeat size in the huntingtin gene; however, environmental factors also play a role in individual AOO for HD. Neuroinflammation, including microglial activation and cytokine production, is a feature of HD and can be caused by environmental factors such as latent brain infection. Epstein-Barr virus (EBV) and cytomegalovirus (CMV) are two common human viruses with the individual prevalence greater than 50% in the USA. Both pathogens develop latent (clinically silent) infections and can also have disease manifestations. Presence of antibodies in blood (seropositivity) against the pathogen indicates persistent infection. The goal of this project is to determine if seropositivity for CMV and EBV are explanatory variables for AOO in individuals carrying the HD mutation. Using human HD plasma samples obtained from a clinical study, ELISAs are being used to determine seropositivity for each pathogen. Residual AOO was calculated for each person by subtracting his or her actual AOO from CAG-predicted AOO to adjust for CAG repeat size and measure variance due to environmental factors. We will then determine if seropositivity impacts AOO. A preliminary analysis of the data will be presented.

Production of Pure Carbon Dioxide from Flue Gas

Dylan Sether, Connor Tarver, Heba Eltoukhy, Hui Cao, Rwan Alshatti

With Dr. John E. Myers, Sandy Duncan

Chemical Engineering

University of Wyoming

Oral Presentation

Department of Chemical Engineering

Laramie, WY

Carbon dioxide (CO₂) is a gas which is produced upon the combustion of fossil fuels and some organic materials, fermentation of sugars, and processes of decay. CO₂ is considered a greenhouse gas, which is a gas in the atmosphere that absorbs and emits radiation within the thermal infrared range (Wikimedia, 2017). Being a greenhouse gas, CO₂ has an effect of increasing the Earth's surface temperature. The increase of Earth's surface temperature has the potential to produce harmful effects on ecosystems, biodiversity, and livelihoods of people around the world. Since the beginning of the Industrial Revolution, the concentration of CO₂ in the atmosphere has increased from 280 ppm to 406 ppm, a 40% increase (Wikimedia, 2017). From these alarming facts, it can be seen that steps are needed to be taken to prevent such a devastating effect on the Earth. To do this, one might lean to carbon capture and storage (CCS). The goal of this project was to capture 15 million tonnes of carbon dioxide each year from the flue gas emitted by the Jim Bridger Power Plant. This was accomplished by designing an absorber and stripper. The absorber contains carbonic anhydrase silica beads which can aid the reversible reaction of CO₂ to carbonate ions. The CO₂ rich stream then enters into a stripper, so that the CO₂ can be removed. The design and sizing of the project was accomplished by calculating the parameters of each equipment, the placement of each equipment was conducted by studying the property as presented to us in *Plant Design and Economics for Chemical Engineers, 5rd ed.* Economics analysis were completed. Safety and environmental regulations were researched and addressed. All of this were considered in order to determine if the industrializing the production of carbon dioxide by using carbonic anhydrase is feasible.

Rehabilitation and Recovery after a Mild Traumatic Brain Injury

Jessi Jeffries, Taylor Thompson, Brandi Carreau

with Dr. Ramesh Sivanpillai

University of Wyoming

Oral Presentation

Department of Physiology

Laramie, WY

Traumatic brain injury (TBI) is one of the foremost forms of neurological disorders. Of all TBI's diagnosed 80-90% are considered mild traumatic brain injuries (mTBI). Diagnosis of mTBI indicates the patient had a loss of consciousness lasting up to 30 minutes, and a Glasgow Coma Scale score of 13-15. Along with the diagnosis of mTBI comes deficits in physiological functioning (loss of memory, loss of certain motor skills), psychological functioning (depression, anxiety), and social functioning (may be unable to work, assist with household tasks). A review of current literature regarding mTBI indicates at this time there is little to no protocol regarding treatment, rehabilitation, or recovery times for mTBI's. Therefore, there is an urgency and need to address the lack thereof to ensure those affected by mTBI and TBI in general can regain basic daily functions that allow them to be productive participants in their own lives, as well as in society. Examination of mechanisms of mTBI's, varying effects of mTBI's, diagnosis of an mTBI, and rehabilitation/recovery related to mTBI will be examined through review of current literature regarding traumatic brain injuries.

HoloLens ASL Recognition
Katherine Chawla, Thao Phung, Russell Todd
Mike Borowczak, Computer Science
University of Wyoming
Both oral and poster presentation

Arvada, CO
Hanoi, Vietnam
Baggs, WY

Communication relies on language -- this project seeks to remove the language barrier between American Sign Language and English by providing real-time English captions of the ASL alphabet. Using deep learning and a Microsoft HoloLens, we approached this problem in a completely unprecedented manner. While ASL alphabet recognition capability exists, it relies on a combination of SVM (Support Vector Machine) and Leap Motion hardware (SVM allows for static image recognition, and Leap Motion is used to track the hand motion). We wanted to be able to recognize the gesture-based characters 'j' and 'z' as well as the other 24 and eliminate the need for extra hardware, so we chose to use Convolutional and Recurrent Neural Networks to analyze captured video. Challenges arose from the lack of adequate video databases with which to train our neural network, and from connecting the neural network to the HoloLens through UnityML. Our project is still in development, but upon completion, results will be measured both quantitatively (in terms of percent of correctly-identified letters) and qualitatively (in terms of ease-of-use for both the person signing and the person reading the captions).

Preliminary genomics study of *Culex tarsalis* arthropod vector of West Nile virus

Amanda Chidester¹, Micah Conner¹, Tori Stanek¹, Richard Hess¹, Kelvin Kinyatta¹, Ian Ostler¹,
and Shannon Linch¹ with Aaron Bender¹ and Steven McAllister¹

¹Central Wyoming College, Department of Science

Poster

INBRE

Green River, WY
Riverton, WY
Riverton, WY
Jackson, WY
Machakos, Kenya
Laurel, MT
Riverton, WY

Since 1999, there have been approximately 44,000 cases of West Nile Virus (WNV) in the United States. WNV is an RNA arbovirus in the family *Flaviviridae*. Birds are the primary reservoir for the virus, but horses and humans serve as the terminal hosts. Fremont County is a hotspot for WNV in Wyoming. The primary vector for WNV in Wyoming is the *C. tarsalis* mosquito. Though it is known that *C. tarsalis* carries WNV, there is little publicly available genomic data for this insect. In an effort to better understand the host virus interaction, we are attempting to obtain genome sequenced data for *C. tarsalis*. As a preliminary effort, we have obtained PCR primers that have been shown to amplify the actin-1 gene for multiple mosquito species (Stanley et al., 2010). DNA has been extracted from a handful of female *C. tarsalis* mosquitoes, and subjected that material to whole genome amplification. Using this material as template, PCR conditions are currently being optimized for amplification of the *C. tarsalis* actin-1 locus. In addition, we are collecting large numbers of female *C. tarsalis* mosquitoes which will be used in an effort to obtain a partial or complete genome sequence.

Fluid Dynamics and Tectonic Movement at Sinks Canyon

Autumn Christie with Dr. Dana Pertermann
Western Wyoming Community College

This testing compares and contrasts earlier studies conducted by the United States Geological Survey conducting an experiment on the underground geological formation present between the sink an rise with in Sinks Canyon, located on within the Wind River range 50 miles from Lander Wyoming. Prior studies indicated a 2-hour flow time between the sink and the rise of the Popo Aggie river as outlined in the 1973 studies report presented by the USGS in 1973. My Primary findings portray a change within the underground formation then that what was seen in the 1973 United states geological study. Environmental as well as climate change is thought to be part of the cause for this change within the formation causing a larger time frame between the sink and rise of the Popo Aggie river.

Architecteds of Adobe Town

Autumn Christie with Dr. Dana Pertermann
Western Wyoming Community College

Analyzation of change over time through weather records and historical maps of Adobe Town. Naturally occurring perception and wind has built the geological structures within the area and it is forever changing, due to the landscape and its surroundings. The variety of change within the region depends widely from the amount of precipitation and wind the region foresees throughout the year. Conservation of the land will keep it free from human induced erosion but is that enough? Or will Adobe Town be around for years to come or will it keep changing due to mother nature's realm in which we cannot protect the landscape.

Crane Free Wind Turbine Erection

Clark Christenson, Jacob Carter, Austin Krier, Michael Lovato, and Zachariah Marvin
Dr. Ann Peck Mechanical Engineering, Prof. Lawrence Willey Mechanical Engineering
University of Wyoming
Oral Presentation

Department of Mechanical Engineering

*Clark Christenson Gillette, WY
Jacob Carter Tokyo, Japan
Austin Krier Sterling, CO
Michael Lovato Gunnison, CO
Zachariah Marvin Fort Lupton, CO*

Our project revolves around finding a way to erect medium sized wind turbines, such as the Vestas V-27 225kW (22.8 metric tons and a 30 meter hub height), without the use of a crane. Using a crane is well known and practiced by many wind turbine erection companies, but comes with many costs. Generally, for a wind turbine of this particular size, two cranes are required for assembly. Usually a large crane is used to carry the weight of the components while a smaller crane is used to help function them. Costs for renting a single crane with the required lifting capacity can be close to \$10,000 a day. On top of the rental costs, transportation of the cranes, crane pads, and crew add up to an even larger bill. Our solution is the crane-less wind turbine erection sled. Rather than picking up each individual piece of the wind turbine and assembling it vertically, we have chosen to preassemble the wind turbine onto our hydraulic sled in a horizontal position. From the assembly point, the first stage of hydraulics will lift the sled and wind turbine upward to a vertical position. Then, the second stage of hydraulics will lower the turbine down onto its bolt pattern where it will be tightened into place. The sled will then release the wind turbine and move to the next site where it will prepare for the next assembly. The next step for this project will be to find sponsors and potential investors to build a prototype. In conclusion, our system can make wind energy even more marketable by increasing the efficiency of the erection, lowering the initial cost, and lowering the total cost of ownership throughout the lifetime of a wind turbine.

Optimizing Parameters for Polyploidy Induction in Table Grapes

C. Claflin¹ and S.A. Dhekney²

¹Sheridan College

²University of Wyoming, Sheridan Research and Extension Center

Oral

Supporting program: Wyoming INBRE

Sheridan, WY

The benefits of inducing polyploidy in agricultural crops include an increase in leaf size and biomass, larger flowers and fruit and improved qualitative traits such as seedlessness. A majority of the grape varieties used for fresh fruit (table grapes) are characterized by large berries, thin skin, high sugar content and seedless fruit. Cold-hardy table grape cultivars are characterized by the presence of small sized berries, which makes them unsuitable for large-scale commercial production. The goal of this study was to optimize protocols for inducing polyploidy in diploid table grape cultivars. Micropropagation cultures of *V. vinifera* cultivars 'Autumn Seedless' and 'Thompson Seedless' were used. A significant effect on shoot tip survival and proliferation was observed depending on the colchicine concentration in the medium. Well-developed plants with a robust root and shoot system are currently being acclimated for subsequent transfer to a greenhouse. The ploidy level of plants obtained following treatment with colchicine will be estimated by evaluating morphological characteristics such as leaf size and shape, stomatal density and flow cytometry. Resulting tetraploid plant lines will be further screened for growth and fruiting parameters. Optimizing techniques for the production of tetraploids will enable the development of cold-hardy table grape cultivars with large berry size and improved cluster architecture for commercial production.

BlockPusher Game Engine and Web IDE

Adam Coggeshall, Alex Germann, Matthew Grant

with Dr. Mike Borowczak

Computer Science

Both Oral and Poster

Department of Computer Science

Gillette, WY

Gillette, WY

Loveland, CO

Video game development is an arduous undertaking, often involving a steep learning curve with many complex tools. Testing game code can be especially time-consuming, as it often requires restarting the game to test each small change to the code. The goal of this project was to build a simple game engine that allows code to be modified as the game runs, as well as a web interface that allows created games to be easily shared. These features are equally useful to developers of all skill levels. Beginners can use any game uploaded to the site as a learning example, using the editor to immediately see the outcome of changing the code. More experienced developers can use the engine to rapidly prototype gameplay concepts and share them to receive feedback. Rather than giving users a complex interface and a number of pre-existing components, the engine places a large emphasis on programming and only provides a minimal editor. This is a great approach for programmers and those wishing to learn programming. This project required a combination of web and game programming and involved a number of challenges. Documentation of the engine is important for anyone wishing to use it. Security is another major concern because the engine allows users to run arbitrary javascript code, so care was taken to ensure game code was isolated and unable to take malicious actions.

Auger Boring Casing Alignment Tool (ABCAT)
Clay Coleman, Garrett Easton, Jesse Gray
Dr. Carl Frick Department of Mechanical Engineering
University of Wyoming
Oral Presentation

Coleman Construction Inc.

Clay Coleman, Rock Springs, WY
Garrett Easton, Rock Springs, WY
Jesse Gray, Rock Springs, WY

Auger boring or “jack and bore tunneling” is a common practice used when a pipeline needs to traverse an obstruction such as a road or railway. The process involves boring a tunnel under the obstruction while simultaneously thrusting steel casing through it to house the pipeline. Boring lengths can exceed upwards of 500 feet while steel casing commonly comes in forty-foot sections. This requires multiple sections of steel casing to be welded together to complete one bore. Aligning steel casing to be welded together is a tedious and time-consuming process. The objective of our project was to enhance the safety, efficiency and cost of aligning steel casing. The ABCAT is a tool that will be mounted on top of the boring machine and will be able to align steel casing by lifting it and shifting it laterally a total of 15 inches in both directions. With it being mounted on top of the boring machine, alignment will no longer require a secondary piece of equipment such as an excavator or crane. This eliminates overhead lifting which enhances safety. With the ABCAT in use the total time to align steel casing will be cut drastically due to its improved accuracy. Time saved on the job equates to dollars saved by the contractor. The Auger Bore Casing Alignment Tool will be the change of process that the industry greatly needs.

Baxter Research Robot playing utilizing computer vision and verbal commands

Zephaniah Connell

with Dr. Suresh Muknahallipatna and Debra Kretzschmar
Electrical and Computer Engineering
University of Wyoming
Oral Presentation

Department of Electrical and Computer Engineering

Casper, WY

The Baxter robotic system is an extremely sophisticated piece of machinery, equipped with a myriad of sensors and features. As of yet, very little research has been accomplished utilizing Baxter by students or faculty in the Department of Electrical and Computer Engineering at the University of Wyoming. This project is a base that will enable future employment of Baxter for more intricate and advanced research topics. This project was derived to showcase a large portion of Baxter’s functionality in an easily digestible and potentially expandable format. It will display a convenient form of user interaction (voice commands), utilization of computer vision (detecting chess board and pieces), and safe and precise physical interactions with or near humans (moving chess pieces). The goal of this project is to enable the Baxter robotic system to move chess pieces on a chess board based on user input in the form of voice commands. This can be broken up into four main parts: physical movement of Baxter’s appendages, computer vision to locate the board and chess pieces, voice recognition for the necessary set of commands, and internal chess board state information and chess logic.

A study of raccoon (*Procyon lotor*) and skunk (*Mephitidae*) cognition and social behaviors

Carissa Cooley with Dr. Sarah Benson-Amram
Department of Zoology and Physiology
University of Wyoming
Oral Presentation

Wyoming NASA Space Grant Consortium

Boring, OR

Many species do not successfully adapt when their environment changes, which is a conservation problem in today's rapidly changing world. Raccoons, however, are one of the few species that seem to easily adapt to environmental change. My project investigates the cognitive abilities of urban raccoons, including learning and problem-solving skills, to determine if cognition allows adaptation to environmental change. I will also be quantifying social behaviors among raccoons and skunks to better understand how different species of wildlife interact with one another in urban areas. I will be analyzing previously collected data from different experimental trials to see if raccoons can learn how to solve a puzzle to get a food reward (i.e., solve a puzzle box). In addition, this summer I will be assisting in the construction of a new, automated puzzle box that will help us deliver numerous types of cognitive tests in addition to problem solving. This summer we will also extend our ongoing project to skunks; another successful urban species. These two species are good to compare to one another because raccoons have a larger relative brain size than skunks, and therefore are expected to be more intelligent. Comparing raccoon and skunk cognition will help us better understand if intelligence influences adaptation to environmental change. This project is relevant to NASA's research goals of understanding how wildlife is responding to a changing planet.

SLASH2, A Wide Area Filesystem

Madison Cooley, Michael Schwindt

Michael Killean, ARCC
University of Wyoming
Poster Presentation

*Advanced Research Computing Center (ARCC),
Pittsburgh Supercomputing Center (PSC)*

*Cheyenne, WY
Loveland, CO*

Researchers often require secure and efficient methods for transferring large data files to collaborate with colleagues over a wide area network (WAN). Sensitive information cannot be trusted to most cloud services, forcing researchers to transmit data directly to their collaborators, creating issues with file ownership. A simple and intuitive method for transferring large files over a WAN securely and efficiently currently does not exist, which is the motivation behind SLASH2. SLASH2 is an open source, wide area filesystem which spans 1,454 miles between Pittsburgh, Pennsylvania and Laramie, Wyoming. SLASH2 will be able to send large datasets over a WAN securely and efficiently. It has many features which include: multi-residency, data integrity verification, and system-managed data transfer. SLASH2 has tools built in to handle data replication and utilizes a metadata server which manages ownership (uid/gid), changes to files, and closest IO server location. SLASH2 is built with WANs in mind, making it different from other filesystems. It uses replication for files that are relevant to the local community and utilizes local caching which results in better performance. This poster describes our research utilizing SLASH2 with Internet2 to transfer large files to and from the University of Wyoming (UWYO) and Pittsburgh Supercomputing Center (PSC).

North Laramie Minor Arterial Route and Development

William Troy Covill with Dr. Michael Barker

Civil Engineering
University of Wyoming
Oral Presentation

Honors

Pinedale, WY

In a mock project for Civil Engineering Senior Design Course, the infrastructure of Laramie, Wyoming is currently inadequate to accommodate future business opportunities and population growth. North Laramie is primarily a residential district with limited minor roads for residents to access Laramie business districts. This project focuses on a proposed minor arterial and development area to service the residential district in North Laramie and allow for future expansion. This alternate route will provide easy access points for truck traffic and business deliveries to North Laramie and the development area. The route will connect with Welsh Lane on the west near I-80, travel east across the Laramie River, connect with existing roads, continue east through the proposed development area and eventually turn south to connect with Grand Avenue at Vista Dr. In the mock design project, the City of Laramie contracted Archimedes Engineering to design the minor arterial roadway. The scope of the project includes: a bridge and foundation design for crossing the Laramie River; traffic volume analyses; intersection and road alignment designs; pavement design; and hydrologic analyses of the development area for a detention pond and a drainage area for a storm water culvert design. The Archimedes Engineering team included seven members selected from the sub-disciplines of structural, water resources, transportation, and geotechnical engineering. Archimedes Engineering employed standard engineering practices to provide a safe, effective, and efficient route to service the future expansion of North Laramie.

Calculation of the Binding Energies of the Protein-Ligand Docking of Several TRPV1 Channel Modulators

Kyle Covington with Dr. Teresa Lehmann and Dr. Baskaran Thyagarajan
Dept. Physical Chemistry and School of Pharmacy

University of Wyoming
Oral Presentation

EPSCoR

Placerville, CA

The ligands that modulate transient receptor potential vanilloid subfamily 1 (TRPV1) protein activity are used in pain therapeutics and neurodegenerative and metabolic diseases. Recently, our laboratory has shown that activation of TRPV1 by capsaicin (a TRPV1 agonist) causes the expression of brown fat specific thermogenic genes and proteins in the white fat. This led to white fat acquiring a brown fat like phenotype, which increases energy utilization and promotes weight loss in mice. Since, capsaicin is a pungent compound, we wanted to evaluate the efficacy of non-pungent analogs of capsaicin and other ligands that showed activity in vitro. The goal of this project was to calculate the binding energies of ten different ligand protein binding interactions, where we evaluated the binding pockets and efficacies of pungent and non-pungent capsaicin analogs and new agonists of TRPV1. The software Discovery Studio Client was used to model these interactions and perform the necessary calculations. TRPV1 structure was obtained from Protein Data Bank (PDB; 3J5P) and the ligands were all drawn within the program. The four different calculations include preparation of the ligands and protein including adding force fields, the initial ligand protein docking, an in situ ligand minimization and lastly the calculation of the binding energies. Comparison of the ligand binding energies shows the effectiveness of their ability to bind to and activate TRPV1. The research outcome will help us identify new TRPV1 agonists and inhibitors, which will advance their use against pain, neurodegenerative and metabolic diseases in which TRPV1 is implicated.

Class D Audio Amplifier

Brandon Crawford with Dr. Jon Pikal

Electrical Engineering

University of Wyoming

Oral Presentation

Department of Electrical & Computer Engineering

Parkersburg, WV

Since the invention of the telephone at the end of the 19th century, there has been a need to transform weak, low amplitude electrical signals into stronger, higher amplitude forms. Traditionally, this amplification has been accomplished with vacuum tube or transistor-based amplifiers acting within their linear region of operation. Modern electronics, however, demand higher efficiencies than traditional amplifier designs can typically deliver, requiring a more innovative approach to an old problem. One method of drastically increasing efficiency in the amplification stage involves the use of a Class D, or switch mode, amplifier. The goal of this project was to research, simulate, and then build a CMOS Class D Audio Amplifier capable of driving a home audio speaker. By incorporating the use of industry standard software with design techniques taught in University of Wyoming electronics course, a functional Class D Amplifier design was realized.

Investigating potential effects of wind turbine color on attracting pollinating insects

Madison Crawford, Lusha Tronstad

Wyoming Natural Diversity Database

University of Wyoming

Oral presentation

NASA Space Grant and Wyoming Research Scholars

Newcastle, WY

Due to the growing demand for renewable energy in the United States, wind power is among the fastest growing clean energy resources. Despite the push for renewable wind energy, there is currently a limited understanding of the impact wind turbines may have on an ecosystem. Studies have shown high mortality rates of birds and bats around wind farms, but we are not aware of any studies investigating insects. Pollinating insects frequently choose the flowers they visit by color and tend to prefer white, yellow, and blue flowers, as well as blooms that reflect UV light. As most wind turbines in the United States are white, pollinators may be more attracted to the structures. To investigate this, we addressed two questions: "What color attracts the most pollinators?" and "What type of pollinators are attracted to which color?" We used wind turbine mimics of nine colors and placed them on a hill with characteristics similar to a wind farm. Insects were caught by pairing each mimic with a corresponding trap station consisting of a vane trap and a bee cup. We found a greater abundance of total pollinators in the white, purple, and blue stations, and the least abundance in the green, orange, yellow, light grey, and dark grey stations. Our results suggest that white, the color of most wind turbines in the United States, is one of the most attractive colors to pollinators. This could be detrimental to these ecosystems, as pollinating insects serve as keystone species in most terrestrial environments.

Do different trematode parasites possess similar elemental Ratios relative to their snail hosts? A novel application of ecological stoichiometry to parasite-host interactions.

Olivia Croft and Dr. Amy Krist
Zoology and Physiology
University of Wyoming
Poster Presentation

Wyoming Research Scholars Program

Elemental ratios often define and constrain organismal function with implications ranging from the populations to ecosystems (Elser et al. 1996). This field of study called ecological stoichiometry focuses on the elements carbon (C), nitrogen (N), and phosphorous (P) because they are the primary ingredients of organisms (excluding water). Organisms with high growth or reproductive rates are predicted to possess low C:P and low N:P ratios (Elser et al. 1996) because both growth and reproduction demand abundant phosphorus. This is because growing and reproducing requires ribosomes, which are approximately 10% phosphorous by mass. Thus parasites, which must have high growth and reproductive rates to complete their life cycles, are predicted to possess low C:P and N:P ratios relative to their hosts. For my research, I am investigating the elemental ratios of several trematode parasites relative to their snail hosts. My overall question is whether, for multiple snail and trematode species, the elemental ratios of parasites and hosts remain constant. I predict that trematodes will have lower C:P and N:P ratios (higher Phosphorus) than their snail hosts because of their high growth and reproductive rates and because the parasites may pull phosphorus from said hosts; unlike free-living organisms parasites have only their hosts as a source for all nutrients. By separating parasitized snail tissue from healthy, parasite-free tissue from the same organism and analyzing it via phosphorus acid digestion and elemental analysis at the University of Wyoming Stable Isotope Facility I seek to gain a greater understanding of the relationship between trematode parasites and the snails they inhabit.

Toluidine Blue Staining of Resin-Embedded Sections for Evaluation of Peripheral Nerve Morphology

Richard Czaikowski¹
¹University of Wyoming

INBRE

Laramie, WY

Peripheral nerves extend throughout the body, enervating motor and sensory target tissues. Due to widespread distribution throughout tissues, peripheral nerves are frequently damaged because of trauma or disease. As methods and strategies have been developed to assess peripheral nerve injury, function and regeneration, analyzing the morphometry of the peripheral nerve has become an essential outcome measurement. Toluidine blue staining of nerve cross sections obtained from resin embedded nerve sections is a reproducible method for qualitative and quantitative assessments of peripheral nerves, enabling visualization of morphology, number of axons, and degree of myelination. This technique, as with many other histological methods, can be difficult to learn and master using standard written protocols. The intent of this project is therefore to accentuate written protocols for toluidine blue staining of peripheral nerves with videography of the method, using sciatic nerves harvested from rats. In this protocol, we describe in vivo peripheral nerve fixation and collection of the tissue, and post-fixation with 2% osmium tetroxide, embedding of nerves in epoxy resin, and ultramicrotome sectioning of nerves to 1-2 μm thickness. Nerve sections then transferred to a glass slide and stained with toluidine blue, after which they are quantitative and qualitatively assessed.

Stomatal features across multiple species and its effect on CO₂ regulation and plant hydraulics

Ethan Darling with Dr. Carmela Rosaria Guadagno
Microbiology
UW
Poster

Microbiology

North Platte, NE

Current climatic changes impact a variety of plants from woody to herbaceous species. Stomatal conductance is one of the most responsive physiological traits to environmental changes. Stomata represent the main regulator for two essential physiological mechanisms in plants: water use and carbon uptake. This raises the question of how different stomatal features across species impact plant response to stress. Importantly, in order to explore differences in water use, we utilize *Atrémisia tridentata*, *Populus grandidentata*, and *Pinus ponderosa*. All of these species were selected because spanning across a wide spectrum of morphological structures. Pine needles characterized by a waxy cuticle; Sage with high number of small leaflets and a fuzzy cuticle; Aspen with broad leaves and thin cuticle. We analyzed the leaf water potential, gas exchanges, and the chlorophyll a fluorescence in well-watered conditions. Our preliminary data shows Aspen and Sagebrush have a much higher photosynthetic efficiency than Pine. As this research proceeds, we will analyze stomatal depth and density. Coupled with our results for gas exchange and water potential, a fine characterization of their stomata will be able to possibly identify water use strategies amongst these different Wyoming native species.

The effect of medial and lateral jump directions on single-leg landing mechanics

D.J. Davis¹, Dr. Boyi Dai¹

¹Department of Kinesiology and Health Promotion, University of Wyoming
Oral Presentation

INBRE

Gillette, WY

Anterior Cruciate Ligament (ACL) injuries are common and potentially devastating. Many of these injuries are non-contact, occurring in jump-landing, particularly at an angle, or cutting movements. In addition, these injuries may result from single-leg landings which subjects the landing leg to more force. The present study examined landing mechanics elucidated by single-leg landings from various angles. Six males and four female recreational athletes participated. Researchers placed 23 retroreflective markers on participant's body segments. Kinetic and kinematic data were collected using eight Vicon cameras (160 Hz) and a Bertec force plate (1600 Hz). Participants stood on a 30 cm box a distance one-half their height from a force plate, hopped onto the force plate with their dominant leg, and jumped for maximum height. The landing condition (Forward, Medial, Lateral, Medial 45, Lateral 45) defined the jump direction relative to the force plate. Results show increased knee valgus angle at contact between the Forward condition and both lateral conditions. When compared to the Forward condition at contact, greater hip adduction occurred in both medial conditions and greater hip abduction occurred in both lateral conditions. Both lateral landing conditions also demonstrated greater knee valgus angles 100 ms following landing compared to the Forward condition. These results indicate that athletes may utilize different preparatory actions before landing from different directions and consequently load the knee differently. Landing from a lateral jump resulted in increased hip abduction and increased knee valgus, which are consistent with movement patterns observed when ACL injuries occur.

Autonomous Tennis Ball Retrieval

Paul Fechtmeister, Jacob Sanderlin, Phillip Scott, Justin Nason, Tom Davis, Gwen Brewer

with Dr. Mike Borowczak

Computer Science

University of Wyoming

Oral & Poster Presentation

Department of Computer Science

Laramie, WY

Tennis players like hitting tennis balls, but picking up tennis balls not so much. Currently, players are forced to burn energy after their session bending over continuously to pick up balls from the court. For those tennis players that suffer from chronic back pain, Ballspot has built a robot that would autonomously pick up balls from the court in place of the player. The goal of this project was to build a robot that would autonomously recognize, maneuver to, and pick up tennis balls off of a tennis court. This was accomplished by designing and building a robot that uses a camera attached to a micro-controller to recognize the balls. The micro-controller connects to our motor controller which operates our motors and drives the robot.

Impact of Maternal Obesity on Term Fetal Sheep Heart Genomic Gene Expression Profile

*Denise De Loera^{1,2,3}, Qiurong Wang¹, Chaoqun Zhu¹, Peter W Nathanielsz¹, Stephen P. Ford¹ and Wei Guo¹

¹Center for the Study of Fetal Programming, Department of Animal Science, University of Wyoming, Laramie, WY; ²Microbiology Program, University of Wyoming, Laramie, WY;

³Department of Molecular Biology, University of Wyoming, Laramie, WY

INBRE

Rock Springs, WY

The rising incidence of obesity is adversely affecting general health worldwide. Obesity has reached pandemic and the prevalence is projected to grow to 70% by 2025. As many as 1 in 5 women are obese during pregnancy. The fetal environment is considered a key factor in the etiology of cardiovascular disease later in life. Over nutrition during pregnancy/maternal obesity, can lead to an adverse uterus environment for fetal development, which could cause molecular and physiological adaptive changes. These adaptive changes may result in long-term consequences in offspring, such as marked physiological and structural alterations in the heart and other organ systems. Many studies have shown maternal obesity is associated with abnormal heart development as well as subsequent cardiovascular disease. Therefore, we hypothesize that maternal obesity will lead to alterations to the genomic gene expression profile in fetal heart. To test this hypothesis, we used maternal obesity sheep model and at late gestation the fetal hearts (3 from control group and 3 from maternal obese group) were removed from fetuses and total RNA was prepared. A genomic gene expression profile was performed by mRNA sequencing on the Illumina platform. Sequencing reads were mapped to sheep reference genome by SNAP aligner. Analysis of count-based differential expression was performed using the counting tool featureCounts and further analysis was done by DESeq2.

A Female Direction
Kathryn Demith with Patrick Konesko
Department of Theatre and Dance
University of Wyoming
Oral and Visual

Honors

Dallas, TX

I'm taking a close-up look at the processes, inspirations and results of female directors in theatre and film throughout the last few decades. Starting with the British Bomb, Joan Littlewood in the 1960s. To the most recent success for females in leading positions, Greta Gerwig who was just nominated for an Oscar for her outstanding screenplay and direction of the film, *Lady Bird*. The director is usually the highest position of artistic and communicative leadership for an individual project. They are responsible for the theme, tone and aesthetic of the show. They have to be able to communicate very clearly and effectively with a wide variety of people. They need to have good people skills and clear expression. In the artistic realm, the director must also have the ability to understand and simplify abstract or complex concepts and be able to visualize, then actualize those concepts. So I will be analyzing roughly 3 – 5 different female directors on the ways that they convey these attributes in their processes. I will also be making critical theatrical analyses of their bodies of work. Finally, I would like to make an analysis of myself as a director. What have I learned from my own experiences as a director? These women who came before me have each paved the way for me to go forward with this ambition. What tools can I draw from their work and experiences? How can they inspire the way that I direct in the future?

Baxter Research Robot playing chess utilizing computer vision and verbal commands

Connor Desmond, Zephaniah Connell and Ryan Cook
with Dr. Suresh Muknahallipatna and Debra Kretzschmar
Electrical and Computer Engineering
University of Wyoming
Oral and Poster Presentation

Department of Electrical and Computer Engineering

*Cheyenne, WY
Casper, WY
Cheyenne, WY*

The Baxter robotic system is an extremely sophisticated piece of machinery, equipped with a myriad of sensors and features. As of yet, very little research has been accomplished utilizing Baxter by students or faculty in the Department of Electrical and Computer Engineering at the University of Wyoming. This project is a base that will enable future employment of Baxter for more intricate and advanced research topics. This project was derived to showcase a large portion of Baxter's functionality in an easily digestible and potentially expandable format. It will display a convenient form of user interaction (voice commands), utilization of computer vision (detecting chess board and pieces), and safe and precise physical interactions with or near humans (moving chess pieces). The goal of this project is to enable the Baxter robotic system to move chess pieces on a chess board based on user input in the form of voice commands. This can be broken up into four main parts: physical movement of Baxter's appendages, computer vision to locate the board and chess pieces, voice recognition for the necessary set of commands, and internal chess board state information and chess logic.

Orchestrated Interests: Examining the Self-Autonomy and Ideology of the Nicaraguan Contras 1979-89

Jackson Deterding Dr. Alexandra Kelly
University of Wyoming
Oral Presentation

Honors

Lincoln, NE

Much research and historical interpretation has been given to the Contra-Sandinista conflict in Nicaragua during the 1980's. The Sandinista National Liberation Front (FSLN), quickly rose to power in 1979 and established a revolutionary socialist government with the overthrow of the U.S.-backed dictator, Anastasio Somoza. Supported by the Soviet Union, the FSLN relied on the important ideological connection of Augusto Sandino and his rebellion in Nicaragua (1927-33). Ultimately, the FSLN created a revolutionary narrative that appealed to persons in and outside of Nicaragua during the 1980s. In contrast, the Contras (*contrarrevolucionarios*), a semi-united group who attempted to overthrow the FSLN in the 1980s, found the majority of its support from a rural peasant populous in the remote Northeastern foothills of Nicaragua. Much discourse by Latin American scholars since 1980 have uniformly categorized the Contra Fighters as "instruments" of Washington that lacked any particular sovereignty from the U.S. and were virtually a continuation of the U.S. hegemonic presence in Latin America since the 19th Century. In addition to this traditional discourse above, my previous research on the Contra's lack of self-autonomy within its organization will be the fundamental presumption for this paper. Utilizing this framework, a comparative analysis will be performed on the specific ideology of the Contra fighters and FSLN government. Whereas the FSLN demonstrated a cohesive and coherent ideology with Augusto Sandino as their national icon, the Contra's monetary relationship with the U.S., numerous human rights violations, and unconnected organization all led to the Contra's failure to obtain power.

Interactions of Rhizosphere Microbiome and Glucosinolate Production in *Brassica rapa*

Ella DeWolf with Dr. Cynthia Weinig and Dr. Marcus Brock
Molecular Biology
University of Wyoming
Oral Presentation

Wyoming Research Scholars Program

Laramie, WY

Rhizosphere microbes have been shown to influence plant growth and stress tolerance. Certain microbes can also aid in plant defense against insects by affecting expression of defense-related genes (Pineda et. al, 2010). Additionally, plants influence the soil microbial community by root exudation of compounds to inhibit or stimulate specific microbial taxa (Berendsen et. al, 2012). Plants in the family Brassicaceae produce secondary compounds called glucosinolates (GLS) that help protect against insect damage (Pineda et. al 2010). However little is known about how these compounds influence the overall rhizosphere microbial community. The goal of this project is two-fold. The first goal is to determine the effect of GLS produced in the roots of *Brassica rapa* on the rhizosphere microbial community. Twelve genotypes of *B. rapa*, as well as four transgenic strains of *Arabidopsis thaliana* were chosen based on their levels of indolic and aliphatic GLS production. Plants from each genotype were grown and their roots harvested for GLS analysis. Rhizosphere soil was also collected for microbial community analysis by 16s rRNA sequencing. The second part of this project investigated whether the soil microbial community affects GLS production and insect damage. Each genotype from part 1 was planted in both an intact and disrupted soil microbial community. These plants were exposed to flea beetles in the field and leaves from these plants were harvested for GLS analysis and analyzed for insect damage.

Characterization of *Fusarium oxysporum*

Julia Dickie with Dr. Karen Wawrousek, Kurt Stahlfeld
Department of Chemical Engineering
University of Wyoming
Poster Presentation

Department of Chemical Engineering

Cheyenne, WY

Biofuel production is rapidly increasing in order to provide energy for growing human populations. One method of biofuel production is the synthesis of ethanol from lignocellulose found in corn. Upgrading corn stover (e.g., corn leaves, stalks, cobs) degradation is a primary focus because its lignin structure is complex, and thus difficult to degrade; consequently, biorefineries burn the leftover lignin component of lignocellulosic biomass as a low-value waste product. Lignin disposal methods must improve to reduce waste, warranting the characterization of organisms capable of degrading lignocellulose (i.e., high lignolytic potential). Some microorganisms and fungi, such as *Phanerochaete chrysosporium*, are known for their high lignolytic potential; however, previous studies indicate that the fungus *Fusarium oxysporum* is far more capable of degrading corn stover, which suggests that *P. chrysosporium* and *F. oxysporum* create different enzymes. One way to detect lignolytic potential is to monitor the degradation of dyes with molecular structures that resemble lignin. Extracellular enzymatic activity was evaluated by comparing the structures of attacked dyes and the rate at which these dyes were degraded. Additionally, these strains were further distinguished by comparing their growth and metabolic activity on various carbon sources such as kraft lignin, cellulose, and glucose. Differing fungal activity was observed, and these results improve the current understanding of lignocellulosic biomass degradation. Further characterization studies have implications that broaden the utilization of microbial metabolic processes, which appears to be a useful alternative to biofuel waste incineration.

Crypsis and predation in post-burn populations of southern red-backed voles and deermice

David M. S. Dodge; Dr. Hayley C. Lanier
Department of Zoology and Physiology
University of Wyoming at Casper
Poster Presentation

Wyoming INBRE

Casper, WY

In 1988 much of the Greater Yellowstone Ecosystem experienced widespread wildfires. The following year and periodically thereafter, small mammal studies were performed in the area. Recent data (a new 2016 burn) shows predicted changes in the post-burn populations of southern red-backed voles (*Myodes gapperi*; hereafter 'voles') and deermice (*Peromyscus maniculatus*). In pre-burn areas, vole populations were higher than those of deermice yet, in post-burn areas the opposite was recorded (voles: 50% in 2015 and 8% in 2017 compared to deermice: 18% in 2015 and 75% in 2017). We sought to test if the decrease in vole numbers was attributable to increased predation brought on by mismatch in coloration between the vole's ruddy back and the charred post-burn substrate. Model voles were made with equal numbers of each color morph (i.e., vole and deermouse). These were set out along 100 meter transects parallel to the existing small mammal study grids. Predation events were recorded daily for each morph for 239 model nights. While both models were subject to attempted predation, the results showed no statistical significance for differences based on vole and deermouse model coloration ($p = 0.8348$). It is possible that the number of model nights was not high enough to capture a significant difference or that the post-burn population of voles is influenced by factors not evaluated in this experiment (e.g., food resource availability). The importance of such studies lies in better understanding interspecies relationships, trophic level interactions, and how to manage diversity within conservation areas.

NASA Microgravity: Internal Structure and Recovery Method Optimization

Brenna Doherty & Dr. Kevin Kilty

Mechanical Engineering

University of Wyoming

Oral Presentation

NASA Space Grant, Honors

Columbia, MD

Microgravity is defined as a state of having very little gravity, such as that experienced in space. Research has been performed by NASA for over 25 years as a way to determine how space technologies are impacted by a microgravity environment. To simulate microgravity, an aerodynamic payload is dropped in a vacuum chamber or from high altitudes until a state of freefall is reached. NASA drop towers are the standard microgravity testing platforms used today. These towers can produce microgravity environments for 2.2-5.2 seconds; however, these platforms are expensive and require months of advanced planning. The University of Wyoming (UW) microgravity project aims to develop a low cost alternative, while also producing microgravity environments that are equal to or better than that of drop towers. For this project, microgravity is achieved by dropping an aerodynamic payload from a weather balloon from an altitude of 100,000 feet. If successful 15-20 seconds of microgravity can be achieved. The first UW microgravity drop occurred in August 2017. Shock force data from the drop revealed that the internal structure components were significantly overdesigned. Incorrect stress analysis of the recovery method contributed to this overdesign. The overdesigned components add unnecessary mass to the payload. The drop also revealed poor integration between the electronic systems and internal frame. The main objective of this project was to optimize the recovery method to reduce shock force, decrease the mass of the internal structure, and provide enhanced integration between electronic systems and the internal frame.

Enhanced Oil Recovery Planning

Jeremy Donaldson, Zach Lodge, Austin Maxwell, Abdullah Alotaibi

Dr. Brian Toelle, Petroleum Engineering

University of Wyoming

Oral Presentation

College of Engineering

Denver, CO

Denver, CO

Casper, WY

Riyadh, Saudi Arabia

Increasing recovery from oil reservoirs through enhanced oil recovery methods is becoming more important with a global increase in demand for hydrocarbons. In order to meet the demand, enhanced oil recovery processes must be run on conventional reservoirs after exhausting primary and secondary recovery or on unconventional reservoirs that require stimulation to produce oil economically. Through selecting a specific enhanced oil recovery method and determining the most valid scenario allows for continued recovery, in this case the Indian Tree Field in Northeastern Wyoming. The field was selected and all available data was collected for analysis of the field. The data collected included well logs (that had to be digitized), reservoir parameters, production history, and past operations. A Static model was created from these parameters and enhanced oil recovery processes were tested by dynamic simulations that allow us to determine the best enhanced oil recovery method(s) to make a suggestion for increasing production in this field. Initial findings suggest miscible CO₂ injection is the best enhanced oil recovery process for the chosen field. After selecting miscible CO₂ injection, the scenario is analyzed for multiple locations in the field and several directions in which the miscible CO₂ is injected to accurately determine the most effective way to increase production. No two reservoirs are identical, but duplicating this procedure in other like fields can further increase production. This allows for reservoirs to produce more oil before the point where production is no longer economically viable.

Wyoming's Water Resiliency
Hillary Donovan with Paul Pellissier
Environmental and Natural Resources
University of Wyoming
Poster Presentation

Honors

Laramie, WY

The state of Wyoming contains the headwaters for the Colorado River, a river that supplies billions of people their water throughout the Western United States. Water is a vital resource that all life needs to survive. As climate change is predicted to change the known water regime and timing in snowpack melt, the state must plan for changes in water availability. In 2015, Wyoming's Governor Matthew Mead released *Wyoming's Water Strategy* to address and plan for future water scarcity. Within his plan, the governor laid out plans for 10 new water storage projects in ten years. Three years after the plan was published, no projects have been completed and only two have been started. The goal of this project was to understand the necessity and accuracy for Governor Mead's plan. This was accomplished by observing and interviewing people throughout the state of Wyoming who would be affected by the Governor's plan. This project also offers different projects or solutions the state would benefit from considering the uncertainty in the future of water.

The Severity of Toxoplasmosis Infection and Parasite Burdens

Konea Dory, Aerianna Fox, Michelle Kilpatrick, Richard Magarian, Haley Simpson, Marie N. Yearling
Laramie County Community College

Toxoplasma gondii is a protozoan parasite that causes a disease known as Toxoplasmosis. It is estimated to infect 11% of Americans and is a leading cause of foodborne illness in the United States. Symptoms of infection vary among individuals and are thought to partially depend on the patient's immune system and the parasite strain. Even still, individuals with healthy immune systems may experience severe outcomes. Indeed, we observe a range of toxoplasmosis severity in genetically identical mice infected with the same parasite strain. Given that infection occurs orally, we focused our investigation on the relationship between intestinal microbiome and infection outcomes. Our role in this project is to determine parasite burden, which can be compared with pathology and microbiome composition data collected in our collaborator labs. We used qPCR to evaluate parasite load from mouse spleen, small intestine, feces, and brain at both acute and chronic infection. If a correlation is observed, further research will investigate the infection outcomes following the depletion of the mouse microbiome.

On the Opportunities and Efficacies of Ants as Model Organisms for Biomedical and Bioinformatics Research.

Andrew J. Drake and Eric C. Atkinson
Biology Department
Northwest College
Oral Presentation

INBRE

Worland, WY

Due to an increase in the effectiveness of biotechnology in many fields of study, we concluded that research in Formicidae, the ants, could offer many benefits. We are initiating a two-pronged research project relying upon ants native to Wyoming and the surrounding region that may serve as Model Organisms. Formicids are ubiquitous, abundant, diverse, and serve pivotal roles in ecological communities. Furthermore, their behaviors lend themselves well to manipulatory studies and investigations. The main purpose of this research is to determine if bacteria from ants in the mid-temperate latitudes produce antibiotic compounds as do some tropical fungus-growing species. We will test ant-inhabiting bacteria for bacteriostatic and antibiotic compounds against *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa* through the Kirby-Bauer disc diffusion method. Various species including, but not limited to, *Pogonomyrmex occidentalis*, *Camponotus modoc*, and *Tetramorium* sp. will be assessed. Additionally, via Next Generation Sequencing (NGS) we hope to definitively conclude whether 'Tetramorium sp. A' from the Old World is conspecific with *Tetramorium* in the New World.

A Collection of Feminist Short Stories Inspired by Myth, Folklore, and Fairytales

Celia Egghart with Nina McConigley
English
University of Wyoming
Oral Presentation

Honors

Palisade, CO

Folk and fairy tales are often deemed as nothing more than “children’s stories” or “old wives’ tales.” With this ideology, stories that are seen as “childlike” or “feminine” are somehow labeled as unimportant or silly. However, these tales, as well as their adaptations, are anything but frivolous and trivial. Folk and fairy tales have the unique power to reflect or change the cultural values of a people and era through their morals and lessons. With this project, I will examine this genre of creative writing and rework classic stories from a feminist perspective to reflect the issues and values of the 21st century. I will be writing a series of short stories inspired by myth, folklore, and fairy tales that feature strong female characters figuring out their own solutions to their problems and becoming their own fairy godmothers. The stories focus on the themes of resilience and courage, individuality, and finding a voice.

Extractivism, Conflict, and Territoriality in Yasuni National Park, Ecuador

Sara Ellingrod and Dr. Zoe Pearson

Global and Area Studies

University of Wyoming

Oral Presentation

Honors

Clearmont, WY

The Block 16 oil concession of Ecuador offers a case study that demonstrates the coexistence in space of several distinct sociopolitical agendas in which governance and conflict occur in less visible ways—that are no less a product of neoliberal ideologies of conservation, extraction, and indigenous multiculturalism. Drawing from ethnographic research conducted in 2017, in this presentation I demonstrate how cultural, conservation, and extractive agendas are made discursively and materially complementary on the ground. In the northwest portion of Ecuador's renowned Yasuni National Park, the Block 16 oil concession, Waorani indigenous communities, and scientific activities come together in ways that benefit the logics of state extractivism. For geographers and other scholars working in such complex frontier landscapes, it is important to consider the extent and character of conservation-corporation-state compatibilities, and their impacts on the residents of resource-rich places. This presentation provides one such example, and in doing so contributes to scholarship on the production of territory, embodied experiences of extractivism, and the social reproduction of the state.

Effectiveness of the U.S. Department of State's Trafficking in Persons Report: Burkina Faso

Sara Ellingrod, Emily Miller, Gabriel Selting

Dr. Yi-Ling Chen

University of Wyoming

Oral Presentation

School of Politics, Public Affairs & International Studies

Sara Ellingrod, Ten Sleep, WY

Emily Miller, Cheyenne, WY

Gabriel Selting, Laramie, WY

Human trafficking is a global human rights problem with many complexities that vary by location, type, and other factors. Despite the differences, human trafficking occurs in every country in the world. For our research, we are examining the effectiveness of the U.S. Department of State's annual Trafficking in Persons Report (TIP Report). The TIP Report ranks every country on their efforts to eradicate human trafficking. If countries underperform then they are downgraded and potentially face economic sanctions. The TIP Report has many inherent flaws, such as the United State's ability to manipulate results for a political agenda as well as inaccuracies due to the many challenges in collecting accurate trafficking data. We are focusing on how trafficking and the TIP Report impact the western African country Burkina Faso. In our research, we analyze how Burkina Faso has been negatively affected by its placement within the TIP Report. In 2017, Burkina Faso was downgraded from Tier 2 to Tier 2 Watchlist and if they are unable to make improvements then they will be downgraded to Tier 3, which requires economic sanctions to be implemented by U.S. Congress. We use qualitative and quantitative data as well as a literature review to support our research.

LPU Puncture Actuator

Sarah Elliott, Sarah Hankins, Alex Duman, Abdulhadi Mansour H. Al Musalami, Tariq Alahmadi
Gustave Anderson, Manufacturing Works, UW Petroleum Engineering Adjunct Professor
University of Wyoming Mechanical Engineering
Oral Presentation

Mechanical Engineering

Sarah Elliott Denver, CO
Sarah Hankins Thornton, CO
Alexander Duman Cottonwood, ID
Hadi Al Musalami Alhasa, KSA
Tariq Alahmadi Madinah, KSA

Navy Aviators are required to wear life vests as an emergency precaution. To activate the life vest, two beaded handles are pulled triggering a puncture actuator which pierces a CO2 cartridge and guides the released gas into an inflatable bladder. The purpose of the life vest is to provide buoyancy so the Navy Aviator's head stays above water until rescued. Unfortunately, the current puncture actuator lever design is flawed and frequently malfunctions. The external lever often gets caught on the packed bladder or the beaded handles' rip cord breaks which prevents activation. As a result, Kennon Products has tasked the team with designing three fully functioning puncture actuator prototypes that solve this problem. Kennon mandated that the new designs are more dependable and puncture the CO2 cartridge enough to fill the bladder in three seconds or less. In order to increase reliability, the team determined that the new designs need to be totally incased so no parts are interacting with the external environment and that a new material is chosen for the rip cord. Over the course of 7 months the incumbent design was analyzed, mechanisms to puncture the CO2 canister were brainstormed and three final designs were selected. The three designs that advanced to the prototyping stage included a camshaft, a compressed spring, and a solenoid battery activated design. The team will submit the final products to the sponsor company, Kennon Products, who will present the designs to their NavAir correspondents.

D Printing Environmental Control

Benjamin Engel, Steven Barrett
Department of Electrical and Computer Engineering
University of Wyoming
Oral Presentation

The project '3D Printing Environmental Control' was designed to augment the capabilities of the popular open-frame Prusa i3-style 3D printers. Hobbyists prefer these machines as they tend to be quite affordable; however, these printers also lack desirable features that make 3D printing a much easier task. The project consisted of two components: an enclosure which the printer is placed in, and a controller that monitors various aspects of the 3D printing process for faults and errors. The controller device was equipped with two temperature sensors for monitoring the ambient temperature both inside and out of the enclosure. Cooling fans were used to maintain the internal ambient temperature within an acceptable range for the printed material. An I2C serial communications bus was implemented to allow for communications with external print servers and the device's LCD display. A three-color set of indicators enabled the controller to quickly communicate common faults and errors. In addition, the controller was also equipped with sensors to monitor the status of the enclosure door to maintain heat retention, as well as sensors for monitoring for filament run-out and filament jamming. The enclosure was constructed out of plywood and acrylic, with appropriately placed windows and doors, and the controller was mounted to the enclosure with the sensors located in appropriate locations.

Particle deformation cytometry to study poly(ethylene) glycol hydrogel degradation

Cassidy Enloe¹, John Oakey¹

¹Department of Chemical Engineering, University of Wyoming

Oral Presentation

INBRE

Big Horn, WY

The purpose of this research project is to characterize the degradation of poly(ethylene) glycol (PEG) hydrogels order to control the timing of drug or protein release. Drug or protein carriers can be suspended within a PEG hydrogel-forming solution. PEG hydrogels are formed from PEG macromers with acrylate end groups that photopolymerize to create polyacrylate chains. The new polymers are crosslinked by PEG creating a three-dimensional mesh that is swollen with water but insoluble in water. A surface eroding polymer, poly(lactic-co-glycolic acid) (PLGA), was used to encapsulate hydrophobic molecules, along with three versions of bulk eroding PEG hydrogels: a diacrylated poly(lactic acid)-PEG triblock copolymer (PLA-PEG-PLA-DA), PEG-norbormene (PEG-NB), and a diacrylated photodegradable PEG (PEG-di-PDA). We demonstrate the hydrogel's microstructure impacts degradation rates, and combining different versions of PEG hydrogels alters the timeframe of release. Encapsulating drug-releasing PLGA nanoparticles in secondary and tertiary layers of bulk eroding hydrogels significantly delays degradation. The encapsulations were enabled by our unique micro-fabrication capabilities that allow structures of heterogeneous materials to be created. Containing the PLGA nanoparticles within layers PEG hydrogels resulted in a prolonged continuous release window for the surface eroding PLGA. Secondary, and tertiary, encapsulation also allows for molecules to be contained in separate layers of the hydrogel. This permits for a gradual release of molecules. The ability to alter degradation rates allows PEG hydrogels to be used as a programmable, passive release vehicles for drugs and proteins.

White Ethnic Diversity and Voluntary Association Participation in Small Town Iowa

Jessica Evans Matthew A. Painter

Sociology

University of Wyoming

Poster

McNair Scholars Program

Rock Springs, WY

Voluntary association participation is willing involvement in an organization. It provides individuals with opportunities to develop interpersonal relationships, networks, and community attachment. Extensive research has been conducted on the reasons why people participate in volunteer groups. In this study, we build upon previous research, which finds that racial/ethnic diversity hinders social life. We focus on white ethnic diversity, particularly European ancestry, and its effects on voluntary association participation. Using data from the 2004 wave of the Iowa Community Survey, we examine this proposed relationship within small, rural communities. This study will enhance researchers' understandings of how ethnic diversity in a seemingly homogenous population affects the central aspect of any community, as well as the hard work and time people put into organizations that make communities better. We conclude with a discussion of the broader implications of the study, and how diversity will continue to shape the appearance of both communities and social organizations.

Science Initiative Hits the Road: University of Wyoming Outreach Program Supports Statewide Engagement and Active Learning Through Student-Led Lessons.

Logan Fairbourn, Natalie Thibault, Jeffrey Johnson, Emily Armitage, Ella

Rachel Watson, Department of Molecular Biology

The University of Wyoming

Oral

WRSP, LAMP, McNair

Logan Fairbourn Cheyenne, WY

Natalie Thibault Cheyenne, WY

Jeffrey Johnson Rock Springs, WY

Emily Armitage Cheyenne, WY

Ella DeWolf Laramie, WY

In 2017, The University of Wyoming Science Initiative's (SI) Learning Actively Mentoring Program (LAMP) offered scholarship support to 16 K-12 educators across the state to attend the Wyoming Department of Education's Roadmap to STE(A)M conference. As a part of this funding, educators were asked to open their classrooms to undergraduate researchers to practice active learning and excite the next generation of STEAM professionals. Simultaneously, the University launched a multi-pronged effort glean community support for the release of appropriated funding to construct the SI building. Seven undergraduate students hailing from diverse fields in the sciences and arts galvanized outreach efforts, and were supported by the Wyoming Research Scholars Program, LAMP, the McNair Program, grad students, and faculty from across the UW campus. Over the course of the 2017/2018 academic year, those seven undergraduate researchers visited 9 cities, 12 schools, and over one thousand students. In all cases, we received a positive response from both students and faculty; in fact, the requests that we received for visits outnumbered our capability. We, as undergraduates, believe that this program - *The Roadshow* - is essential to the growth and development of human capital in our state. Yet, we are keenly aware of the fact that *The Roadshow* in its current form, is unsustainable. We hope that in gathering relevant stakeholders to discuss the results of this effort, we can work together to crystallize the *Roadshow* as a part of the greater institution.

Climate Analysis of the Eocene Thermal Maximum 2

Sarah Fanning and Dr. Ellen Currano

Botany / Geology and Geophysics

University of Wyoming

Poster Presentation

Botany

Thornton, CO

The Eocene Thermal Maximum 2 (ETM2), a significant and geologically abrupt global warming event that occurred approximately 53.7 million years ago, was caused by the release of isotopically light carbon into the atmosphere. This isotope excursion is not as large as the one seen in the Paleocene-Eocene Thermal Maximum (PETM, 56 million years ago), which had nearly a complete turnover of vegetation. Therefore, we expect the change of the ETM2 flora to be less severe than that seen in the PETM. The ETM2 is an important interval of warming to study as it allows for a greater understanding of the climate during the Eocene and the change in the flora that accompanied the global warming event. Here, we examine a fossil flora from the Bighorn Basin, northwest Wyoming, that is the first paleobotanical site known from the ETM2. Fossil leaves were cataloged and dicot specimens were morphotyped using the standard 61 character analysis (Ellis et. al, 2009) The most abundant leaf types at the site were *Platanites raynoldsii*, representing 36% of the flora, and an unnamed legume morphotype, representing 13% of the leaves. Mean Annual Temperature (MAT) was estimated using a paleobotanical proxy based on leaf margin type. The MAT for the ETM2 13.4°C, lower than the 20°C reconstruction for the PETM. During the PETM there are none of the usual taxa like *Platanites* that are found in the Paleocene and early Eocene. The ETM2 represented a very unique ecosystem that was different from the PETM.

High-Performance Computational Modeling for In Vitro Pulsating Arterial Dynamics

Mark Fenn with Dr. Maysam Mousaviraad
CEAS – Mechanical Engineering
University of Wyoming
Oral Presentation

INBRE

Pinedale, WY

Dr. Bud Chew of WWCC has been performing in-vivo experiments for measurements of pressure-volume loop in mice and rats with heart failure to study the effects of manipulating RBM20 levels to improve the diastolic function by restoring the wall stiffness [1]. However, the in-vivo experiments have not isolated the effects of wall stiffness, and are unable to visualize and quantify the modifications in the interactive fluid-structure patterns due to stiffness alterations. To achieve this, in-vitro experiments are required to study the deformation of the arterial walls of the healthy and unhealthy animals in response to pulsating flows. My research will develop a high-performance computing (HPC) model to simulate such isolated behavior, which will provide great insight into the interactions between the fluid and structure dynamics and how the alterations contribute to cardiovascular diseases. The computational model will also provide guidance and validation for the in-vitro experiments that Dr. Chew will be carrying out in the future, as part of a joint proposed work with my mentor, Dr. Mousaviraad. The simplified in-vitro simulations and experiments on arteries from healthy and unhealthy animals will provide significant knowledge on the mechanism of action for the role that RBM20 manipulation plays in treating heart failure with preserved ejection fraction. Also, the simplified high-performance computational modeling for arterial flows will be preliminary to modeling development for a complete cardiovascular system that includes the heart ventricle flows. In order to develop high-performance computational capabilities, I am using an advanced research code called OpenFoam rather than engineering software such as ANSYS Fluent. The high-performance capability will allow me to run simulations on the UW ARCC supercomputers, using many CPU cores to run in parallel for highly resolved simulation results.

How The Brain Uses Sensory Information to Make Decisions: Role of Auditory Cortex in Female Mate Choice

T.W. Fenn, K.S. Lawley, J.F. Prather
University of Wyoming, Neuroscience Program
Department of Zoology and Physiology

INBRE

Laramie, WY

In the natural environment, organisms encounter a vast array of sensory input, and they use that information to decide what actions to take in response to the information gained from those experiences. To address the neural basis of this decision making process, we investigate mate choice in female songbirds. A female bird listens to songs performed by male suitors, evaluates the quality of those courtship signals, and uses that information to choose their mate. Preliminary results from ongoing experiments in our lab have implicated auditory brain sites such as the caudal mesopallium (CM) and caudal nidopallium (NC) is playing key roles in shaping a female's evaluation of song quality and behavioral report of mate preference. To understand how these auditory areas have their influence on motor sites to influence courtship and mating behaviors, we traced the efferent projections from NC to its downstream targets. By identifying these pathways between NC and its downstream motor sites, we have revealed critical missing links between sensory perception centers (NC) and downstream motor regions. The findings from this study will provide us with a more complete understanding of the neuronal pathways involved in mate selection and will open the door to further investigations of the pathways that underlie decision making in other species including humans.

LokkaL – A Group Location-Sharing Application

Kolby Fenster and Josh Sloan

with Dr. Mike Borowczak

Computer Science

University of Wyoming

Oral and Poster Presentation

Department of Computer Science

Laramie, WY

As smart devices become more and more popular among the general population, their use as a tool of communication is no longer their primary functionality. These devices are being used and treated as miniature computers that provide access to entertainment, email, and many other services. We as a group decided to focus on the location-tracking aspect that many smart devices currently provide in hopes of addressing the problem of visiting a location with a group, splitting up, and being unable to know where other group members are. Our solution was to create a free and easy to use mobile application that allows users to share their current location in real-time and send/receive notifications to other members in their group, while not draining a device's battery life. The application is currently designed to run on smart devices running an Android operating system and was built using Android Studio. While other applications currently exist that have similar purposes, our application, LokkaL, was designed to include functionality that is not commonly found in free applications or has not been widely implemented. These features include knowing other members' battery life, notifying members when another group member has left a marked area, and an easy-to-use interface that allows users to easily create groups with one another. No longer will one have to worry about being unable to locate a group member when traveling to a new city, a concert/music festival, or even just a night downtown.

LokkaL – A Group Location-Sharing Application

Kolby Fenster with Dr. Jim Ward

Senior Honors Thesis

University of Wyoming

Oral Presentation

Department of Computer Science

Laramie, WY

As smart devices become more and more popular among the general population, their use as a tool of communication is no longer their primary functionality. These devices are being used and treated as miniature computers that provide access to entertainment, email, and many other services. We as a group decided to focus on the location-tracking aspect that many smart devices currently provide in hopes of addressing the problem of visiting a location with a group, splitting up, and being unable to know where other group members are. Our solution was to create a free and easy to use mobile application that allows users to share their current location in real-time and send/receive notifications to other members in their group, while not draining a device's battery life. The application is currently designed to run on smart devices running an Android operating system and was built using Android Studio. While other applications currently exist that have similar purposes, our application, LokkaL, was designed to include functionality that is not commonly found in free applications or has not been widely implemented. These features include knowing other members' battery life, notifying members when another group member has left a marked area, and an easy-to-use interface that allows users to easily create groups with one another. No longer will one have to worry about being unable to locate a group member when traveling to a new city, a concert/music festival, or even just a night downtown.

**Caregiver Interaction Styles:
Culturally Consistent Rehabilitation Strategies for
Latino Children with Developmental Language Disorders**

Kyliah Ferris and Dr. Mark Guiberson, Ph.D
University of Wyoming
Oral Presentation

INBRE

Laramie, WY

The Latino population has grown significantly within the United States over the past ten years. According to the U.S. Census Bureau, in 2008, 28% of preschool age children spoke a language other than English at home, with a majority speaking Spanish (Kominski & Shin, 2008; Guiberson, 2015). Yet, most treatment techniques for children with developmental language disorders (DLD) are based on European-American families within the U.S. The purpose of this research was to suggest culturally consistent rehabilitation strategies for Latino children with DLD, by describing Latino caregiver interaction styles and preferred teaching activities. Results show that 1) a majority of participants consistently showed interdependent behaviors during play interactions and 2) preferred teaching activities by Latino caregivers include teaching and/or telling their child the names of colors, letters, and numbers, asking questions to help their child think about what they are doing, and reading to their child. Suggested rehabilitations strategies include caregiver-child book sharing and focused stimulation.

Automated Oil Sample Retrieval System from Wind Turbine Gearbox

By David J. Finch, Austin S. Kennedy, Julian D. Bouckenooghe, Luke C. Thompson

Advisor and Instructor: Lawrence Willey, Mechanical Engineering

University of Wyoming

Oral and Poster Presentation

Chas Ogden, CTO, LogiLube, LLC

Casper, WY

Evanston, WY

Belgium

Northglenn, CO

Manual oil sample retrieval from hard to reach locations, such as wind turbine gearboxes, is currently performed manually by wind turbine technicians climbing 80 meters or more to access the gearbox. The product developed is envisioned to offer an automated retrieval system to replace the manual retrieval currently in practice. This can allow for more frequent sample collection. In turn, the goal of monitoring systems more frequently is achieved. Collaboration with LogiLube™ fostered resources and guidance in this design project. The product is designed in a lightweight, compact manor to allow for attachment to a drone. A medium size drone model with approximate max horizontal dimensions of 30 inches and a payload capacity of 5 pounds force was selected. A high endurance drone is required and was selected. However, flexibility to accommodate other drone types is critical. Cost reduction was considered as well as failure prevention. Major obstacles encountered included determining how to move the device from directly underneath a drone to its destination (a SmartGear™ device from which the sample bottle is filled). A linear motion mechanism in the form of scissor arms overcomes this major obstacle. Another obstacle is the attachment of a drone to a turbine nacelle. This challenge is not being considered in this phase of the solution. However, this challenge was considered in design considerations to avoid future conflicts. This solution will save time, labor, and allow for critical data collection which can allow for better component maintenance. The next step is to test this product and perform the required modifications.

Controls on Abrupt Forest Changes in the Snowy Range, Medicine Bow Mountains, Wyoming

Andrew Flaim with Dr. Bryan Shuman

Geology and Geophysics

University of Wyoming

Poster and Oral Presentation

NASA Space Grant, Wyoming Research Scholars Program

Cheyenne, WY

Large-scale forest changes are currently taking place across the western United States as the result of insect outbreaks, fires, and drought. These impacts of global warming are rapidly becoming a reality for the Rocky Mountains of Wyoming. Understanding the relationship between the changing climate and the ecosystems of the Rocky Mountain West will be vital as these changes take place. This study focuses on a case example where both remote sensing and fieldwork have demonstrated that past changes transformed sub-alpine forests. In particular, the Medicine Bow Mountains in southeast Wyoming are home to a high-elevation plateau known as Libby Flats, which contains a large area of meadows covered with the logs from large trees kills that were never replaced by new forest growth. We analyze charcoal and needle concentrations in a sediment core extending to 6209 calibrated years before present (cal. yr BP) collected from a pond on the Libby Flats Plateau to determine the cause and timing of the death of the forests that once covered the area. Needle concentrations reach a minimum around 875 cal. yr BP immediately following a major increase in charcoal accumulation rates, indicating that fire played a critical role in creating a significant and permanent state change on the landscape. This event corresponds with the Medieval Climate Anomaly, during which an estimated 0.5°C regional temperature increase resulted in widespread fires across the Rocky Mountains. This case example shows how climate change and ecosystem disturbance can interact to cause lasting changes in forest populations.

A Bear Named Jerry

Kelly Flickinger with Rattawut Lapcharoensap

English

University of Wyoming

Oral

Honors

Jackson, WY

This creative writing piece is based off experiences within my own family. It describes a family that is in a car accident and the aftermath of that event. The aim of this work is to explore human nature, especially in the face of tragedy. Each member of the family deals with the crash in a different and often unexpected way. The narrator is a girl whose father and two younger siblings are in a wreck during her first year of college. She examines not only the reactions of those around her, but also how she deals with changes brought on by the event. The father is injured and must learn to cope with his paralysis and become humbled by the disabilities he faces. The younger brother struggles with his guilt, as he was the driver and yet walked away uninjured. The little sister as an eleven-year-old portrays a great strength of character as she heals two broken femurs. The mother cannot deal with the stress of the situation, especially when her infidelity comes to light, and leaves the family for her new man. As the story moves from the event of the crash to the divorce following, the narrator becomes critical of the relationships she has with those around her. She questions the ties of family and comes to understand that even her parents are only human and every human is capable of great strength and incredible selfishness.

Comparison of soil microbial communities based on soil storage and nutrient enrichment

Emma Fox-Fogle, Taylor Kepley, Zoe Sherman,

With Linda van Diepen

Ecosystem Science and Management

University of Wyoming

Poster Presentation

Soil Microbiology and U.W. Pedology

Emma Fox-Fogle, Laramie, WY

Taylor Kepley, Cheyenne, WY

Zoe Sherman, Sheridan, WY

The majority of soil based research stores soil either by drying or freezing samples for later analysis. The storage of soil samples may affect the viability of microbial communities, and could affect the results of a culture-based microbial study. Using soils collected from grazed and ungrazed plots at the High Plains Grassland Research station outside of Cheyenne, WY, soil dilutions were made and cultured on a general culture medium to determine microbial density and diversity. The goal of this study was to determine how storage of soil samples, and use different media-nutrient concentrations affect microbial community composition on grazed and ungrazed systems using culture-based techniques. Data was collected through culturing bacteria on nitrogen enriched Tryptic Soy Agar (TSA) and regular TSA. Our findings showed that freezing the sample produces a higher density of bacteria while dried samples had more diversity. Using this information, other studies can choose the preferred storage method for collecting accurate data on soil microbial communities, as well as capturing a higher diversity of microbes.

Transcriptome extraction of *Alternaria astragali*

Wesley S. Frain¹, Shelbee C. Thompson¹, Bethany A. Kinder¹, Samara J. Lucero¹, Dr. Ami L. Wangeline¹, Dr. Courtney L. Springer¹, Dr. Zachary P. Roehrs¹

¹School of Math and Sciences, Laramie County Community College

Poster Presentation

Department of Natural Sciences, INBRE

Ft Collins, CO; Cheyenne, WY

Extreme environments have been useful in identifying organisms that make medicinally useful compounds. *Alternaria astragali* (A3) is a filamentous fungus isolated from soils collected in the intermountain west where parent shale formations are known for being high in selenium (Se). This is unique as Se is usually toxic to fungi, but A3 not only grows in this environment, it thrives. A3 has two known-unknown compounds that have been found to kill cancer cells *in vitro* in preliminary tests. Having successfully extracted and sequenced the A3 genome last year, the next step in identifying these compounds is to compare RNA expression in A3 under different growth conditions to other members of *Alternaria*. This may allow for identification of genes involved in metabolizing Se and producing anti-cancer compounds. Three RNA extraction kits and two different tissue preparations were tested and we found that RNA extraction using liquid nitrogen pulverization and the Norgen Biotek Plant/Fungi Total RNA Purification Kit yielded the highest quality RNA. To obtain transcripts from as many genes as possible, we extracted RNA from cultures grown in a variety of conditions (variable light, heat, UV, pH, nutrient exposure) and with different Se compounds (sodium selenate, sodium selenite, selenocysteine). Extracted RNA will be sequenced and subsequently analyzed using Tophat and Cufflinks software. As this project moves forward, the A3 transcriptome will be a valuable resource in identifying adaptations in Se metabolism and providing insight into novel compounds that may kill cancer cells.

Dhal Bhat and My Digestive System in Nepal

Elsa Froelicher with Nina McConigley

Honors College
University of Wyoming
Oral Presentation

Honors

Cheyenne, WY

Food is central to our lives. We cannot live without it; our bodies need it to function. But food has more meaning than energy to move our muscles, to help us think, or give us vital vitamins and minerals. We relate food to experiences. Traveling to new places almost always involves trying local cuisine or local specialties. We find comfort in food; in greasy, cheesy, gooey, delicious foods. We eat to deal with stress, to celebrate joy, to mourn losses. Holidays are almost always associated with foods. Food is not just a physical need, but also an emotional and psychological need or desire. While traveling in Nepal, this became even more true. I spent more time thinking about food, salivating over food, and mourning over food, than I thought possible. Food gave me comfort; it helped me to communicate and bridged the gaps between me and the people of Nepal, while also causing me hardships. In this project I related my experiences with living in Nepal for four months to my obsession with food while I was there.

Transforming Students Through Geometric Transformations

Sierra Galicia with Linda Hutchison

Secondary Math Education
University of Wyoming
Oral Presentation

Honors

Cheyenne, WY

It is common saying between teachers that the hardest grades to teach are middle school. Beginning January 3rd, 2018, I was placed in an eighth grade mathematics classroom for student teaching with the mindset that I was going to tackle this challenge head-on. I started the experience enthusiastic and ready to teach my students with exciting and engaging lessons. Unfortunately, I soon found that many students have low self-esteem, low self-confidence and they lack the necessary perseverance needed to complete challenging assignments and to be successful in math. It quickly became apparent why people say middle school is the hardest to teach. This work is a collection of all of the pieces of my EdTPA, a performance-based, subject-specific assessment system used to measure the knowledge and skills of students in teacher preparation programs. The lessons that I created for this work focus on geometric transformations including translations, reflections and rotations of an image. Each lesson was created with the hope that it would engage students, challenge them to have more perseverance and increase their self-confidence. This work includes the reasoning behind each lesson, a reflection on how it was implemented and the final results.

Marketing in the Modern World: Tourism After Terrorist Attacks

Alison Geary with Dr. Elizabeth Minton

Marketing & Management

University of Wyoming

Oral Presentation

Honors

Sheridan, WY

The travel and tourism industry is one of the world's largest industries with a global economic contribution (direct, indirect, and induced) of over 7.6 trillion U.S. dollars in 2016. The direct economic impact of the industry in the areas of accommodation, transportation, entertainment, and attractions, was approximately 2.3 trillion U.S. dollars that year (United Nations World Tourism Organization, 2017). However, in recent years, the prevalence of terrorist attacks is causing hesitation in would-be travelers and stigmatizing certain destinations. According to *Statista*, the number of terrorist attacks in 2017 was 22,487, which includes acts of terrorism, insurgency, and politically- or ideologically-motivated violence by non-state actors—enough to cause widespread consequences within the tourism industry. The goal of this project is to analyze the strategies and best practices of different marketing groups after terrorist acts have occurred. The scope will be on the psychological and financial reactions by both national and individual tourism companies after New York City 9/11, Paris 2015, the Nigerian Boko Haram kidnappings, and the Manchester and Las Vegas concert attacks. The results will likely suggest that proactive planning and comprehensive strategy will help people move past fear of terrorism and again encourage traveling to affected regions.

Estimating water surface area from satellite images: effect of data pre-processing

Abigail L. Gettinger¹ and Donovan H. Knowles¹

with Ramesh Sivanpillai^{2&3}

1. Ecosystem Science and Management,
2. Department of Botany, and 3. Wyoming GIS Center

University of Wyoming

Oral Presentation

WyomingView

Newcastle, WY

Tampa, FL

Satellite images are used for mapping Earth surface features such as forests, urban areas and waterbodies. The input satellite images have to be pre-processed, and the type of pre-processing influences the products and values of surface area of features derived from them. This study evaluated the effect of three types of pre-processing on the water surface areas derived from satellite images for five Wyoming lakes and reservoirs. We obtained Landsat images that were pre-processed as raw digital numbers (DN), top-of-the-atmosphere (TOA), and surface (SR) reflectance values. Subset images were extracted and two commonly used index images were derived. A threshold value was applied to each index image to generate a water and non-water (WMW) map. Six WMW (3 pre-processing levels x 2 indices) maps were generated from each Landsat subset image. Consistent differences in surface area values, albeit small, were observed between the indices due to scanline dropout issues in TOA and SR images. Differences in area values were also evident in turbid waterbodies. Results from this study provided insights about the influence of satellite data pre-processing on the surface areas derived from them.

Comparison of denitrification and respiration fluxes in NoName Creek, WY

Ariel J. Gjovig with Rachel Watson and Hilary L. Madinger

Department of Microbiology

University of Wyoming

Oral Presentation

Department of Microbiology

Gillette, WY

Denitrification can be described as the reduction of nitrate, while respiration is the biological process coupled to denitrification that converts oxygen into carbon dioxide. Comparison of denitrification rate and respiration rate can be accomplished using a ratio which varies in aquatic ecosystems. I quantified the relationship between respiration and denitrification rates under variable nitrate concentrations is currently unknown and was quantified through this research. A positive relationship between respiration and denitrification was expected prior to conducting the research. I measured the denitrification rate and respiration rate of NoName Creek, a first-order stream in Medicine Bow National Forest, by incubating water and organic matter from the creek in bottles, taking a small vial sample of the water, and measuring both the nitrogen concentration and the oxygen concentration compared to argon using a membrane inlet mass spectrometer. The relationship between respiration and denitrification was then established by plotting the oxygen to argon concentration versus the nitrogen to argon concentration. A negative relationship was found between oxygen and nitrogen on the plot, where denitrification was 0.4% of respiration. This data has implications in pollution management because people add nitrogen to ecosystems resulting in high nitrate concentrations in mountainous streams. Denitrification can reduce this pollution.

United Patriotism: Wyoming's Serbian-American Community

Carlos A. Gonzalez with Mark Neels

History Department

Western Wyoming Community College

Poster Presentation

Sweet Memories: Historical Research Group

Rock Springs, WY

On October 10, 1918, an article describing a lavish Thanksgiving feast headlined the *Thermopolis Record's* front page. The feast was organized by Gebo's Serbians under guidelines of a national group attempting to unite Serbians. The Serbians were extremely grateful for America's help during World War I and therefore wished to express their patriotism and gratitude. After several public speeches, including some given in the Serbians' native tongue, the attendees retired to the Union Hall for refreshments and watched the moving picture *Civilization*, a Christian film approving the Great War. The article ends with American Colonel George M. Sliney's quote, "Gebo Serbians, we salute you!" The opportunities for work in Gebo, and other communities in Wyoming throughout the decade of the Great War grouped immigrants into several locations, compelling them to create their own communities. Because of America's diverging views on immigrants however, Wyoming's Serbians were obligated to adopt new traditions. Nevertheless, these Serbians retained some of the cultural traditions they brought from Eastern Europe, which were some of the most colorful in Wyoming. During the First World War, a Serbian American identity was formed, establishing an imagined community through the complexity of different customs regarding Serbians in Wyoming's mining communities of Hot Springs and Sweetwater counties.

Radiative Thermal Decomposition/Digestion of Proteins for MALDI-MS Imaging

Andrew Goodenough, Franco Basile

Department of Chemistry

University of Wyoming

Oral and Poster Presentation

INBRE

Laramie, WY

The predominant method of on-tissue digestion for imaging mass spectrometry uses enzymatic digestion. This is a time-consuming step that, due to the use of solvents, can lead to the delocalization of product peptides in a sample. Our research group has previously reported on the non-enzymatic, site-specific thermal decomposition/digestion (TDD) of proteins through plasmonic resonance¹ and resistive² and convective heating³ to temperatures of 220°C-250°C. This presentation and poster examine a new TDD method and apparatus using radiative heating to digest proteins across an entire tissue sample in under a minute. The radiative TDD process does not require the use of solvents, ensuring the spatial fidelity of peptide signals in mass spectrometric images. This new method has been shown to cleave proteins specifically at the N-terminus of cysteine and the C-terminus of aspartic acid, as was observed in previous TDD techniques, which allows for identification of parent proteins through tandem MS. The apparatus for the thermal digestion was designed with a large-surface heating element to ensure uniform heating across samples. MALDI-MS imaging of test samples digested with this system have shown even digestion across samples evenly deposited onto indium-tin oxide slides. These preliminary results suggest that the technique is readily applicable to tissue sections.

1. Zhou, R.; Basile, F. *Chem.*, 2017, 89 (17), pp 8704-8712.
2. Zhang, S.; Basile, F. *Proteome Res.* 2007, 6, pp 1700-1704.
3. Zhou, R.; Basile, F. *Analytical and Applied Pyrolysis*, 2017, 127, pp 451-460.

Slug Tests and Aquifer Properties of Fractured Granite in the Laramie Range

Sam Gragg with Dr. Ye Zhang

Geology and Geophysics

University of Wyoming

Oral Presentation

Honors

Connersville, I

Slug tests are used to estimate hydraulic conductivity near a borehole by instantaneously inducing a hydraulic head gradient between the borehole and the surrounding formation. For this research, a series of slug tests were conducted at the University of Wyoming's Blair Wallis Research Well Field in the Laramie Mountains to estimate hydraulic conductivity and its spatial variability in the well field. This field site is unique because the wells are finished in a fractured granite aquifer. Although this type of aquifer is not very well understood, it is typical of many headwater areas in the U.S. West. Horizontal hydraulic conductivity values between 10^{-7} and 10^{-4} m/s were obtained which agree well with results from other well tests at the site. This large variability demonstrates the dependence of hydraulic properties on the abundance and size of fractures at the field site. These values also demonstrate that although granite is generally ignored as an aquifer material, it can hold a considerable amount of water.

Effects of stand-replacing fires on soil elements in the Greater Yellowstone Ecosystem

Mary E. Graham¹, Sabrina L. Johnson¹, Phillip C. Marsh¹, Tori L. Nye¹, Dr. Ami L. Wangeline¹, Dr. Courtney L. Springer¹, Dr. Zachary P. Roehrs¹

¹Department of Natural Sciences, Laramie County Community College
Poster Presentation

Department of Natural Science, INBRE

Cheyenne, Laramie, Riverton, WY

Part of ongoing research into fire effects in the Greater Yellowstone Ecosystem, this elemental analysis study examines how a stand-replacing fire changes element presence in the soil, allowing us to gain insight on how this affects a forest ecosystem. Previous research has shown that there is little to no change in concentrations of calcium and carbon, while indicating that other elements, such as nitrogen, phosphorus, potassium, magnesium, and iron, increase in concentration immediately following a fire, then rapidly decrease. In this study, we analyzed the biologically relevant elements present in samples collected from two different burn intervals, 28 years and ≥150 years post fire from four burn sites in John D. Rockefeller Jr. Memorial Parkway, Wyoming. To evaluate the light elements, stable isotope analysis was used to determine total carbon and nitrogen, as well as specific carbon-13 and nitrogen-15 isotopes. Using total x-ray fluorescence, concentrations of other heavier elements from aluminum on were measured. Nitrogen-15 has been shown to be elevated post fire, even when total nitrogen decreases, so we anticipate verifying that trend and following the isotope through trophic levels. Overall, we are interested in patterns and differences in elemental concentrations across burn intervals taking into account aspect, soil type and parent material of each site. Having this geochemical information can provide greater insight into changes seen in biota and at shorter temporal scales.

Personality and Coordination on a Problem-Solving Task in Captive Zebra Finches

Rachel L. Graham¹, Lisa P. Barrett¹, and Sarah Benson-Amram¹

¹University of Wyoming,
Animal Behavior & Cognition Lab,
Zebra Finch Project

Oral

INBRE

Riverton, WY

Zebra finches (*Taeniopygia guttata*) exhibit consistent individual differences in behavior, also known as personality. Previous research in our lab has measured several different personality traits including aggressiveness, exploration tendency, and neophobia in a captive colony of zebra finches and shown effects of an individual's personality on its problem-solving abilities. Here, we investigate whether the personality combination between pair bond members influences the pair's coordination on a novel problem-solving task; a maze. We first formed pair bonds of zebra finches and determined their level of similarity. Next, we tested birds' ability to pool their knowledge to find a food reward in a maze. Results from a pilot study suggest variation between pairs on maze success. If similar pairs exhibit higher coordination than that of dissimilar pairs, then we would expect similar personality pairs to have a higher maze completion rate. This study highlights the potential influence of personality on cognition and fitness. Moreover, personality may be a critical component of mate choice for species where pair bonded mates exhibit high levels of coordination in parental care and foraging.

Denitrification Potential of Soil Microbes in the Lower North Platte River Valley, Wyoming

Haden Grandy

Department of Biology
Division of Science and Mathematics
Eastern Wyoming College

Soils and groundwater in east central Goshen County, Wyoming have been documented to have high nitrate levels since the 1950's (Rapp et al., 1957; Parks, 1991). EPA studies have indicated that nitrates are harmful to both human and animal health at concentrations above established limits. The focus of this study is to document the extent to which the presence of nosZ, narG, nirK, and nirS gene-containing bacteria, reduce soil nitrate levels and subsequent groundwater nitrate levels by the natural process of denitrification. In addition, nitrous oxide (N₂O) emissions have been assayed to further assess denitrification activity. Thus far, DNA and RNA have been extracted from soil bacteria, and molecular techniques are being used to amplify the gene fragments and to quantify presence of nitrate reducing soil microorganisms.

Solar Panel Tracking System Designed for Recreational Vehicles

Logan R. Guidry | Tyler J. Cooper | Elijah T. Childers
Instructor: Dr. Kevin Kilty | Advisor: Dr. Jeffrey Anderson
University of Wyoming

Many people use recreational vehicles to explore, site see, and to get off the grid. A limitation for RVs is their reliance on fossil fuels for both driving and electrical applications. For this reason, solar panels have been integrated with RVs to assist in the power requirements for electrical applications. The disadvantage of conventional style panels is that they produce their nameplate rating only if the sun is directly above them. This project's goal is to maximize the efficiency of a solar panel by having it in the optimum position all day. To achieve the goal of optimum panel position, this group designed a device for tracking the sun and to move the panel accordingly. The panel must have two degrees of freedom to follow both horizontal and vertical movement of the sun. With these basic requirements defined, the most important parameter that has influenced our design is that it must have a low profile while the vehicle is moving. This is a necessary safety feature to prevent the panel from flying off the roof or damaging the RV while driving down the highway. Other safety parameters to protect the equipment have also been included in this project to insure reliability. If commercialized, this product could provide a substantial increase in power production, and reduce the dependence on fossil fuels for many RV owners.

The Health Benefits of Spruce and Fir Against Common Ailments of the Day

Matthew Gwynn¹, Elise Kimble¹, Allan Childs², and Eric C. Atkinson¹
¹Biology Department,
²Chemistry Department
Northwest College Poster

INBRE

Ralston WY

Conifers are not your normal go-to for home remedies. They have, however, been used for hundreds of years by Native Americans. They used the bark in poultices for wounds, potentially to fight any bacteria that get in. They took extracts to use as medicine for coughs, diarrhea, pain, and arthritis and overall were used to generally help improve their health and keep away sickness. The needles in most conifers have been shown to hold high amounts of vitamin C and to have antiviral, anticancer, anti-inflammatory, and antibacterial properties. Their potential for being a health and natural cure is enormous. The Douglas-fir (*Pseudotsuga menziesii*) and the Engelmann spruce (*Picea engelmannii*) are found throughout the mountain regions of the Bighorn Basin and possibly contain properties that fight bacteria such as *Escherichia coli* and *Staphylococcus aureus*. Needle and resin samples of these two species will be gathered from their natural habitat away from human contamination. Extracts of these samples will be taken through diffusion in water and acetone to isolate the health properties within the samples. They will be tested to see if bacterial inhibition is achieved via the Kirby-Bauer disc diffusion method.

Rebuilding the Barrier to Inflammation: A potential therapeutic target for the prevention of Hirschsprung's-Associated Enterocolitis

Bailey Hamann, Kristopher Parker, Naomi L. Ward
Department of Molecular Biology
University of Wyoming
Poster Presentation

Wyoming NASA Space Grant Consortium

Cheyenne, WY

Hirschsprung disease (HSCR) is characterized by a genetic defect of nervous system development in the colon. In 1 in 5000 births, neural crest-derived cells fail to innervate the distal portion of the colon leading to a variety of symptoms including poor feeding, vomiting, and an inability to pass stool. In the developed world, motility function of the colon can be corrected through surgery. With restoration of colon function, attention has shifted to Hirschsprung-associated enterocolitis (HAEC), an inflammatory colitis arising in up to 50% of HSCR patients. All patients with HAEC exhibit distension, diarrhea, and fever, while those most severely affected suffer from bacterial translocation, sepsis, and death. The etiology of HAEC remains unknown, therefore hindering the ability to generate effective therapies for its prevention. Previous work in humans and mouse models of HSCR/HAEC have documented disruptions of the gut microbiome and abnormalities and compromised integrity of the intestinal barrier. These abnormalities include altered properties of Goblet cells and reduced levels of intestinal mucins. The gamma-secretase inhibitor, dibenzazepine (DBZ), has been shown to upregulate the primary intestinal mucin (Muc2) in normal mice, while not affecting levels of non-intestinal mucins. By increasing levels of intestinal mucins, DBZ provides a potential therapeutic target to restore mucosal barrier integrity and potentially delay the onset of HAEC.

Creating and Analyzing a Natural Gas to Light Olefins Plant in Wyoming

Noor Alhomoud, Abdulmajeed Asiri, Richard Czaikowski, Ian Hammontree, James Macdonald,
Obaid Safier

Dr. David Bell, Chemical Engineering
University of Wyoming, Oral Presentation

*Noor Alhomoud: Yarmouk, Kuwait
Abdulmajeed Asiri: Abha, Saudi Arabia
Richard Czaikowski: Sugar Land, Texas
Ian Hammontree: Laramie, Wyoming
James Macdonald: Centennial, Colorado
Obaid Safier: Kuwait City, Kuwait*

Due to Wyoming's lower natural gas prices and lower tax rates, a possible business opportunity for building a light olefin production facility in Wyoming using natural gas as a feedstock has been proposed. A few established processes for converting methanol to light olefins already exist, and a process for converting natural gas to methanol is also well established within industry. Although there are plants in China that are designed to convert coal to light olefins, there are no plants that utilize natural gas as the main feedstock. The plant proposed in this project would combine these processes and utilize the relatively cheap and abundant supply of natural gas in Wyoming to produce ethylene and propylene. Through the use of three different reactors and multiple separation stages, the proposed plant can produce these light olefins at an industrial scale using natural gas and water as the feedstocks. The analysis of the plant includes a basic economic and profitability analysis, an examination of both the plant safety and the environmental impact of plant emissions, and the impact of the plant on both the local community and the global olefin markets.

Cost Benefit Analysis: 2017 *Trichomonas* Regulations

Lynnell Hanson; Brant Schumaker
Animal and Veterinary Sciences; Ag Economics
University of Wyoming
Oral Presentation

This Cost Benefit Analysis is in reference to the new 2017 Wyoming *Trichomonas* Regulations and addresses the effect these updates have had on samples received at the Wyoming State Veterinary Laboratory in Laramie, Wyoming. Before 2017 in Wyoming, either a culture or PCR could be performed to test a bull for the presence of *Trichomonas*. New regulations now require PCR diagnoses to take place. This project covers data collected at the WSVL from 2012 through 2017. Both culture and PCR data were analyzed for 2012 to 2016. Data was split into pre- and post-regulation changes, and then divided further into four yearly quarters. The 2017 data was compared to this line in order to determine if the new rules have had any effect on the number of samples received. The main criteria for determining the cost or benefit due to new regulations are substantial decrease or increase in sample submissions and change of seasonal trends. According to the data analyzed thus far, the Wyoming State Vet Lab is seeing a marked decrease in revenue stream after the implementation of the new *Trichomonas foetus* regulations. The overall PCR count has remained relatively similar, however, the inability to use culturing as a diagnostic tool is where the drop in sample numbers is taking place. There is a significant price difference in the consumer cost of culturing as compared to PCR, which may be a causative factor in the lack of customers switching test type.

**Analysis of an Avian Disease Network in the Greater Yellowstone Ecosystem:
Opportunities for Undergraduate Students**

Kayla M. Harakal¹, Chloe D. Winkler¹, Eric C. Atkinson¹

¹Northwest College, Biology Department

Poster

INBRE

Laurel, MT

Cody, WY

From an ongoing project, we are testing avian species in the Greater Yellowstone Ecosystem for malaria, West Nile Virus (WNV), and irides somatic variability. This study started in 2013 and since then we sampled 471 birds of 33 species at six sites along an altitudinal gradient. In the summer of 2017 alone, we caught over 200 birds within the Greater Yellowstone Ecosystem. Each individual researcher has chosen an area of research: disease comparison between House Sparrows (*Passer domesticus*) and House Finches (*Haemorhous mexicanus*) comparing prevalence in diseases between Urban and Rural areas. In the disease comparison of malaria and WNV loads, sample size consists of 170 different House Sparrows and House Finches. Screening for malaria provided evidence that 18 HOFI and 14 HOSP were suspected to have malaria. We also identified both conjunctivitis and Avipoxvirus in a small proportion of sampled House Finches. We also are comparing the prevalence and severity of WNV and conjunctivitis in Urban to Rural environments for six different species. We hope to further our research in the different diseases present in avian species. We hope to test our hypotheses this upcoming summer on abnormalities found within the female Common Grackle iris shown as somatic variability. Through this we could gain further knowledge of where this abnormality could have originated and if iris patterns are indicative of age, condition, and/or disease state. We provide an overview of our continued research throughout the upcoming summer furthering our knowledge on avian diseases present in the Greater Yellowstone Ecosystem.

Synthesis and Characterization of the overlayer heterogeneous catalyst for dry reforming of methane

Seth Harris with Joseph Holles

Chemical Engineering

University of Wyoming

Oral Presentation

Greenhouse gases, like methane and carbon dioxide, have been on the rise in recent years due to an increase in energy demand world-wide. The burning of fossil fuels and the use of automobiles has presumably caused a drastic increase in the emissions of greenhouse gasses into the atmosphere, resulting in damage to the environment. This situation has led to a widespread search for a cost-effective way to use greenhouse gases as an alternative energy source. One proposed method is the Dry Reforming of Methane (DRM), which has thus far proven effective. The dry reforming of methane is an effective reaction because it is accompanied by a low CO/H₂ ratio. However, due to the extreme stability of the methane molecule, a high temperature is required for independent break down. To circumvent the stability of methane, a catalyst can be introduced at a lower temperature to accelerate molecular break down. In order to synthesize, characterize, and test their catalytic abilities, highly-active monometallic (Ni, Pd) and overlayer (Ni@Pd, Pd@Ni) supported CeO₂ catalysts were synthesized via wet-impregnation technique. The catalysts were characterized by X-ray diffraction (XRD) and BET surface analyzer. The catalytic ability of the synthesized catalysts was tested for the dry reforming of methane by flowing methane and carbon dioxide through the catalyst with specific parameters such as reaction temperature, flowrate composition, and weight percentage of the deposited metal. It was noticed that 5wt%Pd@2wt%Ni/CeO₂ was a highly-active overlayer catalyst for the DRM reaction. The CH₄ conversion was approximately 91.37% and relative hydrogen yield was 52.87% at 600 °C and a 1 CH₄:1 CO₂ volumetric flowrate ratio.

CWC's Interdisciplinary Climate Change Expedition (ICCE): Measuring Black Carbon, Water Quantity, and Water Quality in the Dinwoody Cirque

Grace Hartman, Shannon O'Sullivan, Travis Adderhold and Marten Baur

with Associate Professor Jacki Klancher and Dr. Carl Schmitt

Health and Science
Central Wyoming College
Oral and Poster Presentation

INBRE, EPSCoR and NASA

Lander, WY

Wyoming's backcountry regions continuously undergo climate-related changes as the state warms. This research expedition examines the ecological and hydrological effects of climate change in and around the Dinwoody Cirque—one of Wyoming's key high-alpine glacial areas. These diminishing ice masses will be problematic for the future water supply in Wyoming. Research focus included sampling for black carbon, stream discharge, and biological and chemical water quality. These topics have been studied in three previous seasons of ICCE expeditions. Black carbon—a light absorbing particle—is a key contributing factor to glacial and snowfield recession, since higher concentrations of effective black carbon (eBC) significantly reduces snow albedo. The black carbon samples were measured for total eBC per sample filter with the assistance of Dr. Carl Schmitt (National Center for Atmospheric Research). The 2017 black carbon data had a lower average of eBC (54.93 ng/g eBC) compared to the 2016 data average (193 ng/g eBC). The 2017 water flow measurements were sampled from proximate locations as those tested in 2016; however, the 2017 average flow measurements were .34 cms less than the 2016 measurements. The 2016 and 2017 analysis for *E. coli*— a bacterial indicator organism— revealed negative presence in all surface water samples. Black carbon and water flow averages were the only study areas that displayed differences in comparison to previous years.

Recombinant Production of Spider Silk-like Proteins for Biomedical Applications

Kelcey Harvell¹, Joseph Kinder², and Florence Teulé-Finley²

¹Casper College, ²University of Wyoming

Poster

INBRE

Casper, WY

Spider silks produced by golden orb-weaver spiders are tougher than most protein-based materials due to their unique combination of high tensile strength and high extensibility. These natural fibers are also inherently biocompatible, and their strength and elasticity originate from highly repetitive polypeptide motifs that can be manipulated during silk gene engineering to fine-tune the fibers' mechanical and chemical properties. Spider-silk-like-proteins (SSLPs) are emerging as a promising biomaterial with many potential applications, including the production of protein films and hydrogel scaffolding for use in tissue engineering, implantable devices and prosthetics, and drug delivery systems. SSLPs were produced by recombinant *Escherichia coli* through the expression of the synthetic Y1S8₂₀ silk-like gene, a chimeric gene with both dragline and flagelliform silk sequences as well as a histidine tag for purification and analysis. Expression was induced with isopropyl-β-D-1 thiogalactopyranoside (IPTG), and after total protein extraction by cell lysis, the SSLPs were purified using immobilized metal affinity chromatography (IMAC). To analyze the SSLPs, the proteins were separated by length using SDS-PAGE. Presence of proteins was confirmed by staining gels with Coomassie Brilliant Blue and their purity was determined with Western blot analysis. Pure SSLPs were then dialyzed against 5mM ammonium bicarbonate and lyophilized into a dry powder. During our summer INBRE experience, 415.57 mg of recombinant Y1S8₂₀ spider silk protein were recovered from cultured recombinant *E. coli*. These SSLPs will be used in future experiments to produce biofilms and hydrogels.

Malcolm X and Black Lives Matter: How Media Bias, Globalization, and Exigence affect the Messages of Rhetorical Movements

Nancy A. Heise with Dr. Travis Cram
Communication and Journalism
University of Wyoming
Oral Presentation

Honors

Lyman, WY

In order to provide insight into the effectiveness of messages about racial equality for black Americans, this project utilizes Critical Race Theory (CRT) to assess and juxtapose two Malcolm X speeches with rhetoric from the Black Lives Matter (BLM) movement, through neo-Aristotelian Criticism. First, the messages from Malcolm X's two speeches and the rhetoric from the BLM movement are extrapolated and defined through Critical Race Theory. Themes of globalization, US Nationalism, epistemology, self-identification, imagery, media bias, and social movements will be touched on and explored. Next, the speeches, the rhetoric and all of their elements are placed in their historical contexts, with a focus on how institutionalized racisms have affected the social perceptions of Malcolm X and the BLM movement. Then, in accordance with neo-Aristotelian Criticism, the messages of the Malcolm X speeches and the BLM rhetoric are evaluated using the five canons of rhetoric as defined by Aristotle. Finally, the messages of the speeches and the rhetoric are analyzed for effectiveness given their historical context and their use of the five canons of rhetoric.

The Notorious RBG's Undergraduate Research Presentation

James Shupe, Kyle Schmidt, Bryan Cundy, Sarah Kamphaus, Hassan Mohammed Al Ebrahim, Jonah Henry
Joseph Holles Chemical Engineering Department
University of Wyoming
Oral and Poster Presentation

Chemical Engineering Department

James Shupe: Coalville, UT

Kyle Schmidt: Sinclair, WY

Bryan Cundy: Lake City, PN

Sarah Kamphaus: Fort Collins, CO

Hassan Mohommed Al Ebrahim: Qatif, Saudi Arabia

Jonah Henry: Laramie, WY

This project explores a carbon neutral process of dry reforming a feedstock of biogas produced through the anaerobic digestion of municipal and industrial wastes ultimately to create useful fuel product. The feasibility of a chemical plant of this nature will likely be limited by the size of it, the larger the more feasible. To increase the economically feasibility, a large amount of municipal and industrial waste along with high strength waste, fats oils and greases, and dairy waste is needed to create the amount of biogas required to simulate the use of plant in conjunction with the Metro Wastewater Reclamation of Denver, CO's anaerobic digesters. The proposed plant will use dry reforming of lean biogas to create syngas; this syngas is then further processed to create ethanol. Diverting from the industrial standard of flaring biogas, this process has a significant environmental incentive of sustainable fuel production. Estimated results of plant sizing, economic outcomes, safety considerations, legal implications, and general conclusions on the project are planned for future work.

Effects of Environmental Factors on Sufferers of Rheumatoid Arthritis in Sweetwater County Wyoming

Tessa Herbert with Dr. Dana Pertermann
Anthropology
Western Wyoming Community College
Poster Presentation

Department of Anthropology

Smithfield, UT

Rheumatoid Arthritis is a chronic systemic inflammatory disease that can also be classified as an autoimmune disease. This disease can cause swelling, pain, stiffness, and changes in joint mobility and function. The cause of Rheumatoid Arthritis is unknown and no cure currently exists. However, studies show that the symptoms of Rheumatoid Arthritis can be affected by multiple factors, including environment. By understanding what environmental factors worsen symptoms of Rheumatoid Arthritis, sufferers of this disease can learn what environments they should avoid to lessen their symptoms. To learn more about how environmental factors affect the symptoms of Rheumatoid Arthritis, we surveyed adults living in the Young at Heart living facility in Rock Springs, Wyoming. Participants filled out a survey regarding how different environmental factors affected the symptoms of Rheumatoid Arthritis in themselves or someone they know personally. Results suggested multiple environmental factors had an influence on Rheumatoid Arthritis symptoms. Results from this study can help sufferers of Rheumatoid Arthritis to avoid situations that may worsen their symptoms.

Drug Resistant Bacteria Prevalence in Organic vs. Conventional Agriculture Compost

Tawna Herrera, Elise Kimble
Biology Department, Northwest College
Poster

INBRE

Cody, WY

Humans use compost for agriculture, horticulture, and soil sciences. Could drug resistant bacteria be more prevalent in organic compost or conventional compost? This experiment is to test whether there are more drug resistant bacteria in conventional compost than in organic compost. Environmental bacteria in conventional compost are exposed to antibiotics, synthetic hormones, and pesticides that could manipulate the bacteria's genetics and increase resistance to antibiotic treatments. To test this hypothesis, we have taken samples of compost from three farms located in Park County, Wyoming; two organic and one conventional. Compost samples are initially spread on agar medium plates followed by isolation of bacteria. With complete isolation of bacteria, a suite of antibiotic discs is then placed in the lawn of bacteria using the Kirby-Bauer method. Preliminary results of organic compost have yielded four disparate drug resistant bacterial types out of 31 isolates. Conventional compost bacteria isolates however, had one drug resistant bacterium out of 10 isolates thus far. Continuation of this experiment will entail detailed observation and accumulative data providing important information regarding antibiotic resistance under varying agricultural methods.

Chalkboardz

Caleb Cornils, Jack Hess, Andrew Olschwager, Colin Riley, and Nick Stegelman with Dr.

Mike Borowczak

Computer Science

University of Wyoming

Oral Presentation with Poster

Department of Computer Science

Laramie, WY

Reaching and informing customers is an important part of business. Signage has always been an effective method for accomplishing this goal. Maintaining signage can be costly if paying for posters or advertisement space. In-house, updating signage can be time consuming to re-write and design daily, taking manhours away from servicing customers. One way around these issues is to move to digital signage. However, investing in a digital replacement requires high startup costs or a considerable knowledge base to employ effectively. Our Senior Design Team was approached by the proprietors of a restaurant called the Alibi to design a solution for this exact problem. The goal of this project, nicknamed Chalkboardz, was to create a plug-and-play, web-based signboard that required little work from the client to maintain while presenting a homey chalkboard aesthetic, all for a low cost. This was accomplished by using web based languages and tools and simple hardware. The web pages are hosted and powered by GitHub Pages and are displayed in a slideshow format to show menus, specials, advertisements, or any other information the client wishes to share. The hardware of choice for deploying Chalkboardz is a Raspberry Pi, set up to self-update and run as a plug-and-play device, via the HDMI port of a generic display device, automatically opening the Chalkboardz slideshow.

Cornelia de Lange Syndrome: In the Realm of Caregivers and Surviving

Madissen Hester with Dr. Tracey Owens Patton

English

University of Wyoming

Oral Presentation

Honors

Wheatland, WY

Cornelia de Lange Syndrome (CdLS) is a rare congenital disorder that occurs in 1 in 10,000 live births. The goal of this research project was to further understand the impact of caregivers on children with disabilities, specifically CdLS. The purpose of this research project was to critically analyze the caregivers of those with Cornelia de Lange Syndrome, using the social model of disabilities as a theory and Derrida's "Structure" as a method; I argued caretakers of those with disabilities, specifically CdLS need to be given support, as well as resources, in order to maintain a healthy environment and family for the individual with special needs. In the study, *Cornelia de Lange Syndrome: In the Realm of Caregivers and Surviving*, it was found that caregivers would like more resources for their child, whether that be awareness, respite, or long-term care facilities.

Key words: *caregiver, Cornelia de Lange Syndrome (CdLS), disability, resources, respite*

Parkinson's Telehealth Feasibility Study: Confessions of a Research Assistant
Haley Hight, Mary Jo Cooley Hidecker Ph.D., MS, MA, CCC-A/SLP; Erin Bush, Ph.D., CCC-SLP; Reshmi L. Singh, Ph.D.
Communication Disorders
University of Wyoming
Poster Presentation

Communication Disorders

Douglas, WY

Patients with Parkinson's disease living in rural areas may not have the appropriate specialists in their communities. This creates the need for people with Parkinson's to drive long distances to receive necessary intervention from multiple healthcare providers. This feasibility study examined types of technology modifications needed to ensure telehealth participation and effective execution of intervention sessions. Laptops were purchased and modified by removing unnecessary software and installing specific telehealth software (i.e., Zoom® and LSVT). Through the modification process, different challenges were uncovered. However, once issues were addressed participants found using the telehealth technology to be easy and simple, resulting in consistent attendance and participation.

A method for the removal of Arsenic from water through the absorption of CuO Nanowires

Joann Hilman, Dr. TeYu Chien
Department of Physics and Astronomy
University of Wyoming
Oral presentation

Wyoming NASA Space Grant Consortium

Laramie, WY

Much of the world still uses ground water for drinking. However, in many countries including the USA ground water contains elevated levels of arsenic (As). High concentrations of As are toxic to humans and can cause skin cancer, keratosis and death among other symptoms. While many methods of removing As from ground water have been explored most result in either poor efficiency or extra steps to remove the adsorbents. This research examines the use of copper oxide nano-wires (CuO NWs) as a safe and efficient adsorbent to remove As from ground water. This research presents the stability of CuO NWs in water and their absorption of As.

Accuracy of Unimanual Coordination Task for Detection of mTBI History in Patients

Autumn Hopkin with Dr. Qin Zhu
Kinesiology and Health Promotion
University of Wyoming
Poster Presentation

McNair Scholars Program

Greybull, WY

Individuals who have had a mild Traumatic Brain Injury (mTBI) can have damage to the large white matter on the brain also known as the corpus callosum. This damage affects the coordination skills of the individual. A pilot study using various visual-motor coordination tasks to screen mTBI individuals showed some promise for the unimanual coordination task. This study will determine whether a unimanual coordination task is an accurate way to differentiate between healthy controls and individuals with mTBI history. It is hypothesized that a unimanual coordination task is an effective way to screen for mTBI history. Twenty adults with mTBI history and another twenty healthy adults between the ages of 18-44 years old will be recruited in the study. The participants will be asked to perform three unimanual coordination tasks. The tasks involve the use of a computer and a joystick to generate a demanded coordination pattern. The performance data of the healthy group will be compared to that of the mTBI history group and analyzed. This will determine if the unimanual coordination task is effective to detect the difference in coordination between the two groups. It is important to use coordination task to detect patients with mTBI history so that they can be referred to the clinics for timely care.

NASA Microgravity – Electrical Components

Lucas A. Houseal, Alex Weisenbach, Aunders Hallsten and Dr. Kevin Kilty
Designing the Data Logging and Reaction Wheel Systems

Testing in a microgravity environment is an essential prerequisite for satellite operation. The NASA Microgravity senior design project is aimed at creating a platform to test satellite systems in a microgravity environment. This platform is a semi-autonomous vehicle which will be raised using a balloon to an altitude near 100,000 feet. Once the proper elevation has been reached, the monocoque (testing module) will be dropped and allowed to free-fall for 20-30 seconds before releasing a parachute and returning to the ground. The electrical components group is focused on two specific areas of the overall testing platform. The first of which is the creation of a data logging system to record the package altitude, acceleration, and related information for the duration of the flight. This data will be used to verify the quality of the microgravity environment during free fall as well as check for any unwanted motion of the monocoque during flight. The other area of focus is the design of a reaction wheel system to correct low-quality microgravity from rotation of the package. Due to the lack of air resistance at extremely high elevations, any motion of the monocoque gained during the ascent will not settle out as quickly as it would in lower elevation conditions. To maximize the quality of microgravity, the monocoque must have minimal rotation at the time of release. This reduces the time necessary during the fall for the monocoque to orient itself properly allowing for minimal forces disrupting the quality of the microgravity environment. As mechanical engineering students, new concepts in electrical engineering and programming were discovered. Of all the hurdles, some of the biggest included the design of a PCB and programming for a more efficient control system. The completed project will allow for a high-quality testing environment for NASA and their associates.

NASA Microgravity: Internal Structure and Recovery Method Optimization

Brenna Doherty, Will Hultzapple, Xavier Lewis, Patrick Washecka-Jones

Dr. Kevin Kilty, Mechanical Engineering

University of Wyoming

Oral Presentation

Mechanical Engineering Department

Columbia, Maryland

Denver, Colorado

Denver, Colorado

Fort Collins, Colorado

Microgravity is a state in which gravity is approximately one-millionth (10^{-6}) of the gravity that is on the surface of the Earth. NASA has studied and conducted tests to create microgravity environments; however, these tests are expensive and can be time consuming. The University of Wyoming Microgravity Research Team has developed an inexpensive alternative to test in a microgravity environment. This project focused on the optimization of the internal structures and the recovery system of this product. Previous prototypes of this inexpensive microgravity environment (IME) product were overdesigned to withstand forces much greater than those experienced during operation. Alterations to this design included geometry modifications of the internal structures, material changes, and a reduction of parachute size used during recovery. The geometry modifications, created with SolidWorks, allowed for improved communication between the electronic stack and the internal frame, and reduced the weight of the internal structures. Changing the material of the internal frame from 5052 Aluminum to Grade 4 Titanium reduced the weight and increased the strength of the internal frame. The upgraded parachute reduced packing volume and weight from the previously used parachute. Making these changes to the IME product saves money in operation and manufacturing processes.

Gestational Diabetes Mellitus

Carson Hutchinson, Dr. Lanae Fox

School of Pharmacy

University of Wyoming

Oral Presentation

Honors

Evanston, WY

This paper reviews what gestational diabetes mellitus is; its pathophysiology, epidemiology, risks, effects, clinical characteristics, screenings, diagnostics, treatment, and recommended follow up. Gestational diabetes mellitus rate has doubled during the last 20 years in the United States. There is currently only one FDA approved medication (insulin) for gestational diabetes mellitus, however there are a couple anti-hyperglycemic agents that are used off label for this disease. This paper looks at their efficacy and safety of such medications; metformin and glyburide. Current guidelines, clinical trials, retrospective studies, systematic reviews, and case reports were used to assess gestational diabetes and management. This is to help guide pharmacists to understand gestational diabetes mellitus, best practices to manage this disease state, and recommended follow up.

Key words: gestational diabetes mellitus, insulin, metformin, and glyburide

Method Development Optimization for the Analysis of Metabolites in Biological Samples By Gas Chromatography-Mass Spectrometry

Sophia Kwende¹, Franco Basile¹

Department of Chemistry, University of Wyoming
Oral and Poster Presentation

INBRE

Cameroon

The metabolome of a cell, tissue, organ, or organism is represented by its small molecular metabolites, which are the end products of cellular processes. Any changes detected in the metabolome is indicative of changes in upstream molecules, such as genes and proteins with environmental factors. As a result, metabolic profiling or metabolomics can be used to detect the effect of different biological conditions or states at the molecular level. Mass spectrometry is able to detect as little as one or ten to hundreds of metabolite molecules, depending on the analysis being conducted in either a targeted fashion or global. In targeted metabolomics, one or a set of specific molecules are chosen, and their concentration measured across different biological states. In the global metabolomics measurement, the goal is to monitor all of the metabolites (or as many as possible) across different biological states. As such, targeted metabolomics is often used in hypothesis-based measurements and global metabolomics in discovery-based experiments (i.e., biomarker discovery). The need for proven and standardized protocols for global metabolomics is illustrated by the number of publications on the subject (~61,000). In this study, a standardized protocol was developed by optimizing experimental variables for the efficient extraction and subsequent MS detection of multiple metabolite molecules. The optimized protocol was developed using soil as a test matrix but can be applied to any biological sample or fluid (e.g., plasma, urine, etc.).

Treatment of Opioid Dependence and Overdose

Jessi Jeffries with Dr. Brian Cherrington

Physiology

University of Wyoming

Oral Presentation

Honors

Gillette, WY

Every day in America, 90 individuals die from overdosing on prescription pain relievers or synthetic opioids. From 1999 to 2015, American deaths from opioid drug overdoses increased from 8,048 to 33,091 (National Institute on Drug Abuse, 2017). Approximately two million Americans in 2015 abused prescription pain relievers, which increased from 2014. Opioid receptors reside in the reward pathway of the brain, releasing the neurotransmitter dopamine, providing users with euphoria and analgesia. Long term drug use induces chronic constipation, drug tolerance, immune suppression, hormonal changes, and increased sensitivity to pain (Dennis, B., Naji, L., et al., 2014). Opioid use disorders also negatively impact an individual's mental status, increasing incidences of depression, anxiety, and suicide. This review examines previous research to assess the physiological effects of opioid dependence and overdose, with analysis of treatment. For treatment of opioid dependence, Methadone and Suboxone are useful medications. The medications provide enough opioid receptor activity to avoid withdrawals, but not enough stimulation compared to prescription or synthetic opioids. Since Methadone and Suboxone reduce activity at the opioid receptors, the individual experiences less physical dependence. An additional medication can be used for acute overdoses; Naloxone, commonly known as Narcan, can rapidly reverse an acute opioid overdose by blocking the opioid receptors.

Community Partnerships for Addressing Domestic Counterterrorism: A Case Study of Denver and the Front Range

Jonét Jennings with Dr. Jean Garrison and Eric Nigh
School of Politics, Public Affairs, and International Studies
University of Wyoming
Oral and Poster Presentation

McNair Scholars Program

Parker, CO

Understanding and preventing terrorism in the world and, more specifically, in the United States, is an interesting topic of research particularly after the terrorist attacks on September 11, 2001. From that point on, the problem has become a focus for the United States to counter both internationally and on U.S. soil. Domestically, the primary threat of terrorism is homegrown. Citizens become self-radicalized and use extreme measures to achieve certain aims, whether they be economic, social, or political. According to a Washington research center, New America, “since Sept. 11, 2001, nearly twice as many people have been killed by white supremacists, antigovernment fanatics and other non-Muslim extremists than by radical Muslims: 48 have been killed by extremists who are not Muslim” (Shane, 2015). The threat that emerged following the attacks on September 11, 2001 allowed for the creation of several policies, institutions, agencies, and organizations at all levels of government that aid in counterterrorism. Such programs build awareness and implement prevention programs at community levels, while working closely with local law enforcement. This study analyzes the community partnerships between the government, private, and public sectors in Denver and the Front Range. It questions how effective community partnerships are in fighting terrorism and how and why they counter domestic terrorism. Its goal is to understand and evaluate efforts regarding community-based counterterrorism in order to aid in the broader study of effective counterterrorism strategies.

The Automation of Analysis Procedures for the Citizen CATE Experiment Eclipse Data

Logan Jensen with Dr. Michael Pierce
Department of Physics and Astronomy
University of Wyoming
Oral Presentation

WRSP

Greybull, WY

The Citizen Continental-America Telescopic Eclipse (CATE) Experiment trained and equipped a network of 68 volunteer groups across America to collect images of the solar corona spanning the full 90 minutes of the 2017 Great American solar eclipse. The CATE Experiment is one of the first in-depth studies of the inner solar corona, from 1 to 2.5 solar radii, and the nearly continuous 90-minute coverage will revolutionize our understanding of coronal dynamics. With the data collected, the over 700 gigabytes of images must be processed before thorough studies of the corona can begin. This process includes flat fielding and dark current calibrations, the creation of high dynamic range images, radial intensity filtering, edge detection, and aligning the images across all 68 sites to create a continuous data stream. The large scale of the data set requires the development of programs to at least partially automate this process. The details of the process and preliminary results will be presented.

Tenjin: An Advanced, Cross Platform, and Encrypted Note Platform

Mason Johnson, Orrin Kinberg, and Lucas Nicodemus

with Dr. Mike Borowczak

Computer Science

University of Wyoming

Oral and Poster Presentation

Star Valley, WY

Lingle, WY

Aurora, CO

As a result of the proliferation of smartphones, tablets, and personal computers, users have turned to electronic forms of information storage and retrieval far than ever before. This increased proliferation gives rise to novel information systems that make the world more accessible to study, scrutiny, and curiosity. However, this proliferation comes at a cost. As more and more is put into information systems, end users face several challenges. They seek cross platform solutions, to let them access data from a variety of different devices. They want to input many different types of arbitrary information, from math equations to typed text and everything in between. Most importantly, however, they want their platform to not only achieve these goals, but do so in a way that synchronizes data across all of their devices, without being vulnerable to malicious third parties and security vulnerabilities. By creating Tenjin, a note taking platform that features cross platform user interface design, reliable synchronization, and encrypted at rest storage, we meet this market cross section with ease. Tenjin leverages best in class technologies, including Electron, Markdown, SCrypt and Salsa 20 to provide a secure, efficient platform for note capture and organization. We identify a proven business model that can support the platform, as well as highlight how open source development will extend the longevity of Tenjin well beyond the initial project development lifecycle.

Developing Touchscreen Technology for The Motion Disabled

Corey Johnson with Dr. Mike Borowczak

Computer Science

University of Wyoming

Oral and Poster Presentation

Department of Computer Science

Laramie, WY

There are approximately 30 million motion-disabled (Parkinson's, Essential Tremor, Multiple Sclerosis, Osteoarthritis, etc) people in the United States and many more globally. Those with motion-disabilities have less control and stabilization of their hands and arms. As the primary focus of consuming media and information shifts to mobile devices with touchscreens, those with motion disabilities are increasingly left behind. Existing accessibility solutions such as those found on modern Android and IOS devices are focused on the deaf and blind and those that help with motion impairment require precise and difficult timing. Previous development of an accessibility solution using a manufactured active stylus has yielded promising results but has been limited to the Android operating system and has faced commercialization problems. The goal of this project was refining the existing accessibility solution for commercialization, explore porting the accessibility solution to other platforms by leveraging existing hardware, and explore and execute commercialization options. Exploration was performed into porting the existing accessibility solution to Windows and Samsung devices due to the widespread adoption of active styluses with these devices. Differing commercialization avenues were explored and a crowdfunding campaign was developed in order to determine the feasibility of bringing the accessibility solution.

Isolating an *Agkistrodon piscivorus piscivorus* (Eastern Cottonmouth) venom protein for use in degradable polymer-drug eluting stents (DP-DES)

Cortney Johnson, Lyndon Bare, Cassidy Solti with Dr. Rob Milne
Natural Science Division
Sheridan College
Poster Presentation

INBRE

Sheridan, WY

Snake venom is an incredibly rich source of bioactive proteins, some of which may prove to be useful for biomedical applications. *A. p. piscivorus* venom, in particular, has both anticoagulant and coagulant proteins that can clot and thin the blood when it enters into the blood stream. The previously attempted method of ion-exchange chromatography proved insufficient in separating the desired proteins and therefore the research focus shifted to incorporate the additional step of size-exclusion chromatography. Ultimately the purpose of this investigation is isolating the anticoagulation protein to evaluate its incorporation in degradable polymers for drug eluting stents (DP-DES). The isolated proteins will then be combined with several different degradable polymer formulations. Details of venom isolation will be reported.

The effect of load placements on force and power production during a countermovement jump

Devin Jones, B. Dai,
Division of Kinesiology and Health, College of Health Sciences, University of Wyoming Oral Presentation

Biomechanics laboratory, INBRE

Laramie, WY

Muscular strength and power are important components in sports environments and daily living. Increased lower extremity power is associated with increased bone mineral density in both younger and older adults. Training loads that would produce the greatest power have been shown as an effective way to increase peak power. According to American College of Sports Medicine guidelines to train muscular power, training loads of 0–60% of 1 RM and 30–60% of 1 RM are recommended for lower body and upper body exercises, respectively. However, the guidelines for lower body exercises are mainly based on weighted jumps with a load placed on the shoulder. The purpose of this study is to quantify the effect of three load placements on force and power production during a countermovement jump. Participants will perform a countermovement jump in seven conditions: no extra weight, 10% or 20% extra weight held by hands, 10 or 20% extra weight on shoulders, or 10 or 20% extra weight in a vest. Kinematic and kinetic data will be collected using eight high-speed cameras and two force plates. Peak force and power during the jump will be calculated and compared. Our pilot study with one participant indicated potential increased in peak force and power for the extra weight held by hands conditions. Official data collection has started, and we are expected to report the results of 10-20 participants for the presentation. The findings may provide insight for identifying the optimal load for maximizing force and power production during jumps.

SIR Model of Epidemiology in Avian West Nile Virus

Toby Jones and Eric C. Atkinson

Biology Department

Northwest College

Poster

INBRE

Powell, WY

Roy M. Anderson and Robert M. May (1991) proposed the Susceptible/ Infectious/ Recovered (SIR) model of epidemics. Building on micro- and macroparasite*host systems, they proposed that transmission rates are typically very difficult to quantify *in vivo*. Through development of compartmental models, including both density- and frequency-dependent SIR models, however, they suggest that a way to estimate disease reproduction as $R_0 = \beta S / (\alpha + d + \nu)$

Where:

R_0 = estimated reproductive rate of the disease; N = total host population density; S = susceptible host density; I = infected host density; R = recovered (immune) host density; b = host birth rate; d = host natural mortality rate; α = disease-induced mortality rate; β = between host transmission rate; ν = recovery rate of infected hosts; and γ = rate of immunity loss. When $R_0 > 1.0$, the disease spreads; where $R_0 < 1.0$ the disease contracts; where $R_0 = 1.0$ the disease is maintained in equilibrium. The goal of this poster will be to conceptually describe estimation of SIR variables and parameters to ultimately estimate transmission rates of West Nile Virus in several avian species sampled since 2013: House Finch (*Haemorhous mexicanus*), House Sparrow (*Passer domesticus*), American Robin (*Turdus migratorius*), Common Grackle (*Quiscalus quiscula*) and Gray Catbird (*Dumetella carolinensis*). It is our hope that through application of both virus titers and seroprevalence rates of antibodies, we will be able to estimate S , I , and potentially R_0 . Estimation of β , ν , and γ will help identification of both maintenance/reservoir hosts and amplification hosts for WNV.

Investigating inhibition of mixis in the rotifer *Brachionus plicatilis* by the brine shrimp *Artemia salina*

Madysen N. Jones¹, Chloe D. Winkler¹, Kayla Harakal¹, Eric C. Atkinson¹

¹Department of Biology, Northwest College

Poster Presentation

Department of Biology, INBRE

Cody; Lovell, WY and Laurel, MT

Many rotifers exhibit a dual life cycle, in which females generally reproduce asexually (amictic parthenogenesis) until environmental cues initiate mixis leading to the production of haploid males and haploid eggs producing diploid resting eggs. Resting eggs are resistant to desiccation remaining viable for many years as an evolutionarily adaptive trait in ephemeral water bodies. Testing if chemicals (potentially, hormones or endocrine disruptors) produced by brine shrimp affect mixis we are attempting to replicate a previous experiment; the relationship between the amictic and mictic cycles of the rotifer, *Brachionus plicatilis*, and the brine shrimp, *Artemia salina*. In 1986, not only brine shrimp, but also media conditioned by their presence, inhibited rotifers from entering mixis ($\chi^2=14.737$, d.f.=1, $p < 0.001$). In 2017, we showed that brine shrimp and the inoculated water do inhibit mixis in some way although to a considerably lesser degree than our historical data. We noted not only numerical but also a behavioral change in the rotifers; rotifers swim more slowly in the presence of brine shrimp. Rotifer populations were unsurprisingly lower in the presence of brine shrimp but also lower in shrimp-conditioned water. We have three groups of 10 vials each: Just rotifers, rotifers with brine shrimp and rotifers in brine shrimp-conditioned water (36 ppt Instant Ocean®). We placed 0.5 micro-liters of live rotifer solution into each 4-dram shell vials to test to see if they would undergo mixis. For 5-8 days we recorded males and resting egg number determining both the onset and magnitude of mixis.

Inclusive Education in the United States and the Netherlands: A Comparative Study

Shelby Kappler with Michelle Jarman

Disability Studies

University of Wyoming

Oral Presentation

Honors Program

Vancouver, WA

Nearly 20% of the U.S. population (U.S. Census Bureau, 2016), and 15% of the global population (World Health Organization, 2018) has a disability. Although they make up the largest minority in the world, people with disabilities are not recognized as such. Disability is commonly seen as a problem and a nuisance, and as a result, people with disabilities have been marginalized and segregated from society. This phenomenon is not a new development, nor is it localized in the United States. It begins in schools, where students with disabilities typically lack opportunities to intermingle with able-bodied students. Through research from travel abroad, practicum experience and personal interviews, this comparative study analyzes school structure, special education, pedagogical strategies, and national access policies in the United States and the Netherlands. From a young age, students with disabilities in the US may be removed from mainstream classes to receive specialized instruction. In the Netherlands, many students with disabilities are referred to alternate schools. The act of separating students with disabilities from their peers reduces both diversity and tolerance of difference. By incorporating inclusive practices and universal design of learning (UDL) into the classroom, every student would benefit. Students would learn from one another in an integrated setting, and could use this knowledge to improve inclusion in the future.

Optical Monitoring of Young Stellar Objects

Aman Kar with Hannah Jang-Condell

Department of Physics and Astronomy

University of Wyoming

Poster

Department of Physics and Astronomy

Kolkata, India

Observing Young Stellar Objects (YSOs) for variability in different wavelengths enables us to understand the evolution and structure of the protoplanetary disks around stars. The stars observed in this project are known YSOs that show variability in the Infrared. Targets were selected from the Spitzer Space Telescope Young Stellar Object Variability (YSOVAR) Program, which monitored star-forming regions in the mid-infrared. The goal of our project is to investigate any correlation between the variability in the infrared versus the optical. Infrared variability of YSOs is associated with the heating of the protoplanetary disk while accretion signatures are observed in the H-alpha region. We used the University of Wyoming's Red Buttes Observatory to monitor these stars for signs of accretion using an H-alpha narrowband filter and the Johnson-Cousins filter set, over the Summer of 2017. We perform relative photometry and inspect for an image-to-image variation by observing these targets for a period of four months every two to three nights. The study helps us better understand the link between accretion and H-alpha activity and establish a disk-star connection.

Cosmogenic Nuclide Dating of the Deltaic Terraces on the Selenga River Delta, Lake Baikal, Siberia

Shaelynn Kaufman with Dr. Brandon McElroy and Dr. Clifford Riebe
Department of Geology and Geophysics
University of Wyoming
Oral Presentation

The Selenga River flows northward from Mongolia, arriving at the southeastern shore of Lake Baikal, in Siberia, forming a delta system at the edge of a tectonically active continental rift zone. The approximately 600 km² delta region seen today, is the result of a high sediment input transport system, being driven by fluvial and strong aeolian processes. The absolute dating of the Selenga River's deltaic terraces, is an effort to constrain and understand the stratigraphy and geomorphology of the region during the Quaternary period. To interpret the stratigraphic history and geomorphology of the delta, field samples from three distinct terrace levels (regionally named: Manzur, Kabansk, and Barani Mis) are being analyzed for the concentration with depth of the cosmogenic nuclide, Beryllium 10. By analyzing depth profiles for concentration of Beryllium 10, potential surface exposure histories of these terraces can be constrained. The study could yield various results depending on the relative exposure ages of the individual terraces. One hypothesis consistent with the observed stratigraphy and geomorphology, is that repeated avulsions of the delta were caused primarily by the tectonic subsidence associated with the Lake Baikal continental rifting zone, while the formation of the modern terrace system was likely the result of increased erosion due to glacial melt at the beginning of the Holocene as the climate warmed. This study of the Selenga River delta will provide further insight into the importance of tectonic and climatic forcing's on the behavior of active delta systems in continental rift zones.

Exploring Attitudes of a Wyoming Parkinson's Community towards Telehealth for Coordinated Care

Catherine Kellar with Mary Jo Cooley Hidecker; Erin Bush; Reshmi Singh, PhD, MS, BS (Pharm); Katelynne Adams, BS.
Health Sciences
University of Wyoming
Poster

ASPIRE

Rapid City, SD

People with Parkinson's disease (PD) encounter problems coordinating their healthcare. For those living in rural locations, problems with care management are compounded due to difficulty of transportation. Little information exists on the needs of the Parkinson's disease community in rural states. This qualitative study examined attitudes towards telehealth in the Wyoming Parkinson's community. Twenty-nine PD stakeholders attended one of five focus groups at two Wyoming Parkinson's Project meetings. These stakeholders included patients, caregivers, health care providers, and researchers. Participants discussed their attitudes and experiences with receiving or providing telehealth services. Five main themes emerged regarding telehealth and rural PD healthcare: 1) inadequate insurance coverage, 2) importance of exercise, 3) limited speech services, 4) medication management, and 5) mixed feelings towards telehealth. Healthcare providers can increase access to allied healthcare by incorporating telehealth delivery into their practice, which would eliminate the long distances associated with living in rural areas. Interprofessional practice could also utilize telehealth as a platform to improve coordinated care among providers.

Motorized Compact Ascender

Joshua M. Kelley, Jessica A. Skindzier, and Colin D. Stringert

with Dr. Kevin Kilty

Mechanical Engineering

University of Wyoming

Oral and Poster Presentation

Department of Mechanical Engineering

Cheyenne, WY

Thornton, CO

Colorado Springs, CO

Ascending a vertical face has numerous applications, such as military, SWAT, fire, construction, or recreational climbing. However, the ability to ascend in a quick and safe manner is limited by the strength and skill of each individual climber. This is further complicated in situations where additional weight requires vertical movement. Thus, the primary objective of this project is to design and implement a device that can safely and consistently lift a weight of 250 pounds at a rate of 2 meters per second. The secondary objective of this project is to minimize the size, the noise output, and the difficulty of use in order to broaden the applicability of the device. In order to meet these goals, it was readily apparent that a high power, motorized ascender needed to be developed. After consideration of other products currently on the market, it was concluded that our requirements could be realized with the incorporation of two electric motors used in conjunction with a worm drive system and two high discharge batteries. Solidworks models were used to visualize the 3D construction of the device and Abaqus models were used to verify stresses within the system to ensure safety. Friction reduction, heat dissipation, motor timing, and electronic speed control emerged as challenges for the fabrication of the device which are anticipated to be resolved through testing. Attaining these goals will produce a device that will increase safety, efficiency, and ease for all individuals that find themselves in the need of a fast ascension.

Name it, Speak it, Act it

Laura Kelly with Margaret Wilson

Theatre and Dance

University of Wyoming

Oral Presentation

Honors

Buffalo, WY

This creative project is a dance performance piece I have choreographed to challenge the mindsets surrounding racism and white privilege, specifically the mindsets around these topics in the Rocky Mountain region of the United States. My experiences studying school and dance on the east coast last year leads me to believe that many people in this region don't think that racism is still a big issue in the United States. This is a dangerous mindset which can result in inadvertent racism. Dance is a powerful method of communication. Nonverbal communication is a significant way to reach a wide range of people, and this piece will perform both at the American College Dance Association in Boulder, Colorado and at the Shepard Symposium for social justice in Laramie, Wyoming. I hope that it will spark thoughtful conversations about individual mindsets toward this topic, and that it will create empathy. My choreography is driven from feelings of frustration surrounding this topic. I've used unison group work to symbolize the mentality that we can all get stuck in because everyone else is thinking that way, and I've used solos and duets to symbolize thinking for yourself and listening to those around you. This piece creates an open dialogue about this topic and the confusion which surrounds it.

Isocitrate Dehydrogenase and the Glyoxylate Bypass
Jacob Kennedy; Mary Thorsness, Peter Thorsness, Grant Bowman
Molecular Biology
University of Wyoming
Oral Presentation

Honors

Cheyenne, WY

Isocitrate Dehydrogenase is an enzyme of the TCA Cycle that catalyzes the conversion of isocitrate to 2-ketoglutarate. It is a major branch point between the TCA Cycle and the Glyoxylate Bypass, and is regulated by Isocitrate Dehydrogenase Kinase-Phosphatase. The regulation of this branch point has significant implications for a cell's ability to grow in limiting nutrient conditions. Mutant *E. coli* cells without Isocitrate Dehydrogenase-Phosphatase are unable to divert carbon from the TCA Cycle to Glyoxylate Bypass, and thus do not survive when grown on minimal carbon sources like acetate. However, suppressor mutations within Isocitrate Dehydrogenase can restore the ability for these mutant *E. coli* cells to survive. These suppressor mutations illustrate important aspects of Isocitrate Dehydrogenase and its activity, and provide information on the role of Isocitrate Dehydrogenase within the entire metabolic pathway.

Does Body Image Matter When Marketing To Millennials?
Katie Kernan with Elizabeth Minton, Marketing and Management
UW
Oral Presentation

Honors

Wheatland, WY

Over the years marketing campaigns have used traditional models representing a limited body image to attract consumers and influence purchasing decisions. However, marketers today are faced with the task of marketing to a new demographic segment called millennials. Body image is a topic that is brought up in the media along with marketing campaigns. In order to explore how body image effects how millennials make decisions regarding purchasing it is important to gather opinions from millennials through conducting a survey, researching the impact of past and present marketing campaigns, and looking at why millennials are different from past generations. When given a survey over 50% of millennials stated that body image was important to them. There are also a variety of brands including L'Oréal, Lane Bryant, and others that have shifted to including a more diverse set of models. Many also stated that they wished to see more diversity in marketing campaigns. With body image being important today amongst millennials it is important for marketers to take into consideration these behaviors. Marketers should incorporate diversity and focus on improving body image with their marketing campaigns.

Identification of *Cyclospora* in *Scalopus aquaticus* (Eastern moles)

Catherine Kerr¹, Dagmara Motriuk-Smith¹, Chris T. McAllister², and R. Scott Seville¹

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Department of Science and Mathematics, Eastern Oklahoma State College²

Poster Presentation

INBRE

Casper, WY

Two new species of *Cyclospora* were identified in samples collected from *Scalopus aquaticus* (Eastern mole) hosts (collected in Benton Co. and Union Co., Arkansas). Ninety oocysts *Cyclospora* spp1 and fifty-three oocysts from *Cyclospora* spp2 were photographed, measured, and compared to published descriptions. The average size of the oocysts of *Cyclospora* spp1 was 11.4 X 10.0 μm with a shape index length/width (L/W) of 1.1. Micropyle and oocyst residuum were absent but one polar granule was present. These oocysts had a thin wall averaging 0.67 μm . The sporocysts were ellipsoidal and their average was 7.1 X 5.3 μm with a shape index L/W 1.3. The average size of the oocysts of *Cyclospora* spp2 was 17.0 X 15.2 μm with a shape index L/W 1.1. Micropyle and oocyst residuum were absent and only one polar granule was present. The outer layer of the wall was ornate with an average wall thickness of 1.3 μm . The sporocyst measured on average 9.7 X 7.3 μm with a shape index L/W 1.3. This study focused on describing oocysts using morphological traits. DNA extraction, sequencing, and the construction of phylogenetic trees that define evolutionary relationships will be attempted in the future.

Detecting Solar Arrays in Satellite Imagery Using Neural Networks

Michael Kesy Advised by Dr. Wright

Electrical Engineering

University of Wyoming

Oral and Poster Presentation

Cheyenne, WY

Solar energy is a growing sector in today's energy landscape, however, there is a limited amount of publicly accessible data regarding how they're distributed. To remedy this, satellite imagery can be used to manually count and size the rooftop solar arrays present. The purpose of this project was to create an automated method to do this. The way this was done was by using publicly available, annotated, satellite images and first extracting features within the image. These features were then used to train a neural network to detect solar panels and return information regarding their distribution and sizes.

Does Plumage Influence Hybridization in the Family Cardinalidae

Adam Klessens and Libby Megna

Zoology

University of Wyoming

Oral and Poster

Zoology Department

Cody, WY

Over time, reproductive isolation causes species to diverge. This divergence could be caused by many barriers that prevented gene flow between species. If two species come into contact, they could remain isolated or they could hybridize. I have two hypotheses about why hybridization happens in some birds but not in others: 1) plumage divergence is more important in determining if species hybridize or 2) song is more important. In this study, I examined the plumage of six species of Cardinalidae to determine if plumage influences hybridization. My goal for this study was to find a way to quantify the plumage characteristics, so we can determine the likelihood of two species hybridizing, based on plumage similarity, and to predict hybridization in other bird species. The six species I selected either hybridize, are sympatric and do not hybridize, or are completely separate. The species that I am looking at are *Passerina amoena*, *Passerina cyanea*, *Passerina versicolor*, *Passerina ciris*, *Cyanocompsa brissonii*, and *Cyanocompsa parrellina*. We know that *P. amoena* hybridizes with *P. cyanea*, that *P. versicolor* is sympatric with *P. ciris* but they do not hybridize, and *C. brissonii* and *C. parrellina* are allopatric. I will be using multispectral imaging to determine similarities in the plumage between species. I selected small patches on the ventral, lateral, and dorsal sides of each bird to compare against each other. I will calculate plumage divergence between species from these measurements, which will allow me to determine why some species hybridize and others do not.

Ectomycorrhizal Influence on Post Fire Ponderosa Pine Forest Regeneration after high intensity wildfire

Kristina Kline with Dr. Linda van Diepen

Department of Ecosystem Sciences

University of Wyoming

Poster Presentation

Soil Microbial Ecology

Gillette, WY

Mycorrhizal fungi receive photosynthate (sugars) from their host plant in exchange for providing nutrients and water to the plant. Ectomycorrhizal (EM) fungi have a symbiotic relationship with trees and other woody plants, but also have some saprophytic abilities that allow it to live without a host. Additionally, mycorrhizae provide soil stability, can improve uptake of certain nutrients, and can protect plant roots against malicious soil microorganisms ultimately helping to prevent disease. These functions both maintain the health of a forest but also help new seedlings become established and continue to thrive. High intensity wildfires not only kill the living plants seen above ground, but also the belowground seed bank and microorganisms, including mycorrhizae. Any remaining sources of mycorrhizal inoculum would be the best adapted to the local environmental conditions and would be the most efficient at providing resources to the vegetation in that area. The goal of this project was to explore the role mycorrhizal networks play in the regeneration of ponderosa pine forests after a high intensity wildfire. Data was collected from the University of Wyoming's Rogers Research Station, where a high intensity wild-fire swept the area in 2012. Since then, multiple restoration treatments have been put in place to simulate various management strategies. Distance to the remains of burned trees was measured for all surviving planted pine seedlings in each of the restoration treatments, and will be analyzed to investigate the possibility of mycorrhizal fungi serving as a source of inoculum for the next generation of trees.

The Development of an Antemortem Test for Swine Brucellosis

Callie Klinghagen¹, Meagan Soehn¹, Brant Schumaker¹, Noah Hull¹,
Ashley Smith¹

¹Department of Veterinary Sciences, University of Wyoming

Oral Presentation

INBRE

Worland, Casper, WY

Brucellosis is a zoonotic disease caused by bacteria in the genus *Brucella*. It remains the most commonly reported zoonosis and is the number one laboratory acquired infection. *Brucella suis* is the etiologic agent for swine brucellosis, but can be transmitted to cattle and humans. There are an estimated 6 million feral swine inhabiting the United States with seroprevalence for swine brucellosis ranging anywhere from 2-44%. In humans, *B. suis* is acquired through contact or ingestion of infected animal tissues or byproducts (bovine and swine origin), poor hygiene practices after hunting feral swine, or through laboratory practices; while in animals the disease is primarily transmitted through mucosal contact. Diagnosing brucellosis begins with a serologic test followed by the cull and bacterial culture of a reactor or suspect animal. The diagnostic "gold standard", culture, is costly, extremely time consuming, and has poor sensitivity thus, it requires a relatively high number of bacterial cells for colonies to grow, which results in high false negatives. Therefore, the development of a test with high sensitivity and specificity is warranted for the detection of swine brucellosis in livestock and for reduced transmission in humans. This ongoing study is working to find a reliable antemortem assay, such as a quantitative polymerase chain reaction (qPCR) test to detect and diagnose swine brucellosis in animals and food products (milk). The overall objective of this project is to develop, validate, and implement a novel molecular assay for the detection of swine brucellosis and the reduction of spillover into human populations.

Comparison of Deuterium Oxide and Bioelectrical Impedance Analysis in Total Body Water and Body Water Turnover

Travis Kolvo with Dr. Evan Johnson

Department of Kinesiology and Health Promotion

University of Wyoming

Oral Presentation

Human Integrative Physiology Lab

Cheyenne, WY

Bioelectrical Impedance (BIA) is a technique for measuring body composition and total body water (TBW). This is done through an electrical current traveling through the body. The amount of water present is proportional to how quickly the current passes through the body. Deuterium oxide, ²H₂O, utilizes degradation of the isotope deuterium to hydrogen ratio (D/H) to measure total body water. While ²H₂O has been validated, it is a more time consuming, expensive, and technically intensive procedure when compared to BIA. The purpose of this study was to measure the validity of BIA compared to ²H₂O in measurements of TBW and water turnover (WTO) during a 2-week water intake intervention. BIA measurements were gathered pre and post-intervention using a RJL Systems Quantum IV (RJL Systems, Inc., Clinton Township, MI). ²H₂O measurements were collected pre and post-intervention through consecutive urine samples provided over 3 days. ²H₂O samples were distilled through a water extraction line and analyzed for D/H ratio, using a Picarro L2130-I Analyzer (Picarro Inc., Santa Clara, CA). A Bland-Altman plot will be used to compare the two measurement methods. At this point in the study, 4 of 10 subjects have been distilled and are awaiting D/H ratio analysis from the stable isotopes facility.

Third Grade Literacy Recall
Annie Layden with Amy Spiker
Elementary Education
University of Wyoming
Oral Presentation

Honors

Fort Collins, CO

Recall of content knowledge is a skill that every elementary-aged student uses throughout the school day. This skill is practiced in each content area that is associated with collecting information from any oral or written text. Students who are able to recall important knowledge are then able to synthesize that information so it is adequately stored as schema for future learning. Recall can be practiced with literacy and nonfiction texts in the literacy content area. The ability to recall is a skill that is practiced in creating sequels of literacy works along with synthesizing research from two article sources in order to write a paragraph about both articles. Lesson that focus on this skill of retelling and recalling information help students to later access prior knowledge as scaffolding for new knowledge. This skill was practiced with third graders through a fiction, literacy piece along with two nonfiction article on endangered animal species. With the literacy work students were expected to create their own sequel of the story with original story elements. Then student with the endangered species articles were expected to synthesize information from both to create their own analysis of them in a paragraph.

Iron Depletion in *Toxoplasma gondii* Infection Increases Cyst Burden in Mice

Haley Lefaivre^{1,2}, Eissac Flowers^{1,3}, Stephen L. Denton⁴, Jason Gigley^{4,5}

¹Co-presenters, ²College of Pharmacy, ³Department of Physiology, ⁴Department of Molecular Biology, ⁵Principal Investigator

Department of Molecular Biology, INBRE

Rock Springs; Powell, WY

Toxoplasma gondii (*T. gondii*) is one of the most successful human pathogens in that it is highly prevalent, infecting one-third of the population, and there are no treatments to cure or prevent infection. The parasite establishes a relatively asymptomatic, life-long infection, but concerns arise for immunosuppressed individuals for whom the infection can become deadly. In the immunosuppressed, tissue damage caused by necrosis and inflammation can lead to blindness by chorioretinitis and death by encephalitis. The obligate intracellular parasite scavenges many nutrients including essential metals from the host cell. Iron is one of these essential metals required for all life and its balance is highly controlled in humans. We hypothesized that iron is a key determinant of *T. gondii* infection outcomes and that an in-depth examination of iron perturbations on disease progression and host response could identify new pathways for therapeutic intervention. Chelation of iron *in vitro* prevents growth and replication of the pathogen, but paradoxically *in vivo* experiments showed increased dissemination into brain tissue. To address the mechanism behind this phenotype, we investigated using a two-prong approach. Here, *in vitro*, we tested the ability of the parasite to invade and life stage convert using RT-PCR and fluorescent microscopy under iron-deficient conditions. Additionally, *in vivo*, we surveyed host immune cell composition under variable iron conditions using flow cytometry to determine the cell type most impacted by iron availability.

Are Local Pollinators and Plant Seed Set Affected by Laramie's Mosquito Control Program?

Alexis Lester and Lusha Tronstad
Biology
University of Wyoming
Oral Presentation

Wyoming Natural Diversity Database

Cheyenne, WY

Laramie and many other cities in the western United States use broad scale application of insecticides to control mosquitos in the spring and summer. These practices may affect pollinator communities; several commonly used pesticides are toxic to bees. Bees and other pollinating insects are vital for seed-set and pollination of both wild and domestic plants. Our study examined insects and seed-set within the city of Laramie, where insecticide is applied several times weekly during mosquito season, and at a control site outside the city where insecticides are not used. We compared insect abundance and richness by using bee cups and vane traps at the control site within the city of Laramie during the summer of 2017. We also hand-netted bees in the city on 6 occasions. Overall insect mass was similar between bee genera observed at both sites, but the control site had greater bee abundance and diversity. We compared seed-set in hand pollinated, bagged and ambient blossoms on hollyhock plants at control and Laramie sites. More seeds were observed at in Laramie, possibly due to differences in plant cultivars or soil, but mass was similar at both sites. Self-pollinated seeds were smaller for both sites. Our results show differences in the bee community between the control site and within the city, which may indicate that fogging, as well as other urban practices, are affecting Laramie's native bee population.

False Positives in Exoplanet Detection

Jacob Leuquire, Hannah Jang-Condell
Physics and Astronomy
University of Wyoming
Poster Presentation

Cheyenne, WY

Our team at the University of Wyoming uses a 0.6 m telescope at RBO (Red Buttes Observatory) to help confirm results on potential exoplanet candidates from low resolution, wide field surveys shared by the KELT (Kilodegree Extremely Little Telescope) team. False positives are common in this work. We carry out transit photometry, and this method comes with special types of false positives. The most common false positive seen at the confirmation level is an EB (eclipsing binary). Low resolution images are great in detecting multiple sources for photometric dips in light curves, but they lack the precision to decipher single targets at an accurate level. For example, target star KC18C030621 needed RBO's photometric precision to determine there was a nearby EB causing exoplanet type light curves. Identifying false positives with our telescope is important work because it helps eliminate the waste of time taken by more expensive telescopes trying to rule out negative candidate stars. It also furthers the identification of other types of photometric events, like eclipsing binaries, so they can be studied on their own.

Pen-Box

Anson Lichtfuss, Talon Marquard, Eric Mill, Spencer Ollila, and Jacob Wild

with Dr. Borowczak

Computer Science

University of Wyoming

Oral and Poster Presentation

Department of Computer Science

Laramie, WY

Millions of dollars in man-hours, information, and money are lost every year due to lacking organizational security. The Pen-box addresses problems small business and nonprofits face in cybersecurity. Consisting of a suite of penetration testing tools and procedures, it provides a cheap, non-invasive, and easy-to-use solution that allows smaller organizations to safeguard their critical data and infrastructure. Many small-scale officialdoms do not have the capital to retain or temporarily hire a security team. Pen-box is an affordable kit that can be self-navigated and provides an economical solution for testing. It also acts as an educational tool, showing businesses about potential attack vectors. Website vulnerabilities, man-in-the-middle attacks, physical security, and phishing can all be tested for and diagnosed with this tool. Included step-by-step procedures allow companies to quickly find and fix vulnerabilities autonomously, in some cases. The hardware and methodologies incorporated serve as building blocks for organizations to continue learning and adapting to the ever-changing threats in cybersecurity. By using Pen-box, businesses will increase their own security and confidence in its setup. Many hours of investigation and testing were poured into this tool in order to maximize its simplicity and effectiveness. Pen-box, a high-quality, unique tool, is extraordinarily useful in the current technological climate and brings affordable, approachable security to businesses and organizations of diverse sizes.

Rocky Mountain Power's Laramie Microgrid

Daniel Liggett

University of Wyoming

College of Engineering and Applied Science

Department of Electrical & Computer Engineering

The location and existing distribution architecture of Laramie, Wyoming's power grid presents an intriguing opportunity to study the system's ability to operate as a self-sustaining microgrid. Laramie's power distribution system is isolated and has no ties to outside distribution systems. Thus, the study of a diversified, resilient distribution system redesign has been undertaken. This is a three-year project between the Electrical and Computer Engineering Department's Senior Design program & Rocky Mountain Power. The current year (one) focuses on establishing the key attributes of the system, and identifying the infrastructure required for transformation into a self-sustaining microgrid. High-level cost estimates and environmental parameters, as well as power quality parameters unique to Laramie's distribution system are used to develop & simulate an initial microgrid design. Power analysis software, load profiling data, and other design tools are used to develop & simulate a well-balanced mix of distributed energy resources such as wind, solar, and conventional generation. The end goal of the project is a realistic design capable of "islanding" Laramie's power system in a feasible & cost-effective manner.

Solvent Extraction of Powder River Basin Coal

Briana Long, Ishan Patel, Koby Vicksman, Osamah Jubran Al Mawla, Nick Brown

Dr. David Bell, Chemical Engineering
University of Wyoming
Oral Presentation

Chemical Engineering

*Gillette, WY
Ahmedabad, India
Denver, CO
Rock Springs, WY
Encampment, WY*

Our project explores methods used for the continuous solvent extraction of coal. Coal solvent extraction is a process that is likely to be incorporated in coal industries. Our project strives to design an economically feasible plant within the Powder River Basin with a basis of 5000 tons of coal processed per day. Using light cycle oil as the extraction solvent we examined the leaching of high carbon content and ash-free pitch separated from coal. This model is compared economically to coal solvent extraction using tetralin. Pitch, or hyper-coal, is the main product extracted from coal. Though the market is not fully specified, we expect to sell this product to other companies to create products such as polymers, carbon fiber, etc. The goal of this project is to design a plant to produce pitch from Powder River Basin coal, and determine the economic feasibility of coal extraction using various solvents.

The Efficacy of HIIT and HIRT in Older Adults

Avery Madden with Derek Smith
Kinesiology and Health Promotion
University of Wyoming
Oral Presentation

Honors

Torrington, WY

Modern intensity continuous exercise (MICE) improves aerobic and functional fitness and prevents chronic disease and premature morbidity. Aerobic and functional fitness are validated clinical indicators of chronic disease risk. High intensity interval training (HIIT) is a time efficient and safe alternative to MICE that has positive effects on some chronic diseases and risk in younger healthy populations. Limited research has investigated HIIT in older, at-risk populations; and the health benefits of including *resistance training* into HIIT approaches (HIRT) is even more limited in older, at-risk adults. The purpose of this research was to determine the aerobic and functional fitness efficacy of HIIT and HIRT exercise interventions compared to MICE in older adults at-risk for chronic disease. Forty-eight adults (≥ 65 years) were recruited and randomized into three 8-week exercise intervention groups: MICE (active control), HIIT, and HIRT. Aerobic ($VO_2\max$) and functional fitness (functional movement screen, FMS; timed-up-and-go, TUG; floor transfer time, FTT) were measured at baseline and after 8-weeks. $VO_2\max$ improved similarly in all groups (HIIT 2.2 ± 0.3 ; HIRT 3.5 ± 0.7 . MICE 2.1 ± 0.5 ml/kg/min, $P < 0.01$). Both high-intensity groups improved in FTT (HIRT=17%, $P < 0.01$; HIIT=12%, $P < 0.05$) and FMS (HIRT=17%, HIIT =10%, $P < 0.01$). Only HIRT improved in TUG (10.6%) and balance (9%). No injuries or adverse events occurred in any group. HIRT and HITT are as safe and efficacious as MICE in older adults for improving aerobic and functional fitness. HIRT appears to elicit additional functional fitness benefit, but both high-intensity approaches are safe and effective alternatives for older adults' with/at-risk for chronic disease.

Mapping Wyoming's Future

Samuel Mallory with Paddington Hodza

School of Energy Resources, University of Wyoming

Oral Presentation

Department of Geography, University Honors Program

Cheyenne, WY

The state of Wyoming's economy is heavily dependent on its natural resources and extractive mineral industries. In 2008, 39.36% of the Gross Domestic Product of the state was from extractive industries. This dependence has made the state sensitive to the volatility of energy industries and caused major booms and busts throughout its history. In 2016, Governor Matt Mead started the ENDOW Initiative (Economically Needed Diversity Options for Wyoming) in an effort to help guide the state to build a more diversified economy. Through the ENDOW initiative, this project aimed to develop a series of comprehensive asset maps that geographically illustrate the numerous tools the state has available to develop or improve various industry sectors. This was accomplished by establishing a basic understanding of the requisite assets for each individual industry sector, developing an individual map for each asset, and communicating with industry professionals on how to best communicate these maps to the ENDOW council in an unbiased manner. Once a rough draft of all the available assets was developed with feedback from industry professionals, maps were amalgamated thematically to help convey the true opportunities and limitations available to the state; resulting in over 60 published maps to a socioeconomic report for assisting the ENDOW Council. The resulting maps are currently being used by the ENDOW Council to help develop a plan for diversifying Wyoming's Economy.

Racial Inequality of United States Health Care

Brooke Marcus with Dr. Steven Bialostok

Biology and Psychology

University of Wyoming

Oral Presentation

Honors

Douglas, WY

Race is a deeply engrained part of society, impacting all aspects of a person's life including health care. In the United States, a person of minority status is more likely to live a sicker and shorter life compared to a Caucasian American. There has never been a time, in the history of the country, that the health status of minorities has been equal to that of Caucasians (Geiger, 2003; Byrd and Clayton, 2000; National Center of Health Statistics, 2003). Minorities live six years shorter than a person of the social majority born at the same time in the same place (National Center for Health Statistics, 2003). Yet, the difference in DNA between one human to any other human on the planet is only half of a percent (Berg et al., 2015). The disparity in health care is not attributed to physical or biological differences between races, but to social and cultural barriers. The goal of this project was to examine the historical context in which the United States health system began having a health gap between different races, the current scope of the problem with health disparity, and potential solutions. While health disparity is a shocking and dangerous issue, there are steps that the medical community can take to educate future and current health care providers to better care for racial minorities.

Regenerative Braking and Charge Control for the E-Baja

Lissa May Margharos, Jentry Bain

With Dr. Eva Ferre-Pikal

Electrical Engineering

University of Wyoming

Oral and Poster Presentation

Department of Electrical Engineering

Casper, WY

The Electronic Baja (E-Baja) is a fully electric, off-road vehicle that utilizes regenerative braking. In a battery powered electric vehicle, regenerative braking is the conversion of kinetic energy from the vehicle into chemical energy which is stored in a battery; That energy can later be used to power the vehicle. In a traditional gasoline engine, the majority of this kinetic energy is converted into heat by the brake pads and is not recovered. According to the Global Mass Transit Report, transportation accounts for about 20 percent of the world's total energy use, consequently giving rise to the cost of fuel, increased air pollution, and climate change. Regenerative braking has become a popular solution because it increases efficiency of the vehicle, reduces pollution, and decreases maintenance costs. The goal of this project was to design and build a regenerative braking system and create a fully automated battery charger for the E-Baja. Development of a functional E-Baja was accomplished by collaboration between 2 electrical engineers and 5 mechanical engineers. The electrical team engineered and assembled the regenerative braking system, interfaced electronic drivetrain components, and automated the battery charger. A dynamometer that coupled directly to the motor was utilized to validate the regenerative braking system. Data such as torque curves, horsepower and efficiency of the regenerative braking system were determined through the use of the dynamometer.

Sensational Service Through Transformational Travel

Cassidy Marks with Erin Olsen-Pueblitz

SLCE Department

University of Wyoming

Oral and Individual Presentation

Honors

Cheyenne, WY

Travel and service are two fundamental activities for me. One way I have been able to combine these experiences and cultivate my love for them is through the University of Wyoming's Alternative Breaks Program. The mission of this program is, "to engage the University of Wyoming community in service and experiential learning while promoting global citizenship". The goals for students include, but are not limited to, "enact positive change through service, develop a stronger community between students, empower student leaders, becoming further educated on social justice issues, as well as encourage students to become active citizens". It is through the Alternative Breaks program that I have been able to see positive changes in myself, as I have reached some of the goals outlined for students. My first exposure to Alternative Breaks was during my sophomore year, when I went to Kanab, Utah. We worked with Best Friends Animal Sanctuary while focusing on animal wellness for this trip. One year later, I went to Matelot, Trinidad. The focus of this trip was community development and women's education. The two trips were drastically different, while remaining equally impactful. This year, I have the tremendous opportunity to co-lead a trip to Arizona in March 2018. The goal for this trip is to learn about, and provide service for immigration rights and reform. To do so, we will work with non-profit organizations in Tucson and Phoenix, getting exposure to people whose lives are affected by immigration rights on a daily basis.

edTPA: A Performance Based Assessment in the Classroom

Allison Marsh with Dr. Scott Chamberlin

Elementary Education

University of Wyoming

Oral Presentation

Honors

Torrington, WY

Teacher candidates today are faced with the responsibility to meet the diverse needs of learners in the classroom. The University of Wyoming uses Educative Teacher Preparedness Assessment (edTPA) to provide evidence that the candidate understands the classroom as a whole as well as the student's individual needs. One of the most important considerations includes preparedness to modify and differentiate lessons to fit the needs of all students. Through integration of a variety of teaching strategies (both teacher and student centered), teachers are able to reach all types of learners through scaffolding including direct instruction, gradual release, and project based learning. The goal of this project was to create a unit of five lessons for fourth grade students in Wyoming, which aligned with both Common Core literacy standards as well as social studies curriculum, that helped future educators develop skills to be successful in a variety of school settings. This was accomplished through development of planning, instruction, and evaluation tasks that assessed the pre-service teacher's preparedness to meet the academic needs of all students. Students were required to practice literacy strategies, including comprehension, analyzing of primary sources, knowledge of vocabulary words, and how to read informational texts.

Tools, Toys, or Both?

The Use and Effectiveness of Fidgets in the Preschool Classroom

Stephanie McClung with Marci Smith

Kinesiology and Health Promotion

University of Wyoming

Oral Presentation

Honors

Big Springs, NE

The use of fidgets as a therapy tool in preschool classrooms has recently become a topic of debate and research by health care professionals and educators. This paper defines what classifies as a fidget, reviews the therapeutic benefits for preschool special needs students, and examines current research findings that support and refute their effectiveness. A fidget is any object that is used to supply and regulate an individual's sensory need for movement and touch. For years' educators have been using fidgets as a resource to help enhance concentration, initiate calming, and reduce the incidence of off task behaviors. Theoretically this produces the desired responses, however in preschool classrooms fidgets can be a distraction and thus more of a toy than an effective therapy device. By conducting a literature review of current research, the objective of this analysis is to provide evidence for and against the use of fidgets in a preschool.

**Behavioral Inhibition and Posttrauma Symptomatology:
The Moderating Effect of Safety Behaviors**

McClure, K. E.¹, Ripley, A. J.¹, Blakey, S. M.², Kern, S. A.¹, Kozina, R. M.¹, & Clapp, J. D.^{1a}

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^a Faculty Mentor

Oral Presentation

Honors

Cheyenne, WY

Research demonstrates a relation between behavioral inhibition (BI), a general sensitivity to negative outcomes, and symptoms of posttraumatic stress. BI is believed to contribute to maintenance of PTSD through increased risk of avoidance and hypervigilant behavior. Factors altering this relation have received little attention. Anxiety-related safety behaviors (SB), actions performed to prevent or mitigate feared outcomes or distress, may impact the nature of this relation. The current research examined the unique and interactive associations of BIS and SB with posttrauma symptoms. Participants were undergraduates in an ongoing study examining interpersonal and functional outcomes after Criterion-A trauma. Behavioral inhibition was assessed using Carver & White's (1994) scale. SB were examined using a measure targeting the frequency of anxiety-related safety behaviors. Symptoms were evaluated with the PTSD Checklist for DSM-5 (PCL-5). Relationships of SB and behavioral inhibition on symptom dimensions were examined with regression models controlling for sex. Frequency of SB evidenced direct relations with Avoidance ($p < 0.001$, $pr = 0.46$), Cognitive Distortion ($p < 0.001$, $pr = 0.37$), and Re-experiencing ($p < 0.001$, $pr = 0.45$) clusters. An interactive effect of BIS and SB ($p = 0.013$, $pr = 0.22$) was also noted for symptoms of trauma-related Arousal. Simple slopes indicated a reliable association of BIS and Arousal only at high levels of SB ($p = 0.005$, $pr = 0.24$). Results show SB is a predictor of PTSD symptomology but varies across symptoms dimensions. SB showed a moderating effect on BIS for arousal symptoms and main effects for others.

Dual Point Rifle Retention System

Kyle McCurley, Ethan Brost, Rudy Batista, and Connor Dingae

Dr. Robert Erikson, Mechanical Engineering

University of Wyoming

Oral Presentation

NASA Space Grant

Apple Valley, CA

Brush, CO

Riverton, WY

Loveland, CO

The goal of this project was to develop a way to safely and securely carry a firearm, most likely a hunting rifle, on an external frame pack while keeping it readily available to the carrier. In addition to the design goals, a goal as to how well the product must function was set, the user must be able to detach the firearm and present it in under three seconds. Various methods and gadgets already existed; however, none of them satisfied all of the previously mentioned goals. They would often carry the firearm securely but inaccessible or accessible but not secured enough to protect the firearm from swinging into an obstacle. The preliminary design established that a "lock and key" method would best suit the project. A small key would attach to the pack and allow the lock, attached to the firearm via ratcheting ladder strap, to rotate onto the key thus attaching to the pack. As the lock rotates, due to the helical design of the system, the key slides into the lock much like a woodscrew into a board. This lock and key system displayed excellent results during initial testing with 3-D printed prototypes as it securely held the firearm and made it possible to deploy under the three-second goal. Considerations for improvements include tweaking the design to allow the lock and key to attach to each other in an easier way and casting the parts in aluminum for stronger material properties.

Aircraft Battery Capacity Tester

Andrew McLaughlin
Computer Engineering
University of Wyoming
Oral and Poster Presentation

Mistwood Aviation

St. Louis, MO

The purpose of this project is to design an aircraft battery capacity tester less expensive than others with more functionality. Each aircraft service center must have one of these devices to check the capacity (or reliability) of an aircraft battery. The products currently on the market cost anywhere from \$600 to \$2000 while the components to make them cost far less as well as only display a pass/fail result with no data analysis. My battery capacity tester will have all the same functionality, cost only \$250, and will have the capability to transfer data to a computer in which a graph will be automatically generated for the technician to analyze and demonstrate to the owner of the battery. If the owner requires a new battery it will be easily depicted through the graph, if not, then the graph will serve as evidence that the battery was in good condition at the time of the test. The main component that will make my device cheaper than others will be the resistance source that I use. Traditional capacity tester devices use a low ohm, high amperage resistors which can cost around \$100. I will be using halogen lights that will create the same amount of resistance and cost far less. My hope for this project is to be able to market this device to aircraft service centers that wish to save money and desire a more analytic data analysis for their customers.

MPD Modelling Simulator

James Gallagher, Jonathan McGregor, Marc Côté
Tawfik Elshehabi, Petroleum Engineering
University of Wyoming
Oral Presentation

James Gallagher, Calgary, Alberta, CA

Jonathan McGregor, Vernon, British Columbia, CA

Marc Côté, North Sydney, Nova Scotia, CA

Managed pressure drilling is a closed loop pressure control system that allows for the manual and real time manipulation of equivalent circulating densities. This is executed by surface applied back pressure against the annulus during static and or dynamic wellbore conditions. The major area of value with this technology is seen when drilling tight fracture pressure and pore pressure formation windows. This technology has greatly expanded the fields that energy companies can now exploit, allowing for increased recoverable reserves and more abundant energy for the marketplace. Optimizing a managed pressure drilling program is highly dependent on the equivalent circulating densities (ECD) encountered while drilling and equivalent static densities when operations call for static wellbore conditions. The purpose of this project will be to effectively develop a user-friendly Excel based program, that can model ECDs and pressure losses in the system. The primary component of the model in this project is demonstrating frictional losses in the drill string and annular spaces in the wellbore. Initially, the model was formulated based on a straight, vertical pipe segment while circulating drilling mud at a constant rate in like annulus space. All mud properties are based off of the Herschel-Buckley rheological model. Furthermore; other varying downhole parameters that have a significant effect on frictional losses on the circulating system have been added to the simple model. These parameters include; pipe eccentricity, pipe rotation, fluid temperature fluctuations within the wellbore resulting from changing formation temperature gradients, cuttings concentration and loading, the presence of tool joints and stabilizers as well as pressure losses attributed to fluid flow through drilling tools. With these parameters added into the existing Excel-based model, the model can be adjusted to dictate trip speeds based on the equivalent static densities at varying points encountered throughout the drilling program. It will also aim to show required mud densities and surface applied backpressures while drilling at different times and depths throughout the wellbore.

Is Bt cotton responsible for increased number of farmer suicides in India?

Bryan C. McInerney¹, Celia J. Karim², William B. Baxter³, Katherine C. Jacobs⁴
with Ramesh Sivanpillai^{5,6}

1. Department of English, 2. School of Environment & Natural Resources, 3. Department of
Geography, 4. Family and Consumer Science, 5. Department of Botany, and 6. WyGISC
University of Wyoming

Oral Presentation

Haub School of Environment and Natural Resources

*Cheyenne, WY
Sacramento, CA
Riverton, WY
Rock Springs, WY*

Genetically modified (GM) crops have built in resistance to certain insects or diseases; thus, increasing yield and profits for the farmers. Bt cotton, a GM crop, was developed by introducing a toxic gene from a bacterium (*Bacillus thuringiensis*) into cotton plants to build resistance against the pink bollworm (*Pectinophora gossypiella*), a major pest of this crop. Bt cotton was marketed in India with hopes of higher yield and lower input cost. Most farmers secured money from private moneylenders to obtain these new, expensive seeds. However, the farmers did not understand that Bt cotton was susceptible to other pests and drought, and after a few seasons the bollworm started to develop tolerance to Bt cotton. When Bt cotton crops failed, farmers were unable to repay their loans. Increased rates of farmer suicides are now attributed to the problems associated with Bt cotton. This presentation will focus on the history of Bt cotton in India, and its impact on the lives of farmers, primarily the increase in reported farmer suicide.

Stage Management Website

Sheridan McKinley with Sean Stone
Department of Theatre and Dance
University of Wyoming
Poster Presentation

Honors

Sheridan, WY

One of the major challenges in the theatre is communication. With casts of over 20 and design teams of almost 15, making sure everyone is in contact with everyone else is a feat to say the least. Of course, we all have email, Facebook, text messages, etc., but for the University of Wyoming's production of *The Tender Land* by Aaron Copland, I wanted to find a better way to help bridge the gap between the actors, the design team, and the stage management team. I have created a website to act as the hub of communication for everyone involved with the production. It includes pages for schedules, photos, announcements, reports, and everything else involved in the mounting of a production. My goal was to see if creating a website would help everyone involved be more informed about the rehearsal process, and to create a sort of time capsule of the production that the designers, actors, and other faculty could access long after the production closes. In this presentation, I will explain how I made the website, how I chose what got put on it, and whether I accomplished my goals or not.

Universal Micro-Hydroelectric Generator

Luke McLaughlin with Dr. Rob Erikson

Mechanical Engineering

University of Wyoming

Oral Presentation

Department of Mechanical Engineering

Rapid City, SD

As the demand for electricity continues to grow around the world, so does the ability to provide electricity. However, a significant portion of the global population is still without reliable electricity or any electricity at all. Inconsistent grid power caused by natural disaster, prohibitively expensive utility costs and isolation from grid access are a few factors preventing many people around the world from having access to reliable electricity. These issues can often be addressed through simple solutions such as the implementation of generators and solar panels. But, these solutions can be expensive and present several hurdles such as fuel transportation and extensive battery storage. The purpose of this design project was to create an affordable micro-hydroelectric generator made of universal components. By utilizing recycled car parts, metal scraps and other various materials, an affordable micro-hydroelectric generator has been built. A Toyota Denso 22RE alternator was converted to a permanent magnet alternator in order to produce electricity at low turbine speeds. The converted alternator was tested for power output and core temperature as a function of rotational speed. Remaining system components were designed while considering the converted core test results. A build manual for the system has been developed which prescribes materials and methods necessary to build the system. Affordability and availability were key points of focus throughout the project design and building phases. The developed system's intended use is to provide electricity to communities and individuals all around the world.

Universal Micro-Hydroelectric Generator

Damon Unland, Luke McLaughlin, Owen Bense

with Dr. Rob Erikson

Mechanical Engineering

University of Wyoming

Oral Presentation

Department of Mechanical Engineering

Laramie, WY

As the demand for electricity continues to grow around the world, so does the ability to provide electricity. However, a significant portion of the global population is still without reliable electricity or any electricity at all. Inconsistent grid power caused by natural disaster, prohibitively expensive utility costs and isolation from grid access are a few factors preventing many people around the world from having access to reliable electricity. These issues can often be addressed through simple solutions such as the implementation of generators and solar panels. But, these solutions can be expensive and present several hurdles such as fuel transportation and extensive battery storage. The purpose of this design project was to create an affordable micro-hydroelectric generator made of universal components. By utilizing recycled car parts, metal scraps and other various materials, an affordable micro-hydroelectric generator has been built. A Toyota Denso 22RE alternator was converted to a permanent magnet alternator in order to produce electricity at low turbine speeds. The converted alternator was tested for power output and core temperature as a function of rotational speed. Remaining system components were designed while considering the converted core test results. A build manual for the system has been developed which prescribes materials and methods necessary to build the system. Affordability and availability were key points of focus throughout the project design and building phases. The developed system's intended use is to provide electricity to communities and individuals all around the world.

Behavior Based Authentication System

Taylor Means and Jared Frank

With Mike Borowczak, Computer Science

University of Wyoming

Oral & Poster Presentation

Department of Computer Science

Laramie, WY

All current forms of authentication are exploitable via social engineering, theft, hacking, or replication. Due to this, a new form of authentication should be explored: behavioral. A solution to this problem would result in more secure digital environment, including physical access to computers as well as software access. The maze-solving approach presented by this project allows for multiple variables to be observed within a user, presenting many facets of behavior that can be analyzed. In order to solve this problem, enough parameters must be collected and contrasted against one another in order to tell different humans apart from each other based on how they solve a maze. Other methods of currently existing authentication rely on what you own (physical keys), what you know (passwords), and what you have (biometrics). By creating a randomly generated maze and having an observer AI object keep track of how different users solve a maze, we are able to tell two different users apart from one another to a similar degree of accuracy as other methods do. Our AI factors in variables such as time spent moving the player, time spent not moving, backtracking, strategy, and more.

Behavior Based Authentication System

Taylor Means with Mike Borowczak

Computer Science

University of Wyoming

Oral Presentation

Honors

Laramie, WY

All current forms of authentication are exploitable via social engineering, theft, hacking, or replication. Due to this, a new form of authentication should be explored: behavioral. A solution to this problem would result in more secure digital environment, including physical access to computers as well as software access. The maze-solving approach presented by this project allows for multiple variables to be observed within a user, presenting many facets of behavior that can be analyzed. In order to solve this problem, enough parameters must be collected and contrasted against one another in order to tell different humans apart from each other based on how they solve a maze. Other methods of currently existing authentication rely on what you own (physical keys), what you know (passwords), and what you have (biometrics). By creating a randomly generated maze and having an observer AI object keep track of how different users solve a maze, we are able to tell two different users apart from one another to a similar degree of accuracy as other methods do. Our AI factors in variables such as time spent moving the player, time spent not moving, backtracking, strategy, and more.

Treatment Decisions for Late-Acquired Sounds: Results of a National Survey

Makayla J. Meeks with Breanna I. Krueger

Division of Communication Disorders

University of Wyoming

Poster Presentation

Health Science

Lander, WY

The use of normative data can be useful diagnosis; however, there is some controversy over the use of norms in determining treatment targets. This controversy is particularly prevalent in the area of speech sound disorders (SSD). Speech sounds are acquired in an expected age range. When speech sounds are not produced correctly for the child's age, the patient is diagnosed with a SSD. However, many speech-language pathologists (SLPs) express frustration in determining whether children should receive treatment for sounds that are appropriate for their age, or whether they should receive treatment for all sounds in error. The former decision results in therapy not being initiated until very late in children's development--age 7-8. The latter results in better treatment outcomes, according to previous research. Therefore, the purpose of the present study is to investigate current use of developmental norms for the treatment of SSD. We examined the relationship between factors such as caseload size, and SLP experience, and explored how these factors correlate with treatment decisions for late-acquired sounds. We addressed these questions through conducting a national survey, with 204 respondents. Our results indicate that SLPs with larger caseloads are more likely to provide treatment for late-acquired sounds at a later age, which suggests that SLPs may be waiting to provide services as a means of caseload size management. We also found that SLPs who practiced longer reported waiting to provide treatment for late-acquired sounds, suggesting they are unfamiliar with current research in the field of SSD.

Forever Punished: How Society Punishes Ex-Felons

Shelby L. Mikkelson with Dr. Kimberly Schweitzer

Department of Criminal Justice

University of Wyoming

Poster Presentation

McNair Scholars Program

Laramie, WY

The U.S. criminal justice system often punishes offenders through incarceration, causing the highest incarceration rate in the world. Post-incarceration, ex-felons are expected to reintegrate into society as law-abiding members. However, this reintegration process often is not smooth; society often continues to punish the individual after release through civil rights forfeiture, and forced reporting of convictions on job and housing applications. Much of the current literature on ex-felons focuses on recidivism rates and the associated influential factors. Within this, some researchers have explored the difficulty of obtaining employment after incarceration, but they do not examine the long-term effects of incarceration on an ex-felon's ability to be a law-abiding member of society. The proposed research seeks to explain this, and add to the literature by examining how a past felony conviction influences hiring decisions. Specifically, the proposed research will examine how length of incarceration and time since the offender was released effects the likelihood of the offender being hired. To do this, community members nation-wide will be sampled and presented with a survey including the resume of a job applicant. The applicant will describe he was convicted of aggravated assault and state how long he served (15 months, 5 years, or 10 years) and how long he has been released (2 weeks, 3 months, or 1 year). Participants will then report the likelihood that they would hire the applicant for the job. Obtaining a job has been shown to reduce recidivism, and the proposed research will provide better insight into this problem.

**Education, Support, and Results for Wyoming Participants in the Citizen CATE
(Continental-America Telescopic Eclipse) Experiment**

Gabriel Miller, Professor Michael Pierce
Department of Astronomy and Physics
University of Wyoming
Oral Presentation

NASA Undergraduate Research Grant

Casper, WY

Throughout the spring and summer of 2017, the Citizen CATE (Continental-America Telescopic Eclipse) Experiment was active in Wyoming and across the contiguous United States, with the goal of achieving an unbroken line of citizen-operated telescopes and cameras along the path of totality for the August eclipse. Eleven sites were active in Wyoming, composed of teachers, students, amateur and professional astronomers, and interested members of the community. In two large educational sessions, as well as several localized practice events, these groups were trained to use the telescopes and cameras provided for them. Working closely with the National Solar Observatory, a team out of the University of Wyoming helped to educate the Wyoming CATE teams, as well as follow through with them to gather numerous practice data sets and update their equipment whenever necessary over the course of that summer. All teams were successfully able to gather data during the eclipse on August 21st, 2017, and submitted their images to be compiled into a larger, 90-minute film of the entirety of totality. Scientists at the NSO assembled the film in late 2017.

Design of the structural system of a hypothetical building in Laramie, WY

Rachel Mills with Derek Swanson Civil/Architectural Engineering Department University of Wyoming Oral and poster presentation

Honors

Lakewood, CO

My capstone project for Architectural Engineering was completed in the class ARE 4720: Structural Systems Design. The class was a semester-long group project, designing a hypothetical building with a concentration on the detailed design of the project's structural systems. The design focused on complete load paths from roof, wall, and floor elements down to foundations. The project was split into three milestones, as defined by the American Institute of Architects (AIA):

- A.a structural design (SD) narrative describing the loads the building would be expected to experience;
- B.a design development (DD) plan detailing the main structural elements that would be installed in the building to carry the expected loads to the ground; and
- C.a construction documentation (CD) plan and calculation package identifying the construction sequence of the chosen structural elements.

My presentation is a summary of the entire project, with a concentration on the elements of the design on which I worked directly.

Rock the Blockchain Vote: Implementing the Blockchain

Adrian Barberis, Jagadish Bapanapally, Adam Coggeshall,
Rafer Cooley, Kip DeCastro, Wyatt Emery, Kyle Mitchell

Dr. Mike Borowczak

Department of Computer Science

University of Wyoming

Poster Presentation

UW Cybersecurity Education and Research Center

Laramie, WY

Our goal was to develop a fully electronic voting system supported by a customized blockchain implementation which has the potential to be a much more robust application than current electronic voting solutions. Arguments against computerized voting cite inevitable software bugs and security incidents that negatively impact not just the system but the integrity of the election. A blockchain implementation created specifically to address these issues implements distributed ledgers and cryptographic hash functions to make the voting process verifiable while securing the integrity of both the data and the ballots of voters. The ledgers keep data in two blockchains, one for the identities of voters and the other for their votes. This separation allows the system to tally and recount the votes without tying them to any voter-identifying information, and provides verification that no voter can place more votes than they are allowed. The ledgers are distributed among a network of server nodes which will be distributed throughout the state, which enables a consensus among the nodes regarding the validity of the voting activity. Using a ledger system akin to that used in most all current cryptocurrencies allows for both an immutable vote history as well as full auditing capabilities to detect fraudulent activities.

Quantification of *Toxoplasma gondii* from an *in-vivo* study using q-PCR

Samantha Mizokami, Amy Rhoad, Dr. Kerry Sondgeroth

Department of Veterinary Sciences

University of Wyoming, WSVL

Oral Presentation

INBRE

Casper, WY

This research focuses on a mouse model infected with *Toxoplasma gondii*, and the quantification of parasites from different tissues during the course of infection. We compared mice from three different vendors that were either treated or untreated with antibiotics prior to *T. gondii* infection. While the antibiotics should not inhibit *T. gondii* growth, they will decrease the bacterial population in intestinal microbiome and may influence infection severity. The goal of this study is to determine if there are differences in the numbers of *T. gondii* during chronic infection between mice treated with antibiotics and those that are not treated with antibiotics. To address this goal, tissues (small intestine, spleen, and brain) will be collected from mice during acute and chronic infection, and parasite load determined using semi-quantitative PCR. Samples will be collected from different treatment groups (eg. antibiotics or no antibiotics), as well as from three different suppliers. The antibiotic cocktail included Ampicillin, Vancomycin, Neomycin sulfate and Metronidazole¹; and eliminated most of the bacterial intestinal microbiome in the treated mice. If a difference in *T. gondii* infection and parasite load between groups is observed, then it suggests that the composition of the intestinal microbiome may be manipulated to decrease infection severity. Ultimately, this may have implications for the treatment and prognosis in human *T. gondii* infections as well as other infectious diseases.

Repetition Electronic Position Sensor development for squat counting based on angle measurements resulting from an individual's knee

Kyla Mock, Becca Steinkraus, Logan Taylor

Victor Bershinsky Department of Electrical Engineering

Cameron Wright Department of Electrical Engineering

University of Wyoming

Oral and poster presentation

Electrical Engineering

Gillette, Wyoming

Laramie, Wyoming

Sinclair, Wyoming

The motion of the body is constantly being evaluated for improvement. The University of Wyoming's kinesiology department is doing in-depth studies on ACL (anterior cruciate ligament) injuries and the correlation with how the knee bends. Knowing how the knee bends and the distance between the hip and foot can help with both ACL research and other physical therapy problems. Many methods are used to measure this distance using physical material which can cause resistance, human error, or inconvenience. Using electronic sensors and signal processing, we will create a device to measure the distance between two objects, wirelessly. Our main objective is to provide a measuring device that can record measurements allowing medical professionals to evaluate potential problems in body movement. This can extend beyond a squat to other body movements that require form, such as: bench press, deadlift, push-ups, etc. Our product will be unique as it will allow real time data to be collected while satisfying NCAA safety regulations. Initially, our target consumers will be athletes concerned with squat technique. Our repetition electronic position sensor will have two options for the user – recording distance measurements over a length of time and setting boundaries to count the reps performed. This presentation will describe the design, testing, and performance of our device.

A Study on Factors that Impact Rape Myth Acceptance in General Populations

Kayla Mohler with Dr. Matt Gray

Psychology

University of Wyoming

Poster Presentation

McNair Scholar Program

Cheyenne, WY

Rape myths are characterized as “prejudicial, stereotyped, or false beliefs about rape, rape victims, and rapists”, which create a climate of hostility towards victims along with potential biases in criminal prosecution (Burt, 1980). Contemporary rape myths promote attribution of culpability to victims in their own assaults, skepticism towards rape allegations, and beliefs that only specific types of women (e.g. immodest, promiscuous, seductive, etc.) become victims of these crimes. The goal of this project is to empirically examine the relationships between Social Dominance Orientation (SDO), Just World Belief (JWB), Right Wing Authoritarianism (RWA), and Rape Myth Acceptance (RMA) in general populations. Items from the Acceptance of Modern Myths about Sexual Aggression (AAMSA) scale – along with measures of SDO, JWB, and RWA will be administered as part of an online survey to a voluntary sample of the general population. It is hypothesized that SDO, JWB, and RWA will exhibit a positive correlational relationship with RMA. If results are as hypothesized, the findings will be important, as they will highlight individual difference variables and personality traits that may culminate in victim blame and other rape myths.

Sampling and Quantitative Analysis of Environmental DNA for Resistome Mapping

Madalyn Montgomery Dr. John Chase
Biology Department,
Casper College
Poster

INBRE

Casper, WY

The resistome is the collection of antibiotic resistant genes in the environment. Bacteria that produce the enzyme Beta-lactamase are responsible for the creation of antibiotic resistant superbugs. The purpose of this study is to map beta-lactamase genes in the environment and discover where they are most common. Samples were taken from water sources located in Wyoming. The samples were differentially filtered, after which the DNA was extracted from the residing eukaryotes, prokaryotes, and viruses. The DNA was then quantitatively analyzed for the future preparation of metagenomic libraries for NexGen sequencing and PCR.

Schizophrenia as it Affects the Whole Body: A Scientific and Artistic Investigation

Marisa Moret with Meg Flanigan Skinner
Zoology and Physiology
University of Wyoming
Oral Presentation

Honors

Fort Collins, CO

Schizophrenia is a neurodevelopmental psychiatric disorder affecting approximately 0.5-1% of the world's population. The symptoms of schizophrenia are positive, negative, and cognitive in nature, but the effects of schizophrenia have far more widespread effects than just the typical symptoms associated with schizophrenia. There are several causative theories of schizophrenia, including the dopamine hypothesis, glutamate hypothesis, dendritic spine abnormalities, and immune system involvement. These theories have provided proposed pharmacological targets, thus giving rise to numerous antipsychotic drugs. Despite the modest effectiveness of antipsychotic drugs, their systemic side effects are severe and plentiful. These side effects only add to the countless, inherent side effects that accompany this disease, the most notable of which are described in this review. Quality of life is severely impaired in schizophrenia patients, with stigma being a significantly contributing factor. This review, as well as the accompanying dance video, aim to portray the large extent to which schizophrenia affects the whole person.

Point Source Analysis of Water Quality Indicators of the Buffalo Bill Reservoir

Kameesha K. Morris¹, Abigail Hogan¹, Edgar Meza¹, Taylor Russell¹, Michael Cuddy², Eric C. Atkinson¹, ¹Biology Department, ²Chemistry Department

Northwest College

Oral Presentation

INBRE

*Buffalo, WY;
Snohomish, WA;
Spearfish, SD,
Saratoga, WY*

With the rising concern of water quality regulation in western America, it is of paramount importance to establish a research system by which one can evaluate and characterize the health and sustainability of a particular water system. With this goal in mind, we aim to develop techniques to analyze the health and productivity of the Buffalo Bill Reservoir system, located outside of Cody, Wyoming. We will track the variation of seven key water quality indicators including temperature, pH, total dissolved solids, salinity, conductivity, dissolved oxygen, and nitrate level around the perimeter of the reservoir. The data will be compiled and analyzed in a point tracking method from the nearest turbid inflow. This will allow for the reservoir as a whole to be evaluated And create a framework by which we can assess the comprehensive health of the riparian system. Evaluation will highlight vegetation, aquatic stability, input pollution rates, and other factors including optimal reservoir depth, length, and exiting flow rate. Through this project, we intend to theorize methods that can be implemented to improve upon the current state of the Buffalo Bill Reservoir, and can be duplicated to find advances in the health and productivity of other active reservoir systems in America.

Vision Therapy Rehabilitation of Post-Concussion Visual Impairments

Sarah Morton with Meg Flanigan Skinner

Department of Zoology and Physiology

University of Wyoming

Oral Presentation

Honors Program

Cheyenne, WY

Concussion is a common, mild form of traumatic brain injury that is caused by blunt force trauma to the head. Concussion can be caused by a wide variety of situations, commonly sports collisions, automobile accidents, and falls. Signs of concussion include loss of consciousness, temporary amnesia, and disorientation. Severe concussion can result in visual impairments such as blurred vision, light sensitivity, attention deficits, impaired memory, and double vision. Vision therapy can significantly or completely improve many of these visual impairments. Vision therapy is a series of procedures monitored by an optometrist that are designed to improve visual processing. Vision therapy can be used to benefit patients in many different situations from sports vision training and learning difficulty improvements to traumatic brain injury rehabilitation and specific visual condition correction. Many or all of the visual symptoms of concussion respond to vision therapy and vision therapy programs for concussion typically focus on correcting convergence insufficiency, eye movements, visual tracking, and gaze stabilization. The case study included in this report presents the use of vision therapy for the management of post-concussion visual symptoms in a 20 year old male athlete.

Elementary Mathematics Instruction (edTPA)

Lauren Mugg with Dr. Alan Buss

Elementary Education

University of Wyoming

Oral Presentation

Honors

Cheyenne, WY

Mathematics instruction at the elementary level is a complex process. How does one meet the various needs of students with different learning styles and varied instructional levels while keeping every child engaged in the lesson? During my student teaching experience in a third-grade class, I planned, taught, and evaluated two math lessons with the goal of improving my implementation of mathematics instruction. These lessons focused on division and were based on information provided by the Go Math mathematics curriculum. The purpose of this content is to strengthen the students understanding of operations such as addition, subtraction, multiplication, and division. It also serves to prepare students for more fraction centered instruction. These lessons use the workshop model of teaching which provides opportunities for whole group instruction, partner work, and independent work with strong teacher support. During my evaluation, I chose three students to act as target students. Their summative assessments were closely evaluated to determine the effectiveness of the lesson and feedback was provided to the students to help either strengthen or enrich their understanding of the content. I chose three students of varying levels in order to ensure that I effectively differentiated my instruction for the students. I selected one student who is performing math at a sixth-grade level, one who performs math at a third-grade level, and one student on an Individualized Education Program (IEP). Through this planning, implementation, and evaluation process, I have developed skills and strategies that will strengthen my instruction as an educator.

Natural Killer cells may regulate response to secondary infections of *Toxoplasma gondii* through IFN- γ production

Tiffany Mundhenke, Dr. Jason Gigley

Molecular Biology

University of Wyoming

Oral

Honors

Thornton, CO

Natural Killer (NK) cells are described as part of the innate immune system and are an important first line of defense against infectious pathogens and cancer. Recent data from studies of viral infection have determined that NK cells are important in long-term immunity and develop longer lasting responses that resemble those of adaptive immune cells. As such they may be an underappreciated cell type capable of contributing to adaptive immunity. These longer lasting NK cell responses are detected by their ability to 1) respond a second time to challenge, 2) provide a more efficient secondary response and 3) clear a secondary challenge with a pathogen. While NK cells have been observed to be involved in adaptive immunity to viruses, whether they display this similar behavior in response to parasite models such as *Toxoplasma gondii* infections is not known. *T. gondii* infects ~30% of people worldwide and is a significant health threat for immune compromised people and the developing fetus. It is therefore important we understand the role of NK cells in adaptive immunity against *T. gondii*. Using a vaccine challenge model we have addressed this question and have found that upon deletion of NK cells *in vivo* during secondary infections of *T. gondii*, parasite burdens are higher demonstrating that NK cells are important in adaptive immune system recall responses. To define the mechanism by which NK cells contribute to adaptive immune responses to *T. gondii* we explored if NK cell IFN- γ production contributed to immune protection during the secondary response. Overall defining how NK cells contribute to adaptive immunity against *T. gondii* infection will improve health outcomes associated with this infection.

Calcium Supplement Dosage and Lead Content

Josey L. Nickles¹, Michael Cuddy¹, Department of Chemistry, Northwest College¹
Poster Presentation

Department of Chemistry, INBRE

Powell, WY

According to the Centers for Disease Control, over half of Americans take some form of dietary supplement. The most common form of supplement is the multivitamin/mineral, which must contain at least three vitamins and may or may not contain minerals such as calcium or magnesium. Calcium is taken by a wide range of people throughout the United States, but in particular by women, both young as well as older women to prevent or battle osteoporosis. Since many women do not get the dietary calcium they need, supplementation is not only common, but encouraged. However, despite high consumer confidence in over-the-counter multivitamins, manufacturers are held to surprisingly low standards in the United States, and this can lead to inaccurate dosing and even exposure to toxic metals such as lead. Because the manner of regulation of supplements differs drastically from regulation of prescription and over-the-counter drugs, lead has been found in calcium and other herbal supplements. Studies done on vitamin D, or cholecalciferol, have found inaccurate dosages ranging from 9-146%. This experiment is part of an ongoing effort to check suppliers for accuracy and safety by determining whether calcium supplement doses match the label, and whether there is still lead present in a variety of samples. To this end I will use gravimetric determination and a complexometric titration using EDTA to determine the amount of calcium and lead, if any, in the supplement. Selection of calcium supplements will be chosen based on several factors. I will choose five different supplements, at least two based on the historical presence of lead found in dolomite and calcium carbonate supplements. One will be chosen based on whether it is certified by the US Pharmacopeia.

Verum Electus: An Ethereum ÐApp Voting Platform

Lucas Nicodemus and Raylyn Pettigrew

with Dr. Mike Borowczak
Computer Science
University of Wyoming
Poster Presentation

*Aurora, CO
Casper, WY*

The State of Wyoming needs a secure and efficient program for modernizing the general election system. We propose an Ethereum smart contract that allows Wyomingite voters to cast traceable, verifiable, and secure votes on a modern, proven platform. Due to recent controversies regarding election integrity, we believe that the State of Wyoming needs a secure and efficient program for modernizing the election system in the state. Therefore, we propose an Ethereum smart contract that allows Wyomingite voters to cast traceable, verifiable, and secure votes on a modern, proven platform. Using a Ruby on Rails application we provide an interoperability layer to interface with the Ethereum network for developers and to ensure voter accountability. Our smart contract provides a secure platform for casting and tallying a multitude of ballots and includes write-in vote capabilities.

Comparing Perceived and Actual Cognitive Lateral Bias in University Dance Majors

Haley Nigro; Faculty Mentor: Jennifer Deckert

Theatre and Dance
University of Wyoming
Oral Presentation

Honors

Brighton, CO

Lateral bias (also referred to as lateral preference) is defined as an “innate bias for one side or the other” (Kimmerle, 2010). “Side” of the body is a reference to whether a movement is right dominant or left dominant in its execution. Although all human beings develop a functional lateral bias that is reinforced by the habits in their daily lives, it has been suggested that dance training increases asymmetry because of its over-emphasis on the right side of the body (Mertz et al., 2011). Despite this hypothesis that dance training could be a proponent of lateral bias toward right dominant movement, dancers are encouraged to be symmetrically proficient in their ability to perform movements that are both right dominant and left dominant to avoid choreographic limitation and injury. While it is difficult to determine if asymmetries are pre-existing in a dancer, there is strong evidence that dancers have a highly-developed proprioceptive sense that allows them to accurately identify relatively minute differences in their own laterality (Jola et al., 2011). The objective of this research was to determine if university dance students’ perception of their lateral bias correlates with their actual lateral bias. This information will help dance researchers to understand the effect of lateral bias on dance training and performance, as well as assist dance teachers in making informed choices about how to develop well-rounded dancers.

Do cattle vaccinated with *Histophilus somni* have detectable antibodies using the *IbpA5* ELISA?

Jess Oldham with Dr. O’Toole and Dr. Kerry Sondgeroth

Department of Veterinary Sciences
University of Wyoming
Oral Presentation

Department of Veterinary Sciences

Lander, WY

Histophilus somni is an opportunistic bacterium found on respiratory and reproductive mucosa in cattle. When cattle are stressed due to viral infections, weather, movement, or poor nutrition this bacterium invades the host and causes bovine pneumonia. While many cattle producers routinely vaccinate against viruses that cause pneumonia, less than 28% of cattle are vaccinated against *H.somni*. Studies have shown existing vaccines against *H. somni* infection are limited in efficacy. Virulent strains of *H. somni* express the *IbpA5* protein, and antibodies are produced against this protein in cattle infected with these strains. What has not been determined is whether cattle vaccinated, with attenuated (vaccine) strains of *H.somni*, will also produce antibodies to the *IbpA5* protein. In this study, a live attenuated *H.somni* vaccine is given to cattle and longitudinal blood samples evaluated to determine if antibodies to the *IbpA5* are detectable over time. The hypothesis is that cattle vaccinated with *H.somni* will develop antibodies and become seropositive using the *IbpA5* ELISA. Twenty-five cattle from the UW beef unit were vaccinated and blood samples collected on day 0, day 19, and day 40. Serum was then evaluated for antibody presence by the *IbpA5* ELISA. Interestingly, our results showed that there were no antibodies detected in any of the cattle at any time. The absence of antibodies from this ELISA does not necessarily indicate a lack of antibody response to the vaccine, and positive serum samples from producers, are not likely due to vaccination, but rather exposure to a virulent *H.somni* strain.

VLA Data of Polar Broad Absorption Line Quasar Candidates

Kianna Olson with Dr. Michael Brotherton

Astronomy and Astrophysics

University of Wyoming

Poster Presentation

Wyoming Research Scholars Program

Laramie, WY

Polar broad absorption line quasars have a radio jet that is viewed at a small angle from the Earth so that it appears to be pointing at it. Another characteristic of Polar broad absorption line quasars is a flat spectrum in the radio wavelength. In their paper, Hall and Chajet (2011) argue that such an object would have a brightness temperature that exceeds 10^{12} K and a flux density that varies over short periods of time. We observed a total of twelve objects that are polar broad absorption line quasar candidates, several of them selected from the objects observed by Hall and Chajet, in the C, L and X frequencies. We then reduced the data using CASA and calculated the brightness temperatures, flux variation, θ_{\max} , and δ_{\min} . On plotting frequency versus peak flux we found that the objects possess flat spectra as expected. They also demonstrated flux variation furthering the case of them being polar broad absorption line quasars. The time that had elapsed between the epochs was too great to calculate an accurate brightness temperature, θ_{\max} , and δ_{\min} . Based on our calculations and our spectra plots, it is likely that these objects are indeed polar broad absorption line quasars.

Wyoming Undergraduate Research Day Abstract

Samuel Owen with Pamela Henderson

School of Energy Resources

University of Wyoming

Oral Presentation

Honors

Columbus, OH

As the least populous state in the nation, Wyoming is in a unique situation politically. The state lacks a large metropolitan area, and the mantra of "all politics is local" is more applicable for candidates and politicians here than in any other portion of the nation. However, with a far-reaching population and critical industries comprising a large portion of the state's gross domestic product, the political landscape is no less complex. As a University of Wyoming honors student, I had the opportunity to complete internships for U.S. Senators John Barrasso and Mike Enzi, where I gained critical insight into Wyoming government operations at the state and federal level. Often, I interacted directly with constituents in the state, and worked to understand their unique situations and perspectives on nearly every political issue. Inspired by my time with the Senate offices, I studied citizenry perspectives on the role of government in the State of Wyoming and their willingness to interact with it for my Honors College Senior Capstone Project. As there are less people in this state than in any other, I feel their opinions on governmental operations carry more weight than anywhere else. I will rely on my experience with the Senate and the research I have conducted to present my findings on Undergraduate Research Day, and look forward to sharing my results.

The influence of pile length and body size on rates of heat loss in common garden bumble bees *Bombus vosnesenskii* from altitudinal and latitudinal gradients.

Zachary Parsons and Michael E. Dillon
Zoology and Physiology
University of Wyoming
Poster

WRSP

East Wenatchee, WA

The adaptive significance of bumble bee pile has been debated but only minimally investigated. One of the most prevalent and obvious hypotheses is that it provides valuable insulation while foraging outside the nest in cool temperatures. Although bumble bees are heterothermic, they may regularly experience temperature extremes when foraging outside the nest at cooler temperatures or when their prodigious ability to generate heat and evolutionary origins in cool climates make them susceptible to overheating even in moderately warm conditions. In cold climates, bumble bees often require a highly elevated body temperature to maintain flight. Pile may decrease thermal conductivity and therefore allow bumble bees to maintain high body temperatures during periodic stops for nectar and pollen, while foraging. Here, we examined the effect of pile length, body mass and shape on the rate of cooling in *Bombus vosnesenskii* workers, reared from queens distributed across latitudinal and altitudinal gradients, in common garden conditions. Workers were fresh frozen and thermocouples were implanted in their thoraxes. After thawing they were heated to ~50C (highest recorded inter-flight temperature) and allowed to cool in wind tunnels at a flow rate of $\sim 20 \pm 2$ mLmin⁻¹. Results suggest that bumble bee body size and pile length may strongly influence rates of heat loss while foraging.

Characterizing Star Clusters in Nearby Galaxies

Ryan Parziale with Dr. Daniel Dale
Department of Physics and Astronomy
University of Wyoming
Oral

Wyoming Research Scholars Program

Littleton, CO

Dwarf galaxies are similar to 'normal' galaxies like our Milky Way except they are 100-1000 times smaller. However, dwarf galaxies are key to understanding galaxy evolution since they vastly outnumber normal galaxies, and in fact, normal galaxies likely formed via the accretion of dwarf galaxies; dwarf galaxies are thought to be the building blocks of galaxies in a hierarchical universe. Despite their abundance in the local Universe, the understanding of star formation in dwarf galaxies is still incomplete. For example, it is a mystery why dwarf galaxies exhibit a paucity of ionizing photons, photons energetic enough to strip the electron from a Hydrogen atom. Is this paucity due to a lack of very massive stars, stars 10-50 times as massive as our Sun? This project aims to understand the lack of ionizing photons in dwarf galaxies. I will first identify all star clusters (a grouping of tens to hundreds of thousands of stars) within 29 dwarf galaxies using images downloaded from the Hubble Space Telescope archives. After the identifications have been carried out, I will measure each cluster's brightness at a variety of wavelengths, and use this information along with theoretical stellar models to infer the clusters' ages and masses. With this information in-hand, I will be able to determine whether dwarf galaxies indeed lack a population of very massive stars.

NASA Microgravity - Unlocking Mechanism

Viren Patel, Kanishk Rawat, Joe Whiteaker with Dr. Kevin Kilty
Department of Mechanical Engineering
University of Wyoming
Oral Presentation

Mechanical Engineering Senior Design

Laramie, WY

The aim of the design project was to improve upon the unlocking mechanism for the NASA Microgravity project. The team aimed to reduce the weight and improve cost and reliability factors in considerations for their new design. While the previous design included the use of four servo motors and four clamps along with a connecting ring, the team aimed to reduce these numbers to three. This goal was achieved by eliminating the ring and approaching a modular design for all connecting parts while also selecting ABS as the primary material. This reduced the weight, complexity, costs and maintenance of the module. In order to determine potential business markets, extensive research was done on current microgravity projects around the globe. In addition to the Glenn Research Center (NASA), the team found companies such as AstroGenetix interested in microgravity applications. Extra measures were taken to ensure that the motors push the clamps out at the right time. The test site and time were chosen to ensure best results and maximum safety. While observing FAA regulations for balloons, the launch was scheduled during the daytime on a clear weather day. It was also desirable to have the launch site in a remote area and isolate potential sources of hazards or litigations. The weight of the module was reduced while also keeping costs in check. Moreover, the design was simplified, and measures were taken to ensure safety and counter possible failures. The design could use some improvements over the course of time.

Autonomous Lawn Care Unit

Karan Patel, Blake Wright, Peter Johnson
Dr. Steven Barrett
Electrical & Computer Engineering
University of Wyoming
Oral and Poster Presentation

Electrical & Computer Engineering

*Cheyenne, WY
Laramie, WY
Rawlins, WY*

The landscaping industry is a multi-billion-dollar industry. The average consumer spends hundreds of dollars each year on lawn care (National Association of Landscape Professionals). As these costs are for labor, they continue every year. Our product aims to eliminate that yearly cost with a one-time cost. This will help the consumer by allowing them to pay once for a product that will eliminate any labor cost they pay for on a monthly or yearly basis, saving time and money. Our prototype will be modifying an existing lawn mower to be semi-autonomous. The unit will mow a predetermined area of grass and will be equipped with safety sensors to assure no harm is done to people or property. There will be a wireless controller to control the unit with commands such as start and stop. Our product aims to cost fairly low compared to what is offered currently in the market.

Understanding the role of amino acid content in an intrinsically disordered protein sequence

Samantha C. Patterson with Dr. Grant Bowman
Molecular Biology
University of Wyoming
Oral Presentation

Caulobacter crescentus, which belongs to the class of Alphaproteobacteria, has a highly organized cytoplasm that includes complex macromolecular structures at the cell poles. These polar complexes are assembled through the activity of a scaffolding protein, known as the Polar Organizing Protein Z (PopZ). PopZ interacts with other proteins via an N-terminal domain that is mostly intrinsically disordered, and contains, an abundance of proline, glutamate, and aspartate (P,E, and D) residues. Surprisingly, scrambling the order of amino acids in the PED region does not affect PopZ function, suggesting that binding affinity and specificity are not dependent on interactions with individual amino acids within this low-complexity region. The biochemical qualities of P,E and D promote intrinsic disorder, but they are not the only types of amino acids that are found in unstructured protein domains. By making targeted changes in the PopZ sequence, we are asking if binding affinity and specificity are dependent on qualities associated specifically with P,E, and D (for example, negative charge), or if any form of intrinsic disorder is sufficient to support a functional PopZ binding domain. One change we are making is to substitute all of the prolines for serine. While this will certainly affect the hydrophobicity of the protein, our in silico analyses predict that the change will preserve intrinsic disorder. Another change will be to substitute the aspartate and glutamate residue for lysine, thus reversing the electrostatic charge with an amino acid that promotes intrinsic disorder.

Development of a diagnostic qPCR assay for bacterial pathogens in Bovine Respiratory Disease

Hannah Peterson, Brookely Schamber, Patrick Harvey
with, Hally Killion, Dr. Donal O'Toole and Dr. Kerry Sondgeroth
Veterinary Sciences
University of Wyoming
Poster

Department of Veterinary Sciences

*Orange County, CA
Pinedale, WY
Green River, WY*

Bovine respiratory disease (BRD) is a major problem for cattle producers; causing a loss of \$2-3 billion annually.^{1,2} BRD is due to a multifactorial infectious process with stress predisposing cattle to viral and bacterial infections, some of which are fatal. The bacterial pathogens that are commonly associated with BRD include *Mannheimia haemolytica*, *Mycoplasma bovis*, *Pasteurella multocida*, and *Histophilus somni*. Currently at the Wyoming State Veterinary Lab (WSVL), suspected BRD samples are cultured. Since multiple types of bacteria are commonly involved, it is difficult to make accurate diagnoses. The more abundant bacteria, *M. haemolytica* and *P. multocida*, will outgrow the fewer *H. somni* in a given sample. Due to inaccuracy, there is a need for a diagnostic assay at WSVL. The focus of this project was to develop a qPCR assay for *H. somni* and *P. multocida*. Tissue samples were collected and archived from 2016 to 2018 following submission of tissues from cattle that died of BRD in Wyoming. A total of 59 tissue samples were retrieved from the archived, which 23 were culture-positive for *H. somni* and 16 for *P. multocida*. DNA was extracted from tissues submitted, and qPCR has been optimized for each of the bacterial targets using primers and probes developed by collaborators at University of Nebraska. This poster highlights the steps taken in this project with the goal of developing a multiplex qPCR assay more sensitive than bacterial culture identification. This assay will eventually be utilized by WSVL for routine diagnostic testing of suspected BRD cases.

Effects of Fungal Pretreatment on Lignocellulosic Biomass Pyrolysis

Brett Peterson, Kurt Stahlfeld, Dr. Karen Wawrousek, Dr. Erica Belmont

Chemical Engineering, Mechanical Engineering

University of Wyoming

Poster

Chemical Engineering

Loveland, CO

The environmental impact caused by the continued use of fossil fuels has given rise to the need for alternative energy sources. One such potential alternative energy source is lignocellulosic biomass. Many lignocellulosic biomasses exist in great natural abundance and are readily available for use. There are 100 million tons of corn stover available in the US alone each year. Biomass can be thermochemically converted into bio oils with the use of pyrolysis. Pyrolysis is a thermochemical decomposition process that occurs at high temperatures in the presence of inert gases. The bio oils produced during biomass pyrolysis have the potential to be used as fuels or as precursors for chemical production. Fungal pretreatment of lignocellulosic biomasses has been hypothesized to improve the pyrolysis characteristics of lignocellulosic biomass by degrading the lignin fraction of the lignocellulosic biomass. This study examines the effects of fungal pretreatment using three different fungal species on the pyrolysis characteristics and resulting bio oils from three types of lignocellulosic biomass. Results show that fungal pretreatment results in increased maximum mass loss during pyrolysis as well as lower temperatures corresponding to maximum mass loss. Fungal pretreatment also results in a different array of bio oils being produced during pyrolysis. On an industrial scale, fungal pretreatment could be used to reduce the energy requirements for the production of bio oils using pyrolysis.

Developmental and Spatial Growth Gradients across Endemic Wyoming Species

Hunter Peterson with Dr. Carmela Rosaria Guadagno

Botany

University of Wyoming

Oral

Botany Department

Ft. Bridger, WY

During plant development, factors such as life-history traits and morphology alter plant response to possible environmental stress. Species endemic to arid areas, like Wyoming, have evolved strategies to cope with drought. This experiment will attempt to characterize different strategies and potential vulnerability of trees and shrubs endemic to Southeastern Wyoming to soil water stress different stages of development, with particular attention to photosynthetic trade-offs. This will be accomplished by analyzing plant behavior in a well-watered environment, and examining the trait dynamics of each species, to extrapolate and forecast their potential response to drought occurrence. In this experiment, seedlings of species *Pinus ponderosa* (Pine, 3 years old), *Populus tremuloides* (Aspen, 2 years old), and *Artemis tridentata* (Sagebrush, 1 year old) will be observed in native soil. Chlorophyll *a* fluorescence, leaf gas exchange, environmental PAR, and leaf morphology will be used as proxies for photosynthetic efficiency. Measurements will be taken at different time-points to capture gradients in development and spatial structure as the plant ages. As preliminary data is analyzed, it appears that Aspen and Sagebrush exhibit higher photosynthetic efficiency than Pine. We expect to see an increase in this trend, with Aspen exhibiting the most photosynthetic efficiency overall, due to Aspen's tendency to be found in more mesic environments than the other species. As this research proceeds, water stress will be applied, with the plant responses being compared to this well-watered baseline, in order to analyze the effects of drought on seedlings of these species over time, and validate our predictions.

The Mobility of Rare Earth Elements in Sherman Granite Aquifers

McKenzie Peterson with Dr. John Kaszuba

Geology and Geophysics

University of Wyoming

Poster Presentation

Department of Geology and Geophysics

Star Valley Ranch, WY

Rare Earth Elements are a dynamic part of our everyday lives. They are needed for nearly all electronics and are used in the energy industry everyday. Rare Earth Elements (REE's) can be found in many minerals such as alkali feldspars. Alkali Feldspar is a mineral with a tetrahedral-octahedral-tetrahedral complex (TOT) forming an I-beam due to the silica within its chemical formula. There is speculation that REE's ions can be held between these I-beams. This alkali feldspar is most common in Anorogenic granites or A-type granites commonly found in the Sherman batholith located in the Southeastern part of Wyoming. A Sherman granite generally contains alkali feldspar, plagioclase, quartz and biotite as its main four elements. This Sherman granite will be crushed, placed in tubes with an acidic, basic and neutral fluid for 30 days. The alkali feldspar will dissociate in these fluids, the REE's will be released and can be detected in an Ion Coupled Plasma- Mass Spectrometer (ICP-MS). The goal of this project is to distinguish the mobility of these REE's in the Sherman granite aquifers. We will test to see if an altered granite will produce more or less REE's than a fractured granite due to ground water or a pristine granite.

Redesigning the Emergency Survival Raft

Aubrey Peterson, Adam Schliffke, Kyle Stuehm

With Dr. Ryan Fertig

Mechanical Engineering

University of Wyoming

Oral Presentation

Department of Mechanical Engineering

Laramie, WY

Cheyenne, WY

Nunn, CO

In the event of pilot ejection over large bodies of water, the survival raft becomes the pilot's most important piece of equipment. The current raft used by the navy is the LRU-18, which is difficult to board, heavy, bulky, and leaves the passenger wet and cold. The team sought to remedy many of these issues by using a lighter, stronger, and thinner Dyneema based material, and a proprietary welding method developed by sponsor Kennon Products. The team created a design that has reduced size, weight, improved boarding for injured users, increased protection from the elements, and the ability to self-bail any water that may enter the raft. The team spent the majority of the first semester brainstorming all manner of raft concepts. The concepts were boiled down to three promising ideas with each team member focusing on one concept and improving it throughout the semester. Early the following semester, the relative strengths and weaknesses of each design were discussed, and the team began working together to build a product that combined the best parts of each design. This raft was then modeled in SolidWorks and then sent to Kennon Products for manufacturing. Once the model was finished, it was pool tested and its strengths and weaknesses determined. The data gained from the pool testing will be invaluable for making design adjustments, as there is limited data on the behavior of Dyneema inflatables under specific loading conditions.

Benefits of ECHO: Decreasing Isolation for Wyoming Speech-Language Pathologists
Clarissa Petres^{1,2}; Catherine Kellar¹; Mary Jo Cooley Hidecker, PhD, MS, MA, CCC-A/SLP^{1,2};
Erin Bush, PhD, CCC-SLP¹; Breanna Krueger, PhD, CCC-SLP¹; Canyon Hardesty, MS, CHES²
¹Division of Communication Disorders, University of Wyoming
²Wyoming Institute for Disabilities, University of Wyoming
Poster Presentation

ASPIRE

Rapid City, SD

Project ECHO is an interprofessional practice network where education and/or healthcare professionals learn together. Didactic lectures and case presentations are conducted during weekly/bi-weekly video conferences. Speech-language pathologists (SLPs) are frequent ECHO network participants. The purpose of this qualitative study was to understand why SLPs in Wyoming attend these networks. The researchers employed a qualitative multiple case study design to explore SLPs' ECHO experiences. This design used cases from ECHO and semi-structured interviews for data collection. The final qualitative data analysis revealed the overarching concept: Benefits of ECHO for SLPs. The variety of benefits experienced were further delineated by the following emergent themes: 1.) Advantages from ECHO Core Components emerged from participants' positive comments on the core components and/or characteristics that they found helpful. 2.) Improving SLP Skills and Knowledge was noted in responses that described new knowledge obtained from ECHO sessions. 3.) Increasing Interprofessional Practice was evident in participants sharing information and recommendations with other professionals or on multidisciplinary teams. 4.) Enhancing Services to Students and Families was described by several participants who explained how ECHO knowledge impacted service delivery. 5.) Decreased Perceptions of Isolation SLPs expressed feelings of isolation due to their rural/remote settings, however; participation in the ECHO network decreased this perceived isolation. The ECHO model is a powerful tool for increasing interprofessional practice among education and health care professionals. The ECHO model also provides opportunities for professionals to enhance their own skills and knowledge, as well as their services to students and families.

The interaction of water salinity and mycorrhizal inoculation on *Cucumis sativus* morphology, photosynthetic rate, and stomatal conductance.

Alexus Pierce, Cheyenne Hunter, Miranda Gallagher, Jaden McHoes, and Ami Erickson
Natural Sciences
Sheridan College
Poster Presentation

INBRE

Sheridan, WY

Available water for agricultural uses is becoming more saline. We do not know how increased salinity affects mycorrhizal interaction with plants, but we hypothesize that using a fungal mycorrhizae treatment would benefit plants in uptaking nutrients during salt stress. Seeds of cucumber plants (*Cucumis sativus* var. Sweet Burpless) were planted with or without endomycorrhizal spores (BioOrganics, New Hope, PA) . During a six week period after germination, cucumbers were watered with 50mM salt water or regular city water. Morphology and growth rate measurements were taken weekly, including mature leaf count, node number, and leaf area on the second node. Dry biomass of the shoots and roots was measured after six weeks. Physiological response to treatment was evaluated with photosynthetic rate (A) and the stomatal conductivity (gsw) taken from each plant with a LI-COR 6400 (Lincoln, NE). The impact of the treatments on soil was evaluated with weekly measurements of salt conductivity of leached water and pH of the soil. An evaluation of root development will be conducted by examining stained, thin-sectioned (10µm) root tips. Plants in the uninoculated salt treatment had a higher average photosynthetic rate (6.9µmol/m²/s) compared to the lowest average rate of 5.006 µmol/m²/s for the uninoculated, untreated plants. Based on our preliminary data, our hypothesis is not supported.

“I’d Strike the Son if He Insulted Me: Milton and Melville’s Radical Individuals”

Benjamin Platt with Harvey Hix
Department of English
University of Wyoming
Oral Presentation

English Honors, Honors

Lafayette, CO

John Milton and Herman Melville, despite 184 years and an ocean of separation, created two of Western literature’s grandest rebels in Satan and Ahab. I propose that these two characters are blueprints for a literary type, that of the fallen revolutionary. Both assert their own equality and try to overthrow the power structures that they feel oppress them in their respective settings, but both, instead of destroying the inequality that drove them to rebel, betray their own cause and comrades by serving only themselves. Both Milton and Melville advocated for increasing political democratization within their societies; Milton fought against the monarchy, while Melville was a whole-hearted believer in the American democratic experiment. In *Paradise Lost*, Milton creates Satan as an opponent to the monarchical Father in Heaven, but who fails to carry out his revolution completely, as he becomes a tyrant in hell obsessed with destruction rather than a liberator intent on creation and freedom. In *Moby Dick*, Ahab is rebelling against what he feels is the metaphysical inequality of the universe that manifests itself in the white whale; he too rails against divine oppression, but he too establishes himself as a tyrant aboard the *Pequod* seeking only to raise himself above his peers rather than enable the freedom of all. Neither rebel’s principles can be wholly discounted, but we also must move beyond their example and recognize the need to fully free ourselves from tyranny and embrace our collective humanity.

Autoerotic Asphyxia: The Killer Cocktail of Taboos

Haley Powell with Dr. Erin Abraham
Departments of Zoology, Environment and Natural Resources
University of Wyoming
Oral Presentation

Honors College

Laramie, WY

Taboos have a tremendous amount of power over sex and sexuality throughout cultures, including modern Judeo-Christian societies. This power is particularly evident in discussions and silences surrounding autoerotic asphyxiation (AEA), which involve a number of associated taboos. Together, these taboos create ever-evolving, complex, and often negative connotations and consequences. An analysis of approximately five decades’ of forensic and popular evidence regarding AEA provides clarity about the ways these discussions and ideas have changed over time, and illustrates the ways associated taboos (such as sex, masturbation, transvestitism, death, and suicide) influence and are influenced by the overarching taboo surrounding AEA. This look into the depths of the darkest, unmentionable topics sheds light on the influence taboos exert and the power of that influence.

HVAC Teaching Apparatus

Brandon Preston, David King, David Case, Usman Humayun

Dr. Paul Dellenback Mechanical Engineering

Lawrence D. Willey, P.E. Mechanical Engineering

University of Wyoming

Oral Presentation

Mechanical Engineering

Brandon Preston Woodland, WA

David King Boerne, TX

David Case San Diego, CA

Usman Humayun Mailsi, Pakistan

Heating, Ventilation, and Air Conditioning (HVAC) are grouped into a single discipline that incorporates the design principles of thermodynamics, fluid mechanics, and heat transfer. The grouping of these factors allow for an effective laboratory to be created in order to expose not only mechanical, but also civil and architectural engineering students to the physical phenomena of these important subjects. The apparatus is such a laboratory that will be implemented in the new engineering building at the University of Wyoming, providing students with this hands on experience. The rig's main test will consist of multiple components along the duct including two evaporative cooling sections, cooling by a finned heat exchanger, and electric resistive heating. This main duct consists of a 24"x24" cross section that is 18' long which includes a 4' test section that may be used for traditional wind tunnel model evaluations and other heat exchanger performance testing. With psychometric instrumentation between each component, students will be able to evaluate the performance of each individual part. In addition, the apparatus will also feature an instrumented refrigeration cycle, VFD blower, and an entirely separate use case utilizing the same blower to power micro wind tunnels to be used in other fluid mechanic experiments. The apparatus was designed by a mechanical engineering senior design team. The project provided the team with invaluable real world design and industry experience by selecting and justifying parts, working with manufacturers, meeting deadlines, and presenting findings to superiors all within the controlled environment of a capstone class.

Machine Learning Applied to Commercial Property Valuations

Colton Proctor with Dr. Mike Borowczak

Computer Science

University of Wyoming

Poster and Oral Presentation

Department of Computer Science

Laramie, WY

The current market value of commercial real estate is estimated at one trillion dollars (IBISWorld, 2017). However, commercial property valuations are largely kept behind proprietary paywalls. Only a select number of companies have access to large enough data sets in order to accurately give an estimate of a commercial properties value. Using publicly aggregated data I am providing an open interface for comparison of commercial properties. This will allow people to accurately research valuations using the application of machine learning algorithms.

The role of Programmed Death Ligand 1 (PD-L1) in the Activation of NK Cells

Natasha R. Radosevich, Dr. Jason P. Gigley

Oral Presentation

INBRE

Casper, WY

Toxoplasma gondii is a single cellular parasite that infects a significant portion of the world's population, and causes the disease toxoplasmosis. In the US the percentage of infected people over the age of 6 sits around 11%, but in some areas of the world, most often in low altitude, hot, humid climates, that percentage jumps to 95% percent of the population (CDC 2017). Newly infected pregnant women and those suffering from a compromised immune system are at the greatest risk. To prevent these infections and protect against this parasite, it is important to understand how the parasite works, and how it is able to evade clearance by the host's immune system. Natural Killer (NK) cells are an important part of this immune clearance. In toxoplasma, NK cells have been shown to be essential in controlling the parasite early on (Gigley 2016). However, little is known about their impact on long-term immunity to this parasite. Preliminary data suggested NK cells contributed to chronic Toxoplasmosis by negatively regulating CD4 and CD8 T cell responses and contributing to a process known as immune exhaustion. Treatment of infected animals with an antibody against an inhibitory ligand known as PD-L1 rescues animals from immune exhaustion (Bhadra 2011). We do not know whether this therapy can impact how the NK cells contribute to immune exhaustion. Therefore this project will examine the role of PD-L1 in activation and function of NK cells that promote immune exhaustion and chronic *T. gondii* infection.

Arboreal

Adrian Barberis, Wyatt Emery, Danny Radosevich

Computer Science

University of Wyoming

Poster and Oral Presentation

File systems control how data is stored and retrieved on a computer. To the detriment of users, file systems have made little progress towards efficiency and functionality since their invention over half a century ago. The first file systems were hierarchical, emulating the storage style of a filing cabinet, by storing files within potentially nested directories (i.e. folders). This method is still used by file systems today. Our goal was to develop a new type of file system; one which allows users to store their files in a more intuitive way that is free of the restrictions of outdated models. We wished to create a system that allowed users to search for their files faster than ever before, manipulate their files in a more flexible way, and increase user productivity. To achieve this goal, we created Arboreal, which takes into account modern computing capabilities and the average user's data storage needs. Since files are most intuitively stored by the characteristics of the data contained within them, Arboreal abandons the rigid structure of directories in favor of the more flexible concept of a tag, to store and associate files with one another. Thereby, allowing users to search for sets of characteristics (tags) and retrieve the files associated with those characteristics. Arboreal is a fully functioning filesystem, with the exception that it cannot currently support running an operating system. We hope to implement this functionality in the future, but for now, Arboreal is best suited for high-level file storage and organization.

United Wellness: Health Promotion at the University of Wyoming

Nathan Raska Jill Keith
Family and Consumer Sciences
University of Wyoming
Oral

Honors

Laramie, WY

The GetFRUVED Project; a USDA approved joint research opportunity evaluating over 90 academic institutions throughout the United States, was designed to assess the health and wellness status of campus environments. Of those institutions included, the University of Wyoming was selected to serve as a Control Site, with collected data focused on the evaluation of the health facilitation resources it offers. To accomplish this, two methods of research were utilized including 1) an initial survey and 2) a subsequent audit series. Entitled the “Health, Fitness and Wellness Survey”, this initial assessment, designed by the GetFRUVED research team, was distributed across campus via email. The Health, Fitness, and Wellness Survey contained a variety of questions regarding students’ personal behaviors, as well as perceptions of the healthfulness of the University of Wyoming campus environment. Along with survey-collected data, observational audits were conducted as well. These audits targeted three primary sectors of campus health: Dining, Physical Fitness and Recreation, and Health Policy. Within Dining and Physical Fitness, various establishments located both on campus grounds as well as within a set perimeter were visited and evaluated through the use of predetermined audit forms. To evaluate the sector of Health Policy, the University’s website and complementary databases were utilized. Audits were conducted by a 7-member team composed of undergraduate community nutrition students, as well as undergraduate honors and graduate researchers. All data obtained from the survey and audits were compiled and submitted to the GetFRUVED national research team for analysis and quantification. Data collection for the GetFRUVED project reached completion at the end of 2017. Data specific to the University of Wyoming will likely be received in the Spring of 2018, at which point it will be made available to campus officials as well as supervisors within the sectors of campus evaluation. Feedback from the GetFRUVED project will be used to enhance current health and wellness resources as well as inspire the creation of novel programs and offerings.

Neonatal Iron Supplementation Preferentially Activates Microglial in N171-82Q Huntington’s Disease Mice

Marley Realing¹, DW Donley^{2,3}, J Gigley⁴, JH Fox^{2,3}.

¹Department of Microbiology ²Veterinary Sciences and ³Neuroscience Program, ⁴Department of Molecular Biology, University of Wyoming, Laramie, WY, 82070

INBRE

Casper, WY

Huntington’s Disease (HD) is a genetic neurodegenerative disorder with no cure that results in motor and cognitive dysfunction. HD affected individuals develop neuroinflammation before clinical HD onset but the mechanisms are not well understood. Microglial cells, brain immune cells, are primarily responsible for neuroinflammation. Iron accumulates in the HD brain and oxidative stress due to iron activates microglial cells inducing neuroinflammation. Neonatal iron supplementation in HD mice potentiates neurodegeneration. The aim of this project was to understand if neonatal iron supplementation in HD mice promotes microglial activation. N171-82Q HD or wild-type mice were dosed with iron or vehicle in a 2x2 design from post-natal day 10-17 then sacrificed at 14-weeks of age, corresponding to early HD in these mice. First, we measured microglial iron accumulation using flow cytometry. We found a significant increase in iron accumulation in HD versus wild-type microglial cells. Next, we measured activation status by morphology. Microglia were visualized using IBA-1 labeling. Image stacks were obtained then Neurolucida software was used for morphologic analyses. Iron-supplemented HD mice had a significantly higher proportion of reactive microglia compared to control HD mice ($p=0.0187$), demonstrating more activation. Further, iron supplementation in both wild-type and HD mice increased cell body volume compared to vehicle treated mice ($p=0.0057$), indicating increased activation. The data indicates that neonatal iron supplementation activates microglia in wild-type and HD mice; however, the effect in HD mice is

greater based on the outcomes studied. Neonatal iron supplementation may potentiate HD in mice in part by activating microglia.

The Necessity for a Critical Analysis of WWOOFing in the Ecotourism and Sustainable Voluntourism Sector of Latin America

Marley Realing and Dr. Zoe Pearson
Environment and Natural Resources and Honors Program
University of Wyoming
Oral Presentation

Tourism in Latin America has exponentially increased in the past couple of decades. Two major sectors of this tourism boom have been voluntourism and ecotourism. Voluntourism is defined as “a form of tourism in which travelers participate in voluntary work” (Oxford, Dictionary, 2018). Of course, as its name implies, ecotourism is the form of tourism focused on sustainability. These forms of tourism intersect with World-Wide Opportunities on Organic Farms (WWOOF). In its essence, WWOOF is an online forum that serves as a route for volunteers to connect with local farm owners, leading to a stint of voluntourism on an organic farm (FoWo, 2018). Although WWOOFing is not the most frequent form of either ecotourism, nor voluntourism it is prevalent enough that an in-depth analysis of its effects economically, politically, and culturally, is imperative to understanding the entire picture of ecotourism/voluntourism in rural Latin America and the Caribbean (LAC).

Bioproduction of Magnetic Nanoparticles & Integration into Biosensors

Jacob Rex¹, Dr. Karen Wawrousek¹
¹Department of Chemical Engineering, University of Wyoming

INBRE

Laramie, WY

Magnetic nanoparticles are of interest for both an emerging role in diagnostics and treatments of diseases. Iron oxide nanoparticles are the best studied and show promise both for use in imaging, such as magnetic resonance imaging, treatment of cancers, and diagnostics. However, the effectiveness of their use can be severely affected by the size of the nanoparticle. Magnetic materials are produced throughout biology, frequently giving animals the ability to fly or move by following the earth's magnetic field lines. Magnetotactic bacteria generate magnetic nanoparticles to move along the Earth's magnetic field lines, frequently in search of a microoxic environment. These bacterially produced magnetic nanoparticles have impressive uniformity and are optimized for their magnetic properties, making a biological system attractive for magnetic nanoparticle production. For example, this research utilized the bacterium *Magnetospirillum magneticum* AMB-1 produced magnetic octahedral nanoparticles that are ~50nm across. These ferromagnetic particles are single-domain magnetic particles, maximizing the magnetic properties for the size of the nanoparticle. This research project was focused on the use of magnetotactic bacterium (MTB) *Magnetospirillum magneticum* AMB-1 nanoparticles in biomedical applications. There were three core project goals. The first was to set up and learn how to use the New Brunswick BioFlo 115 benchtop fermenter and bioreactor. The bioreactor is a vital piece of equipment that allowed us to grow the bacteria needed in an efficient manner. The second aim of this research project was to find a way to optimize growth of MTB and isolation of the magnetic nanoparticles within. The third goal for the research was to dope the magnetic particles with different metals and functionalize them with antibodies for integration into Surface enhanced Raman scattering (SERS) biosensors for use as a diagnostic agent. With this research project, the unique nature of magnetotactic bacterium and their promising future in the field of biomedical research was explored.

Microbial Production of Lipids for Biodiesel

Abdulwahab Ahamd, Daney Brauchie, Sawyer Letourneau, Anthony Menghini, Jacob Rex,

Teneil Schumacher

Dr. Karen Wawrousek Department of Chemical Engineering

University of Wyoming

Oral Presentation

Department of Chemical Engineering

Kuwait

Casper, WY

Fairfield, ME

Cheyenne, WY

Phoenix, AZ

Buffalo, WY

The purpose of this project was to economically design a chemical plant that produces biodiesel from lipids produced by the filamentous fungi *F. oxysporum*. Furthermore, the potential for market distribution is considered through comparison to petroleum derived biodiesel. The analysis of the design takes into consideration various separation and transport processes. Among such processes includes the cultivation and extraction of a lipid feedstock, the conversion of the lipid feedstock into biodiesel, and the purification of biodiesel into a final product. Benchtop growth data for *F. oxysporum* on high energy sugar beet waste was collected and scaled up to a chemical plant. The experimental data showed that *F. oxysporum* has approximately 25% cell dry weight as C16 to C18 lipids, making it ideal for large scale production of biodiesel. The goal for this semester was to design an optimal second generation biodiesel production process from the given benchtop data and analyze its economic validity. It was found that this process was not economically feasible at a large scale. A flowsheet for the entire process was created and mass and energy balances were calculated by hand. The process is divided into two sections. The first is the production and extraction of lipids, and the second is the production and purification of biodiesel. The biodiesel production and purification process produces 35,000 gal biodiesel/year. The process design, which is modeled in Aspen, consists of a sequence of processes to extract the lipids from the biomass and further produce and purify the biodiesel.

Woodpeckers and Parasites: Testing for correlations between immune function and carotenoid levels

Ashleigh Rhea with Dr. Matthew Carling

Dept. Zoology and Physiology

University of Wyoming

Oral Presentation

Honors College, Wyoming Research Scholars Program

Dillon, MT

Many physiological processes must take place in order for an immune response to be activated. Adequate nutrition providing all of the body's essential vitamins, minerals, pigments is a necessary component of normal health responses. Diet-based carotenoids have been linked with activating the immune response. What is unclear is whether the concentration of carotenoids present, as measured in the surface area of carotenoid-based plumage coloration, correlate with the presence of parasitic infection. To answer these questions, we used 65 Red-breasted Sapsucker (*Sphyrapicus ruber*) and 16 Red-naped Sapsucker (*Sphyrapicus nuchalis*) specimens to determine carotenoid concentration from red-colored breast and crown feathers via gas chromatography. These data were analyzed in conjunction with avian malaria (*Plasmodium spp.* and *Haemoproteus spp.*) infection rates obtained by polymerase chain reaction (PCR). We found that 40% of our sample size was infected with avian malaria. We also compared standardized measures of the estimated red coloration on the breast and crown using ImageJ. We found that there is a significant ($p=0.0116$) difference between the red feather proportions on the breasts of infected individuals in comparison with uninfected individuals. The findings of our study will help shed light on how climate change facilitating the northern expansion of *Culex* mosquitos and avian malaria will impact these woodpeckers. Additionally, these data indicate differences in the reproductive and survival costs associated with avian malaria infection.

Miscible Solutions

Daniel Rhyan
Petroleum Engineering

The Elk Basin is the central focus of our focus with the overall goal of providing actionable data for Vanguard. The scope of the data will be the economic viability of CO2 flooding within the region. This viability will cover the construction of a 3D model that will be tested for different recovery methods. These results will be expanded to look at what option should be made. This data will be handed over and presented to Vanguard energy. CO2 flooding is becoming more and more common within the Wyoming region. The CO2 flooding that is currently being implemented is main focused around the center of the state of Wyoming. Some of these formations that are already being flooded extend all the way up to Elk Basin. The Elk Basin region has many different formations that lie on top of one another. The formation that our group was tasked to evaluate for CO2 flooding is the Madison formation. This formation has been identified as a target formation of CO2 flooding by the EORI.

Correlation of Isolated Archaeological Resource Concentrations to Environmental Diversity

Michaela Rich-Mooney: Marieka Arksey
Anthropology
University of Wyoming
Oral and Poster Presentation

University of Wyoming Archaeological Repository

Casper, WY

Isolated archaeological resources are defined by the State of Wyoming as a prehistoric resource with less than 15 artifacts, or a historic resource with less than 50 artifacts. These differ from archaeological sites not only how they are defined, but also the amount of data that is required to be collected and preserved – resulting in isolated archaeological resources not being heavily researched. With more than 2,000 archaeological isolates in its collection, the University of Wyoming Archaeological Repository (UWAR) offers a plethora of untapped research potential. This presentation focuses on a comparison of the density of isolated resources per county to begin to determine why some counties demonstrate a much higher concentration of isolates than others. Looking at the relationship of the color of artifacts in contrast to soil types and vegetation, I propose that artifacts of contrasting colors in a less-vegetated areas are the primary cause of higher concentrations of isolated artifacts. This research demonstrates the need to be aware of this bias in the misrepresentation of this data but also illustrates the potential value of these curated collections in a holistic approach archaeological research.

Have You-genol Taken Thyme to Re-think Medicine?

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Poster

INBRE

Powell, WY

Spices have been used throughout history in natural remedies and treatments. The different compounds making up these spices have very limited solubility in aqueous solutions. An example of this limitation can be found in nutmeg. One of the major components of nutmeg is myristicin. The aqueous solubility of myristicin is approximately 46.4 mg/L at 25°C. The focus of this research is to determine whether the solubility of spice compounds can be altered by making carbohydrate derivatives. Improving the solubility of these compounds could make them more bioavailable, thus making them more active. An increase in activity could lead to spices being more effective in natural treatments, thus leading to a more prevalent use in future medicine.

Using the Microsoft HoloLens as a Robotic Controller

Marcus Rieker with Professor Suresh S. Muknahallipatna

Computer Engineering

University of Wyoming

Oral & Poster Presentation

Department of Electrical and Computer Engineering

Laramie, WY

The Raspberry Pi 3 is a low cost, credit-card sized computer. Windows 10 IoT Core is an operating system built for such small devices. Windows 10 IoT Core embraces a rich UWP (Universal Windows Platform) app experience. The Microsoft HoloLens is the first self-contained, holographic computer, enabling users to engage and interact with holograms in the world around them. The goal of this project is to use a Raspberry Pi 3 (running Windows 10 IoT Core) and a Microsoft HoloLens to control a small robotic platform. This platform will have two DC motors (powering two separate wheels) controlled by an H-Bridge mounted on the robotic platform. The Raspberry Pi will take commands via WiFi (TCP / IP sockets) from the Microsoft HoloLens. A user will control the robotic platform (turning it, moving it forward/backward, etc.) via model manipulation. I.e. the model will appear in the HoloLens and will allow the user to interact with it. If the user pushes / turns the model the robotic platform will move accordingly. There will also be a live feed from a camera mounted on the platform that streams to the HoloLens. This will assist the user in control and not limit them to being in the same vicinity as the platform. The fundamental concept of this project (communication between a Raspberry Pi and Microsoft HoloLens) will have unlimited applications in the years to come, especially as the HoloLens becomes more and more affordable to the general public.

**The Interdisciplinary Climate Change Expedition (ICCE):
Soil Development along a Chronosequence in the Dinwoody Cirque**
Anna Robinson with Elizabeth Traver and Associate Professor Jacki Klancher
Ecosystem Science and Management, U Wyoming
Central Wyoming College
Poster Presentation

INBRE, EPSCoR, NASA

Lander, WY

Globally and locally, glaciers are disappearing in increasing numbers and expanding the surface area of exposed soil. The Wind River Range, located in western Wyoming, is home to some of the remaining glaciers in the continental US, including the Dinwoody glacier. In response to global climate change, the Dinwoody glacier is retreating at an increasing rate. The movement of the glacial terminus upward towards higher elevations creates an opportunity to investigate the process of soil development and chemical composition along a chronosequence. In August 2017, soil samples along five separate transects were collected parallel to the toe of the Dinwoody glacier and ranged from the toe to the ~1850 (Little Ice Age) terminal moraine. Based on the retreat of the glacial terminus, it is possible to identify patterns of soil development and transformation using the forefield as a measure of time thus generating a chronosequence. The newer soils are closest to the glacial toe and the older soils are farthest from the glacial toe, ending at the ~1850 terminal moraine. Seven plots were sampled within each transect, recording seven cover classes and collecting four soil samples. From the soil samples the following parameters were measured: soil electrical conductivity (EC), pH, and organic matter (LOI: loss on ignition). Data analysis included exploration of the relationship between soil exposure time, soil characteristics, and associated vegetation communities. Older soils showed evidence of increased vegetation, lower soil pH, and lower EC. This type of soil research is critical in predicting Wyoming's future landscapes.

Vertically Challenged LLC

Gabriel Rooker, Lawrence Aguinaldo, Hongfeng Xue, Noah Eckebrecht, Colton Burkett

Dr. Tawfik Elshehabi

UW Oral Presentation

Forest Grove, OR, Laramie, WY, Beijing, China, Littleton, CO, Casper, WY

Horizontal completions have revolutionized the oil and gas industry with respect to production and enhanced oil recovery of OOIP/OGIP. The incorporation of directional drilling and formation fracturing helped provide incentive to push towards higher production rates and extraction of coal bed methane. The team project, under the name of Vertically Challenged LLC, is set out to compare production rates of a real horizontal well, in the Turner formation, to a duplicate well drilled twice as far. To model the duplicate well, reservoir simulator Petrel will be used as the simulation platform. With the simulated production data, our objective is to observe the increase between production and increased drilled distance. Our educated guess suggests the production will increase with respect to the incremental distances drilled, but with diminishing return. In other words, the production data is anticipated to increase to a point as costs involved with drilling/completion surpass that of the production returns. The data gathered should determine the optimal distance needed for any specific horizontal well to maximize well performance. The project hypothesis surrounds the field of directional drilling and its relation to production increases. Team Vertically Challenged LLC intends to use a relevant well formation to form a simulation, in the software Petrel, to observe the increase of production given a certain incremental increase in distance drilled. The objective of the team is to create a static model that shows the hypothetical diminishing returns of well that is drilled at incremental values more than its original value. Using the data gathered from Petrel, the team intends to incorporate fracturing methods to help increase production values. Eventually, the end of the project will incorporate oil and gas prices into the economic model to show the advantages of drilling further into the formation.

Investigating the Role of PopZ in Establishment and Maintenance of Bacterial Cell Polarity

Dylan Rust¹, Dr. Grant Bowman¹

¹University of Wyoming, Molecular Biology
Poster

INBRE

Laramie, WY

Rod-shaped bacteria are often polarized, having morphological and functional differences between the two ends of the cell. However, the mechanisms by which this asymmetry is established and maintained is not well understood. A knowledge of these processes is of great biomedical importance, as polarization can be used by pathogenic bacteria to create multiple cell types, each with its own role in virulence. A recently discovered protein, PopZ, is a molecular hub that has a role in cellular organization in *Caulobacter crescentus* through direct interactions with a number of binding partners. This project focused on further characterizing the importance of PopZ in cell organization, by evaluating the protein from various bacterial species, and their interactions with cellular pole proteins of different bacterial strains. In addition, this project attempts to establish a PopZ variant which would act as a super-binder. If successful, this would provide a valuable tool in further characterizing cell pole organization, and would advance the understanding of the role that bacterial polarity plays in pathogenicity.

Microfluidic Devices for Studying Algal Growth Under Geometric Confinement

Benjamin Sabat¹, Dr. John Oakey¹

¹Department of Chemical Engineering, University of Wyoming
Poster Presentation

INBRE

Laramie, WY

Microfluidics deals with the manipulation of fluids in small channels. Microfluidic devices have a wide array of uses, and are inexpensive to fabricate. Some of the uses of these devices include medical diagnostics, environmental sensing, and fundamental cell studies, where the microenvironment can be actively and quickly changed. Microfluidic devices are made using polydimethylsiloxane (PDMS), which allows for gas permeability, and is biocompatible, making a favorable environment for the growth and movement of organisms. Here, we use microfluidic devices as growth chambers to obtain high-resolution images of single cells. Microfluidic growth chambers allow for cells to be grown in a single layer, according to the depth of the chamber, allowing for a three-dimensional cell to be easily imaged. This allows for an analysis of not only the growth of a single-celled organism, but also the motility of the organism. We created microfluidic devices to study the growth dynamics and motility of a desiccation-tolerant green algae found in desert crusts. The motility and growth dynamics of this algae have not been previously studied because they are conventionally grown in a suspension. This alga was studied in the confined environment of a microfluidic growth chamber, designed to represent basic aspects of their native soil niche, and were found to exhibit a “passive motility”, seeming to explore its surrounding environment. We are gathering data on the motion of these algae in this confined space and are interested in finding out how the algae responds to variation in their environmental geometry, such as vertical and horizontal confinement.

Locating Raccoon (*Procyon lotor*) Hotspots in Laramie, WY, using Trail Cameras

Jahshua Sanchez, Dr. Sarah Benson-Amram
Zoology and Physiology
University of Wyoming
Oral Presentation

NASA Space Grant

Douglas, WY

North American raccoons are a meso-carnivore species that often exploit resources found in urbanized landscapes. Around Laramie, Wyoming, there have been sightings of raccoons at various locations from backyards to storm drains, and some have been reported taking pet food or rummaging through dumpsters. Raccoons are one of many species that have shown remarkable adaptation to human-modified landscapes and with that adaptation comes conflict with humans. Its important we study these species and their interactions with humans in order to better understand how to best mitigate human-wildlife conflict. The objective of this research project was to determine how frequently raccoons visit certain sites in the city of Laramie, Wyoming. I used trail cameras to monitor two locations in town from June to September 2017. From previous research conducted by the University of Wyoming Raccoon Project, we know that there are raccoons in Laramie that carry zoonotic diseases. Given the potential for transmission to humans via pets, livestock, and even water, it is important to determine the locations of local raccoons, so these areas can be monitored.

Potential mediators of the dysregulated innate immune response in cardiac pathologies

Alyssa J. Sanders¹, Luiza M. Bosch¹, Aspen R. Smith¹, Oliva M. Glassock¹, Matthew R. Peterson¹, Dr. Guanglong He¹

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Oral Presentation

Biomedical Sciences, INBRE

Green River; Pinedale; Powell; Buffalo, Wyoming

An underlying inflammatory response contributes to pathological cardiac remodeling in heart disease. Secretion of cytokines by infiltrating immune cells plays a major role. Despite significant basic and translational progress, heart failure and its many risk factors continue to dominate the leaderboard of worldwide morbidity and mortality. Results from clinical trials directly targeting a promising cytokine of interest have been disappointing. Because numerous cytokines contribute to the process of cardiac pathologies, we hypothesized that proteins expressed in immune cells that regulate cytokine secretion might serve as more powerful therapeutic targets. We identified three such proteins from existing scientific literature:

1. Caspase Recruitment Domain family member 9 (CARD9)
2. NLR family Pyrin domain-containing 3 (NLRP3)
3. Nucleotide-binding Oligomerization Domain-containing protein 2 (NOD2)

Homozygous genetic knockout (KO) mice lacking expression of either CARD9, NLRP3, or NOD2 were acquired. In order to determine the effect of genetic knockout, wild-type (WT) and KO mice were split and assigned to a control or disease group. The CARD9 disease group was subjected to chronic transverse aortic constriction for 3 months as a model of hypertensive heart remodeling. NOD2 and NLRP3 disease groups were assigned to 5 months of high-fat diet feeding to generate a model of obesity induced cardiac dysfunction. Following 3 months of TAC or 5 months of high fat diet feeding, heart function was assessed with echocardiography and compared to WT counterparts and controls. The results will be used to choose the most suitable protein target, and follow up with a thorough investigation.

Transient Receptor Potential Vanilloid Subfamily 1 (TRPV1) activation Regulates Mitochondrial Quality Control in Brown Adipose Tissue

Lauren Scandrett*, Jessica O'Neal*, Jenni Ebersberger*, Padmamalini Baskaran and Baskaran
Thyagarajan

Molecular Signaling Laboratory, School of Pharmacy, University of Wyoming

INBRE

Laramie, WY

Obesity forewarns metabolic dysfunction. Currently, about one third of the world's population is obese/overweight. The increasing rate of obesity and complications associated with it necessitate the development of novel strategies to counter obesity. Recently, activation of TRPV1 is emerging as an effective strategy to stimulate metabolic activity and thermogenesis via browning of white adipose tissue (WAT) and activation of brown adipose tissue (BAT). Here, we present novel data suggesting that TRPV1 activation enhances mitochondrial biogenesis in demonstrating the effect of TRPV1 activation on mitochondrial biogenesis in WAT and BAT. To analyze the effect of TRPV1 activation on mitochondrial biogenesis, we measured the ratio of mitochondrial DNA to nuclear DNA in the WAT and BAT isolated from normal chow diet or high fat diet (HFD; \pm capsaicin)-fed wild type and TRPV1^{-/-} mice. We analyzed mitochondrial numbers in BAT sections by transmission electron microscopy. Also, we measured the expression of genes that regulate mitochondrial biogenesis (PGC-1 α and NRF-2) in these tissues. HFD suppressed the expression of PGC-1 α and NRF-2 and decreased mitochondrial numbers in BAT. HFD decreased mitochondrial DNA copy numbers. Capsaicin reversed the effects of HFD in the wild type mice but not in TRPV1^{-/-} mice. Our research unmask a novel role of TRPV1 activation to enhance mitochondrial biogenesis to increase thermogenesis and metabolic activity.

Childhood Poverty and Its Effects on the Brain: Physiological and Functional Implications

Lauren Scandrett

Dr Donal Skinner

Honors College

University of Wyoming

Oral Presentation

Honors

Laramie, WY

One out of every five American children lives below the federal poverty line. Considering that poverty is deemed one of the most influential risk factors for poor developmental outcomes, it is critical to understand what effect poverty has on the developing brain and how those brain changes affect a child's life. Poverty is chiefly defined by having a low socioeconomic status (SES), but a low SES is often accompanied by other influencers, such as nutrition and mental stimulation, termed poverty co-factors. Other poverty co-factors include, but are not limited to, maternal stress and malnutrition, environmental toxins, parental nurturance, and education. A low SES and accompanying poverty co-factors influence changes in the brain, including both the type and rate of change. Variances have been noted in the frontal lobe, prefrontal cortex, amygdala, hippocampus, and the white and grey matter size and ratios. Neurotransmitter and hormone modifications have also been observed. These brain changes have long-reaching impacts, affecting educational and intellectual attainment, emotional processing, and risk of mental illness. As knowledge regarding poverty-driven brain changes increases, more possible intervention strategies are being developed. These strategies center on parental involvement and mental and verbal stimulation. The achievement discrepancies noticed between children raised below the poverty line and children raised above it likely contribute to the continuation of intergenerational poverty. Further research and information regarding poverty and how it affects the developing brain contribute to developing target strategies to ameliorate the effects of childhood poverty.

Structure-Function Analysis of Bacterial Scaffolding Protein PopZ

Kaylan Schilling¹ and Dr. Grant Bowman¹

¹Department of Molecular Biology, University of Wyoming
Poster

INBRE

Riverton, WY

Bacteria are the smallest and simplest forms of life on our planet, yet even these basic cells exhibit a surprising degree of subcellular organization. Even though the cytoplasm is a single openly diffusive compartment, anatomical features are formed as cellular components assemble into distinct structures at discrete locations. The cell poles of *Alphaproteobacteria* are organized by a highly dynamic scaffolding protein called Polar organizing protein Z (PopZ). Classified as an intrinsically disordered hub protein, PopZ contains a flexible binding site that binds to at least eight different proteins, which are involved in cell cycle regulation and chromosomal segregation. The binding domain for PopZ contains a short, evolutionarily conserved sequence that is predicted to form an alpha helix and is thought to be responsible for binding specificity. These residues, defined as a molecular recognition feature (MoRF), are embedded within a larger structurally disordered region that is less conserved but also required for interacting with multiple binding partners. To further understand the binding interface of PopZ, we use targeted mutagenesis to alter residues within regions thought to be necessary for protein interaction. To test for binding activity, we expressed mutant variants of PopZ with two of its binding partners, ChpT and ParB, in *Escherichia coli*. Because the proteins included fluorescent protein tags, we could use live cell fluorescence microscopy to observe whether the modifications to PopZ affect interaction with its binding partners. Our results are helping identify features within PopZ's structurally disordered region that are critical for determining binding affinity and specificity.

Empty Promises:

Mega-sporting events, the displacement of the disadvantaged and the illusion of economic advancement

Emily Schimelpfenig, Dr. Stephanie Anderson

UW Political Science Department

Oral Presentation

Honors

Lander, WY

The International Olympic Committee (IOC) and the Federation Internationale de Football Association (FIFA) represent the legacy of premier athletics, economic development and globalization. Cities around the world fight to host these premier events and showcase the beauty and robustness of their community. The construction of venues for these games adversely effects local populations. This paper attempts to address the arguments for showcasing such events, despite the local population displacement they cause. Using an examination of current literature on the topic, I attempt to provide a picture of the local impact of mega sporting events. I will look at how three forms of legitimacy provided by states as justification for hosting are often not based in reality. I will argue that economic legitimacy influences states to host games based on perceived benefits that do not reach the majority of the population, especially the poor. A second form of legitimacy, inherent legitimacy, focuses on the way that different types of spending are legitimized or not legitimized by the international community, and how spending on sports has an inherent legitimacy that for example, military spending does not. Finally, I will argue that legitimacy through terminology, such as marketing the perceived benefits to the community of the event, has adverse effects on local populations that are often ignored.

Improved Spectral Classification of Quasars Via Detected Visual Inspection

Danielle Schurhammer with Adam Myers

Department of Physics and Astronomy

University of Wyoming

Oral Presentation

WRSP & NASA Grant Consortium

Plainview, MN

A quasar is a compact region in the center of a massive galaxy surrounding a central supermassive black hole. The term 'quasar' was derived from how these objects were originally discovered in the earliest radio surveys of the sky. Away from the plane of the Milky Way Galaxy, most radio sources were identified with otherwise normal-looking galaxies. Some radio sources, however, were similar to objects that appeared to be unusually blue stars, although photographs of some of these objects showed them to be surrounded by faint, fuzzy halos. These halos around their quasars were actually the host galaxy. Because the quasar is so bright, it outshines all of the stars in its galaxy, making the stars look faint by comparison. Because of their star-like appearance, they were dubbed 'quasi-stellar radio sources,' which was shortened to 'quasar'. Spectra of quasars can be used to derive their distances, via their 'redshift', in addition to their chemical composition, temperature, and other properties. A pipeline, named *idlspec2d*, is used to determine the automated spectral classification, redshift, and parameter measurement of quasars. However, the pipeline still has issues picking out the correct emission lines in order to determine the redshift of each quasar. My goal was to look at as many spectra as I could and determine whether the pipeline was correct, and also make note of any unique features within the spectra.

A Social Study of Mining in Latin America

Andrew Schuster

History

University of Wyoming

Oral Presentation

ESPCoR

Big Horn, WY

If one subscribes to the three-sector theory of economics, then the countries of Latin America largely are tied to status of primary countries, or those which extract resources for secondary and tertiary countries to utilize in their more 'advanced' economies. While this three-tiered and categorical system certainly has problems, undoubtedly the economies of Bolivia and Mexico revolve around extraction of raw materials – especially through mining. In this context many of these raw materials are extricated to the United States, often by US Companies, for a sizeable portion of the last two centuries. This relationship both at a micro and macro-level importantly shapes said countries relations with their powerful northern neighbor. Specifically this project focuses on labor relations and complications in the long-standing relationship between Latin American Workforces and higher level largely Anglo-American mining workers, executives and even mine owners. Additionally, this relationship will be discussed in relation to how those same workforces interacted with state-run nationalized mining operations in Bolivia and the transfer of the majority of mines in Mexico into Mexican, but private hands and then effective nationalization. As such, this project finds that in large part, though no complete and general conclusion can be reached, that the relationships between Latin Americans and Anglo-Americans in the context of the mines were characterized by separation and obvious different conditions. Naturally, this resulted in animosity from the workforces which, as in other industries, occasionally resulted in violence and protest. However attitudes towards overseers in the later nationalized context carried many of the same trappings, showing perhaps that such animosity came more from a conditional than stereotyped place. Definitively though, the experience of and rhetoric around working for US companies certainly have helped color the US in a distasteful light.

LED Vehicle Display System

Michael Schwindt and Kaylyn Wessel

Dr. Steven Barrett Electrical Engineering Department
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Oral and Poster Presentation

Electrical Engineering Program

*Loveland, CO
Encampment, WY*

The LED Vehicle Display System is a system designed so that the driver of one car can communicate short appropriate messages to a driver behind them while on the road. The LED is a thin but long board that sits in the rear window of a driver's car and is connected to a numeric keypad. The keypad is installed on the dashboard near the driver so that they may choose a number and send a preset message to the board to be read by the driver behind. This display system is completely safe to use while driving and the Wyoming Department of Transportation has been notified about the intent of this project; by which no problems with the design were found. Because of its simple preset design, it is deemed no worse than using a car radio while driving. No external power source is required for this display as it uses the vehicles voltage and ground lines. For consumer use, the LED would have to be professionally installed in the vehicle to prevent any damage to both the display and the vehicle itself.

Refugee Resettlement in Wyoming: A 'How To' Guide

Gabriel Selting with Eric Nigh

International Studies
University of Wyoming
Oral Presentation and Poster

Honors

Laramie, WY

Wyoming is only state in the entire country that does not have a refugee resettlement program filed with the federal government. Given the free movement between states, refugees are finding their way to Wyoming without access to refugee cash and medical assistance, legal services, employment transition services, English training, refugee-specific grants, and other services that are critical to an effective resettlement effort. A successful refugee integration program is important not only for the refugees, but is important to the economic and security interests of the state as a whole. Community members throughout Wyoming have recognized this void and have expressed interest in developing a program; however, the process of creating a refugee resettlement program is a complicated endeavor. This research looks to map out the process of developing a refugee resettlement program, and it will put forward a theoretical model that can be used as the Wyoming resettlement project moves forward.

Enhanced Oil Recovery Screening of Oil Fields in Wyoming WYOscreen

Mark Jefferson, Zuhail Durani, Faisal Alsubaie, Jonathan Settlemeyer

Oil and gas companies have been producing oil within Wyoming for decades. Some of the oil producing fields are experiencing a decline in production after exhausting their capacities to produce naturally. To boost their abilities to continue producing, those oil fields have their current production linked to the secondary recovery. Like the primary recovery, the secondary recovery will be ineffective in the future and the Enhanced Oil Recovery (EOR) will be needed for those oil fields to continue producing. Based on the Enhanced oil recovery Institute (EORI) database available, a petroleum engineering senior design team was assigned to conduct a candidate field screening to determine and select the fields that have the most potential for Enhanced Oil Recovery within Wyoming. The selection of those fields is possible based on different EOR methods criteria and their related economic and safety aspects.

Explaining Economic Wellbeing in the United States

Josh Sheinberg with Stephen Bieber

Department of Statistics

University of Wyoming

Poster Presentation

McNair

Broomfield, CO

In the United States, every state differs in the average amount of personal income. Yet, this is not a good measure of economic wellbeing due to varying cost of living. In this paper, instead of cost of living, we will use the ratio between personal income and housing prices, as well as the ratio between personal income and consumer price index (CPI). This gives a more direct measure than "cost of living". To predict these two measures, we will be using economics data such as gross domestic income (GDP), and unemployment, as well as education data such as graduation rates and federal school funding. We will be looking at all of these in the year 2015, as well as comparing these results to 2010 and 2005. All 50 states and Washington D.C. will be included. The goal of this project is to better understand how and why the states differ in economic wellbeing, which we will be measuring by the two ratios previously stated. With this, another objective of this research is to compare and contrast the different statistical methods available to use in the analysis and to answer the research question.

Race and Racism; Westerns' Perspective

Korra Sheldon and Dr. Dana Pertermann

Anthropology

Western Wyoming Community College

Poster

Green River, WY

The issues surrounding race relations in the U.S. have a great deal to do with the lack of education citizens have on this topic. The purpose of this study is to better understand perspectives about race and racism and to see how much people know about this concept. 20 interviews were conducted from students and faculty at Western Wyoming Community College. The interviews consisted of five in-depth questions about race and their experiences with racism. Each interview was recorded on a voice recorder and then be transcribed. The significance of this research is to see perceptions that individuals have at WWCC on race and racism, and if there are any trends within this group that can be addressed to improve misperceptions and the experiences of Western student and faculty.

Using Data Science as a Tool for Answering Scientific Questions

Rachel Shrode with Dr. Carmela Guadagno

Botany

University of Wyoming

Poster Presentation

EPSCoR

Waunakee, WI

During the last decades, technological advancements in data science have allowed us to better interpret our data [LG1] and answer the most pressing scientific questions for our society. One relevant issue data science can assist in is modeling the consequences of the environment on plant physiology. Some traits, such as plant stomatal conductance and photosynthetic rate, are usually used as proxies to monitor the response of vegetation to changing environmental conditions. Reliable predictions of photosynthetic rate from stomatal conductance can implement our understanding of how plants will respond to changed external inputs, such as lower soil water content. Using the statistical programming software R, we analyzed a data set of *Brassica rapa* encompassing several ecotypes and genotypes in both well-watered and droughted conditions. A Bayesian model was fit to explain the relationship between stomatal conductance and photosynthetic rate. Data was withheld in order to test the predictive accuracy of the model. Our model was able to accurately predict photosynthetic rate from stomatal conductance. Future work will focus on integrating previously collected metabolomics and transcriptomics data into the model and reveal new physiological connections through data science.

The Future of Car Dealerships: Omnichannel Sales in the Experience Economy

Cameron Skinner with Dr. Kent Drummond

Management & Marketing

University of Wyoming

Oral Presentation

Honors

Laramie, WY

As the demographics of the car-buying population begin to undergo dramatic shifts, the dealership model is facing unprecedented challenges to adapt to the new experience economy. Currently, only 17% of polled participants like the current car-buying model, which has negative implications for multiple industries directly and complementarily associated with dealerships. With industry disruptors, such as Tesla, challenging the quo socially, technologically, and legislatively while hedging at leaders and garnering market share, the car salesman concept (that has been in place since the inception of automobiles) is under attack. The goal of this project was to analyze the dealership model and the consumer market, and to ultimately determine the future of the car-buying process. This was accomplished by investigating consumer preferences, trends in the automobile and transportation industries, international comparisons, and the history of the dealership. All of this was taken into account to develop a sustainable, omnichannel prototype of the dealership model that benefits both the industry firms and consumers.

Production of Carbon Fiber from Coal

Tucker Skoric, Erin Auerbach, Kyle Curtiss, James “Max” Weiss, Ben Reinicke, Musaad Alshamrani
Dr. David Bell, Dr. John Myers, Department of Chemical Engineering
University of Wyoming
Oral Presentation

Chemical Engineering Department

*Berthoud, CO
Irvine, CA
Loveland, CO
Wheaton, IL
Arvada, CO
Riyadh, Saudi Arabia*

With the push away from coal-powered energy, alternative uses for Wyoming coal need to be explored. Coal mining has contributed more than \$1 billion annually to both the state and local budget of Wyoming prior to the drop in coal prices. This substantial drop has sparked interest in the research for alternative uses of Wyoming sub-bituminous coal. The production of carbon fiber from coal has been studied and results show a potential for the start of a lucrative industrial plant. Carbon fiber is fibers in which carbon atoms are oriented in a fashion that provides high strength and relatively low weight. Higher strength carbon fibers are used for high performance uses such as airplanes or sporting equipment. We are looking into producing construction grade carbon fibers that are weaker, but cheaper to produce, and could be used in the building of homes, automobiles, or any industry that could benefit from a cheaper carbon fiber as compared to traditional PAN fibers. The goal of this project was to design and analyze a plant that converts coal-derived pitch into carbon fiber with the intended market being construction materials. We will be analyzing the economies of scale between a 10 million pound per year plant and a 100 million pound per year plant. We will accomplish this by turning coal into hyper-coal, a coal derived pitch, and then subsequently stabilizing and carbonizing the pitch to turn it into carbon fibers that we can sell on an industrial level.

A Scoping Review: The Use of Telehealth with Older Adults

Hannah Snyder, Erin Heald, Holly Trujillo, Madison Haun, and Mattie Bartels
Mary Jo Cooley Hidecker, PhD, MS, MA, CCC-A/SLP; Erin Bush, PhD, CCC-SLP
Division of Communication Disorders, University of Wyoming
Poster Presentation

*Arvada, CO
Casper, WY
Sheridan, WY
Torrington, WY
Colorado Springs, CO*

Telehealth is an emerging healthcare service that is provided through the use of telecommunication technologies. The goal is to provide and enhance client services through technology without clients needing to receive therapy in person. Major benefits of telehealth include: improved access to therapy, cost efficiencies of therapy, and improved quality of care. Research has suggested that telehealth is beneficial across interprofessional practices and a variety of populations. However, little is known about its use with older adults. Purpose: The purpose of this study is to complete a review of the extant literature regarding older adults' use of telehealth. Method: Advanced literature searches were conducted to find studies that implemented computer-based therapy specifically with the older adult population. Through collecting studies common themes, benefits, and issues of using telehealth with older adults were noted. Some variation was found in where the technology came from and where the location of telehealth occurred. Significance: This research will postulate explanations for the difficulties that older adults may encounter when using telehealth. Healthcare providers may adjust the manners of telehealth to better fit the older population for easier navigation of the technology.

How could a exoplanet survive a post-main sequence event?

Rebecca L. Sorber
Dr. Hannah Jang-Condell
Astronomy & Physics
Poster

McNair

Laramie, WY

This project will investigate the ways in which the exoplanet in the star systems GL 86 could have survived a post-main sequence evolutionary event. The question is how can a planet in such a close orbit could have survived the death of the star companion GL 86B. The searing force of the stellar wind in such an event should destroy all planets in its wake. The post-main sequence evolution with planet survival will be examined by modeling using the program Mercury (Chambers 1999). Using the model, we examine the origins of the planet: whether it formed before or after the post-main sequence evolution of GL86B. The modeling will give us insight into the dynamical evolution of not only, the binary star system, but also the planet's life cycle.

Wyoming Wheels: A Geared, Lever-Action, Manual Wheelchair System

Matthew Jones, Jacob Porter, Nick Staiano, David Tobin

Ike Ruse, Mechanical Engineering
Len Lutz, College of Engineering

University of Wyoming College of Engineering and Applied Science

Monarch Mobility

Wyoming Institute for Disabilities (WIND)

Wyoming Assistive Technology Resources (WATR)

Matthew Jones, Eureka, CA

Jacob Porter, McMinnville, OR

Nick Staiano, Mead, CO

David Tobin, Aurora, CO

Manual wheelchair users traditionally suffer from an increased risk of chronic shoulder injury and the inability to travel quickly or uphill independently. Beginning as a senior design project in Fall of 2016, Wyoming Wheels is a geared, lever-action, manual wheelchair system designed to mitigate these challenges. For the 2017-2018 school year, the goal of the project was to create a functional prototype by optimizing the previous year's project. Specifically, the weight and noise output needed to be decreased, and the shifting, braking, and overall ergonomics of the chair needed to be improved. The total weight of the chair was reduced by 57% by replacing the original steel gears and handles with delrin plastic and lightweight aluminum. By combining a single planetary gear system with a 3-speed internally geared hub, the gearing and shifting systems were simplified and the sound output was reduced to that of a bicycle. A two-way pawl was designed to engage the planetary gear system as a clutch such that the gears are only driven when the lever action handles are engaged. This creates a default neutral setting, allowing the user to operate the chair normally when the handles are not engaged. The shifting interface was simplified by implementing a standard bicycle twisting shifter. An internal drum-brake system was added for improved stopping power and increased safety. The handle was re-designed to incorporate the shifting, brake lever, and pawl-clutch lever in a useful and ergonomic arrangement. This prototype was ultimately successful in meeting the desired objectives.

Developmental Study of Ankyrin 3 Knockout Mice

Danny Stanley

Sun Neuroscience lab, University of Wyoming
University of Wyoming, Physiology and Zoology
Oral Presentation

INBRE

Laramie, WY

This is an ongoing developmental study of Ankyrin 3 knockout mice. These mice are genetically altered to have a seizure disorder. The goal of the study is to track many Ankyrin mice over the course of their lifetime and see if there is any pattern in the development of the seizures as these mice age. All of the surgery done on the Ankyrin mice for this experiment was done by Dan Petrus in an earlier phase of the research. In surgery an intracranial electrode was implanted into the S1 region of the mouse brain. After the mice have had time to recover from surgery, they are hooked up to an EEG and recorded. Each mouse is recorded multiple times, so any changes in the seizure profile can be recorded. When the mouse dies the information on the mouse is carefully recorded and added to the death log. The data collected in our study shows that 100% of mice in the study develop seizure activity by 80 days old. However, we have been unable to isolate an age where seizure activity does not occur in the population. There also seems to be a theme of more seizure activity developing with age, however has not been significantly demonstrated. The final stage of research involves analyzing the rest of the data that has already been collected.

Optimizing experimental conditions for genetic screening of Polar Organizing Protein Z (PopZ) mutants

Steinberg S.¹, T. Smith¹, C. Kerr¹, Dr. Dagmara Motriuk-Smith¹, Dr. Grant Bowman²

¹Department of Zoology and Physiology, University of Wyoming at Casper

²Department of Molecular Biology, University of Wyoming

Poster Presentation

INBRE

El Cajon, CA; Monticello, MN; Casper, WY

Caulobacter crescentus, which belongs to the diverse class of *Alphaproteobacteria* is known to express Polar Organizing Protein Z (PopZ) representing an intrinsically disordered protein (IDP). This protein is responsible for cellular polar localization. Challenges of PopZ structural predictions are associated with the lack of stable structure. One of the experimental approaches allowing to determine the function of individual amino acids within PopZ and its interactions with the binding partners is construction of mutants. The mutant constructs will be screened for binding with normally positive binding partners. These experiments will support efforts to further understand the structure-function relationship of PopZ and may lead to a better understanding of other IDPs. The purpose of this study is to develop an accurate experimental protocol for recombinant protein expression and co-localization using positive and negative controls. Construction and co-expression of recombinant proteins mCherry-PopZ and GFP-ParB in *Escherichia coli* allow for visual confirmation of their interaction using live cell fluorescence microscopy. Another example of plasmid encoded recombinant proteins representing positive controls are mCherry-PopZ and GFP-ChipT. The negative controls are mCherry-PopZ and GFP-DivK; mCherry-PopZ mutant and GFP-ParB. Optimizing *E.coli* optical density, incubation time, and inducer (IPTG and arabinose) concentration will result in acquisition of accurate microscopic images.

Energy Analysis of HVAC System and Implementation of Occupancy Schedules

Aaron Stidolph, Caymen Perrault, Jessica Brist
Liping Wang, Civil and Architectural Engineering
University of Wyoming
Oral Presentation

Department of Architectural Engineering

*Laramie, WY
Bonsall, CA
Billings, MT*

Building energy usage represents nearly half of the total energy consumed in the United States. Current efforts to reduce this consumption focus on supplying thermal comfort to individuals rather than spaces. Our research focusses on obtaining fine-grained occupancy data to create occupancy schedules for building thermal zones. Most building occupants exhibit regular occupancy behavior, allowing for the creation of occupancy profiles to reduce energy usage during unoccupied times. We surveyed several offices over two weeks to obtain occupancy data to apply to energy modelling software and implement in the University of Wyoming Engineering HVAC lab. The implementation of occupancy profiles indicated energy savings can be achieved without sacrificing thermal comfort. This can be an effective method of reducing energy consumption in existing buildings where other methods involving renovation would be too costly. To validate the results obtained via simulation, the profiles were applied to the HVAC lab where energy usage is monitored and logged for analysis. Real experimental results obtained from the HVAC Lab were used to calibrate the simulation model for accurate simulation results.

Renal Injury Risk Exposure from Non-Steroidal Anti-Inflammatory Drug Use and High Intensity Training: Pilot Study

Brandon D. Strannigan, Dr. Evan C. Johnson
Kinesiology & Health Promotion
University of Wyoming, Laramie, WY, U.S.A
Oral Presentation

Department of Kinesiology and Health

Elizabeth, CO

INTRODUCTION: High intensity endurance exercise with prior ingestion of non-steroidal anti-inflammatory drugs (NSAIDS), has been associated with increased risk of acute kidney injury (AKI). The intensity during high intensity functional resistance training (HIFRT), and possible NSAID use could present a risk of AKI. However, the prevalence of HIFRT, and NSAID ingestion has not been quantified. **PURPOSE:** The purpose is to quantify NSAID use in individuals that regularly participate in HIFRT by-polling a randomized sample of HIFRT facilities within the United States (US) to calculate the number of individuals performing “Murph” (1 mile run, 100 pull-ups, 200 push-ups, 300 air squats, and a final 1 mile run) annually. **METHODS:** 107 adults ($36.5 \pm 11.1y$, 53 males, 54 females) HIFRT individuals completed a questionnaire assessing frequency of NSAID use. 106 of the 5463 HIFRT facilities in the US will be contacted via phone or email. Contacted facilities were randomized and stratified by state. The number of facilities contacted per state was dependent upon total number of facilities per state. **RESULTS:** NSAID questionnaire suggested 21% of individuals used NSAIDS prior to exercise, of those 20% exceeded the prescribed dosage. The exposure rate for this study is estimated at 312,429 individuals completing “Murph” annually. **CONCLUSION:** The prevalence of NSAID use within the HIFRT facility in Laramie, Wyoming, and the high number of yearly “Murph” participants nationwide is evidence of potential high risk of AKIs during HIFRT. Therefore, further research is needed to evaluate AKI subsequent to “Murph” with or without prior NSAID ingestion.

Snow Now

Jacob Strong, Jacob Paulson, Mohammad Aldhefiri, Mohammad Ali, Sebastian Eckman
with Kassi Trujillo-Sullivan
Manufacturing Works
University of Wyoming
Oral Presentation

Department of Chemical Engineering

Jacob Strong - Cheyenne, WY

Jacob Paulson - Casper, WY

Mohammad Aldhefiri - Al-Mangaf, Kuwait

Mohammad Ali - Al-Mangaf, Kuwait

Sebastian Eckman - Denver, CO

When people think of winter the image of snow covering the ground is immediately thought of. In Wyoming this image is brought to life without fail every year, but what about people in other parts of the United States? In many parts of the southern United States it is common to not have any snow during the year. Because of the strong impression of what winter should look like, many people desire to fulfill this idea and would like to have snow covered lawns, but they are unable to. A solution to this problem is a synthetic product that looks like snow and is safe to the environment. This project assesses the viability of an indoor product comprised of a superabsorbent polymer, sodium polyacrylate, to be used on a larger scale outdoors as well as a way to apply the product to the ground primarily for decoration purposes. Tests on the product's resistance to heat, cold, wind, and sunlight were completed, and environmental concerns were researched. In addition, multiple applicators and application processes were considered to determine the best way to apply the product. What was found was that the product was not affected by any of the tests, which makes it suitable for outdoor use, and that premixing the product and then applying it is the best method.

Snow Now

Jacob Strong with Dr. David Bell
Chemical Engineering
University of Wyoming
Oral Presentation

Department of Chemical Engineering

Cheyenne, WY

When people think of winter the image of snow covering the ground is immediately thought of. In Wyoming this image is brought to life without fail every year, but what about people in other parts of the United States? In many parts of the southern United States it is common to not have any snow during the year. Because of the strong impression of what winter should look like, many people desire to fulfill this idea and would like to have snow covered lawns, but they are unable to. A solution to this problem is a synthetic product that looks like snow and is safe to the environment. This project assesses the viability of an indoor product comprised of a superabsorbent polymer, sodium polyacrylate, to be used on a larger scale outdoors as well as a way to apply the product to the ground primarily for decoration purposes. Tests on the product's resistance to heat, cold, wind, and sunlight were completed, and environmental concerns were researched. In addition, multiple applicators and application processes were considered to determine the best way to apply the product. What was found was that the product was not affected by any of the tests, which makes it suitable for outdoor use, and that premixing the product and then applying it is the most effective method.

Monitoring Glacial and Permanent Snowfield Recession in the Wind River Range

Aaron Strubhar, Chad Younger

Jacki Klancher, Assistant Professor of Environmental Health

Central Wyoming College

Oral Presentation and Poster

EPSCOR, INBRE, NASA

Lander, WY

The glaciers of the Wind River Range contribute essential runoff, both for Eastern and Western water resource regions. This glacial runoff is essential for the watershed, especially during the dry summer months when little precipitation falls. This glacial runoff replenishes aquifers, is utilized for agriculture, and is vital to wildlife for both habitat and sustenance. There have been several studies on alpine glaciers in Wind River Range with particular emphasis on the Dinwoody Glacier at the base of Wyoming's tallest mountain, Gannett Peak. The Interdisciplinary Climate Change Expedition (ICCE) hosted by Central Wyoming College has been using ground penetrating radar (GPR) to collect depth measurements along a specific transect of the Dinwoody Glacier for the past three years. GPR data from these expeditions offers detailed subsurface imaging of a section of the Dinwoody Glacier, first measured in the mid 1980's. The results from 2015 demonstrated some inaccuracies but the data from 2016 and 2017 has proven replicable and revealing. The CWC ice depth data was collected along a 2km established transect, and using a Noggin 100 MHz antenna. This data is believed to be the most reliable contemporary baseline data available. The Dinwoody GPR data was taken from the field and then processed through Reflex GPR and seismic processing software. The 2017 GPR team also collected transects across two permanent snowfields near the base of the Dinwoody Glacier. The depths of these permanent snowfields has not been previously recorded.

Drought tolerance: An evaluation of growth and seed yield of four pinto bean cultivars under two irrigation regimes in a greenhouse environment

Thomas Suhr and Jim Heitholt

Dept. Plant Sciences

With the ever-increasing effects of climate change on everyday life, combating current droughts and droughts of the future, the world will have to overcome a major hurdle for the survival of mankind. This study measured the effects of two different crop ecosystems, to which one system is fully irrigated and another system is in a drought scenario with sufficient water for survival. It also depicts which of the four dry bean varieties that were studied is the most efficient as well as which variety has the most tolerance for drought. Seed of La Paz, Monterrey, Othello and Poncho were sown in 3-gallon pots in the greenhouse with a mixture of sand, pine bark, and native soil in January 2017. The exact same method that was ran in January 2017 was also repeated in July 2017 to increase the accuracy of the study. Seedlings were thinned to three per pot after two weeks. The experiment was a completely randomized design with three replicates and a total of 24 pots. Water volume applied to each pot was recorded so that a cumulative seasonal water use could be calculated. At maturity, plants were dissected into pod walls, seed, stalks, and roots. We analyzed the impacts of drought tolerance on crop yields and the effects of stress on different varieties of pinto beans and compared them to the same varieties that were subjected to field capacity. The impacts of drought on all four varieties correlated closely with the yield differences which closely related to the number of pods per pot. Seeds per pod and seed size had some effect, but on the yield reduction it was relatively minor. Cumulative water use of the full irrigation treatment was about 50% higher than the drought-stressed treatment. Water use efficiency and the shoot-to-root ratio was surprisingly unaffected by the treatments. The two earlier maturing cultivars tended to use less seasonal water than the two later maturing cultivars. No cultivar-by-irrigation interactions were detected. This study provides valuable information that can be used to adapt the worlds food systems to crops that have the highest tolerance and the highest water use efficiency.

Geophysical Imaging of Structural and Hydrologic Controls in an Isolated Karst System

Nathan Swaim with Dr. Andrew Parsekian

Geology and Geophysics

University of Wyoming

Oral Presentation

Department of Geology and Geophysics

Monument, CO

Geophysical instruments can be used to image the subsurface properties of a karst environment. This project utilized Electrical Resistivity Tomography (ERT), Nuclear Magnetic Resonance (NMR), and seismic refraction surveys to interpret structural and hydrologic controls in the Lone Tree Sinkhole Complex in the southern Laramie Basin, Albany County, Wyoming. The formation of sinkholes and collapse features at the Lone Tree Sinkhole Complex is attributed to gypsum dissolution via water movement along thrust faults that cut the Satanka Shale and Forelle Limestone (Ver Ploeg et al., 2016). However, water transport along fault systems in the complex has not been confirmed with quantitative evidence in prior research endeavors. The purpose of this research is to utilize near-surface geophysical methods to image the subsurface and identify a hitherto inferred thrust fault and determine if water transportation along such a fault is a likely cause for sinkhole and collapse feature formation. By employing a multi-instrumental approach that includes ERT, NMR, and seismic refraction surveys, a series of crosschecks can be made to establish the combined presence of thrust fault features and fracture-based water in the subsurface. Given the ongoing sinkhole development and significant size of the collapse feature being studied for this project, geophysical evidence may suggest the presence of a reactivated thrust system in the southern Laramie Basin. Additionally, the geophysical surveys conducted at the Lone Tree Sinkhole Complex may be of use when considering groundwater well development along concealed fault lines in this region.

Energy Storage Devices as Actuators in Wide Area Control

John Tacke with Dr. John O'Brien

Electrical Engineering

University of Wyoming

Poster and Oral Presentation

Department of Electrical and Computer Engineering

Rock Springs, WY

This project was inspired by the small signal event of 1996 that resulted in the destabilization of the western power grid. The cause of this event was a combination of factors which resulted in the loss of frequency stability between distant buses. While events of this type are rare this event illustrates the potential of disturbances to result in outages in a lightly damped distribution system. Current transmission systems are quite stable, however as power demands increase and conventional turbines are replaced with renewables like wind and solar the relative stability of the system is decreased. The 1996 event could have been avoided had appropriate actuation been available at the time of the incident. By injecting or removing active power at troubled buses frequency destabilization can be avoided until more permanent solutions can be activated. The purpose of this project was to assess the viability of using distributed energy storage devices as actuators in wide area control networks. Other researchers have already studied the use of HVDC lines as actuators for this purpose. The basic concept of this project is similar to HVDC so the performance of HVDC lines was used as a baseline against which the proposed systems were measured. Due to the lack of information regarding response characteristics of energy storage devices we were unable to simulate them directly. Instead this project developed a set of device specifications based on the requirement that the system must be comparable in performance to HVDC. The ultimate goal of the project was to create a comprehensive summary which compared and contrasted various actuator designs from both a practical and an economic standpoint.

Designing an Automated Material Handler for Agricultural Warehouse Applications

Brendan Taedter with Dr. Kevin Kilty and Dr. Jeff Anderson

University Honors Program

University of Wyoming

Oral Presentation

Mechanical Engineering Department and Plenty Unlimited, Inc.

Scottsbluff, NE

Plenty Unlimited farms are contained within 100,000 ft² warehouses in which a substantial amount of goods transportation is required. Currently, these goods are primarily transported by humans. In order to optimize labor efficiency within the warehouse, remedial tasks such as manually carrying goods should be conducted autonomously. This investigation aims to address the issue of automating the task of carrying goods. Automated material handlers for warehouses already exist; however, these handlers are very expensive and are riddled with non-essential functionality. The material handler design proposed by the senior design team and Plenty Unlimited engineers is a line-following, multi-directional robot capable of receiving a destination to which it will deliver up to 500lbs of produce. The current iteration of the design will have only the most basic functionality; however, the microprocessor is capable of being reprogrammed to include other desired functionality. The current design still requires the robot to be loaded and unloaded manually; this problem will be addressed in future iterations of the design and is not included in the current project scope. Because the robot will be used in an agricultural warehouse in which food is produced, the materials used to construct the robot must meet FDA standards. Furthermore, the robot must be safe and easy to use by humans. Implementation of the proposed design will provide Plenty Unlimited with a safer and more time-efficient means of goods transportation.

Vocal identity of *Ceratopipra mentalis*

Josephine Tagestad with Corey Tarwater

Zoology and Physiology

University of Wyoming

Poster

Thornton, CO

For several organisms, studies have found non-invasive methods to distinguish between individuals. Humpback whales, for example, may be identified decisively by photographing the patterns on the undersides of their flukes, allowing for estimation of population size and monitoring of individual behavior (Katona 1979). *Ceratopipra mentalis*, the red-capped manakin, is an important rainforest bird expected to decline in the coming century (Brawn et al. 2016). Methods to track population size and individuals will aid in their conservation. Male red-capped manakins gather in groups, called leks, where they perform courtship displays for females. In this project, we investigate individual variation in the vocalizations of *C. mentalis*, testing whether males can be distinguished by call using two years of recordings from leks in Panama. A discriminate function analysis was performed on diagnostic characteristics of their "whistle-peep" call. In addition to allowing for population monitoring, individual variation may facilitate social recognition, maintaining relationships within leks and communicating male appeal to females. We hypothesize that males will show diagnostic vocal variance and that "whistle-peeps" will be indicative of individual identity. As *C. mentalis* is an early indicator of ecosystem health, a non-invasive method such as vocal recordings could aid in monitoring broader avian community.

Making Coal Power Plants Cleaner

Connor Tarver with Sandy Duncan

Chemical Engineering

University of Wyoming

Oral and Poster

Honors

Jackson, WY

Global climate change has become an increasingly important area of research as the human effect on the environment has become more evident. Since carbon dioxide emissions largely come from the coal industry, environmentalists may seek to significantly reduce emissions produced by power plants. Therefore, the aim of this project was to compare various carbon capture and sequestration methods that could be retrofitted to the Jim Bridger Power Plant. One type of post combustion retrofit system that has proved to be successful was an amine carbon capture system that uses monoethanolamine (MEA) in an absorber in conjunction with a solvent regenerator in order to capture carbon dioxide. This process reduces carbon dioxide emissions, but creates other environmental concerns including ammonia gas emissions and the formation of a potentially hazardous solid waste. Sodium carbonate was investigated to replace MEA as the solvent in the amine system. Sodium carbonate was investigated due to its minimal environmental concerns compared to MEA and affordability compared to the use of potassium carbonate as a solvent. The use of *Chlorella vulgaris*, a photosynthetic alga, in a bioreactor was also investigated. This system proved to be problematic as the rate of photosynthesis was so small that it required a very large and costly bioreactor. Due to the extreme cost of the investigated carbon capture and sequestration technologies, companies likely would not implement these systems unless laws required them.

Biases with the Ink and Paint Department

Emma Thielk with Susan Aronstein

American Studies

University of Wyoming

Oral Presentation

Honors

Aurora, CO

I researched gender at the Disney studio during the 1920's through the 1940's with a specific focus of the Ink and Paint Department. This department, for a while, was the only department where women could work, but faded away with the introduction of technology at the studio. There has been a revival in knowing about the Ink and Paint department in recent years and the purpose of this paper is to figure out who are the knowledge keepers of this department because of the biases that surround this department. To understand the complexity of this department and therefore revival, this study was completed in three parts – how the department was viewed in the past (to know how the studio viewed the department during the golden years of the studio), how it is viewed in a museum setting, and how it is viewed in present day with the publication of a book. I found biases in how the story was presented in different settings and the format of telling these stories greatly impact how the public then views these stories as well. The story that is being presented as the truth was told through the lens of unbiased sources such as a museum or a book, but these unbiased sources actually hold many biases and they have the privilege of controlling how the Ink and Paint department is being viewed present day.

A Brief History of Medicine and Future Healthcare Improvement

Trey Thompson

Honors

Medicine is and always has been an essential part of human existence. Throughout history, our ancestors have been consistently striving to cure disease, ease pain and prolong life. Although medicine has drastically evolved through time, these goals still define the core of today's medicine, and thus history intimately connects us with our ancestors. This link allows humanity to learn from countless years of human experience, and gain valuable information that enables incredible improvements. By implementing knowledge from past successes and failures in medicine, changes can be focused, efficient and evidence based. Therefore, the undeniable synergy between the history of medicine and healthcare improvement, warrants a thorough review of medicine's past, present and future. Medicine has rapidly developed through history and its progression is still rapidly increasing. A once barbaric and chaotic trade has evolved into one of the most precise and calculated professions in the world. Although medicine has become highly advanced with cures for complex diseases and innovative treatments, that is not to say it is perfect by any measure. In fact, our US healthcare system is badly broken. There are numerous improvements to be made, primarily to improve the quality, access and cost of good healthcare. More specifically the major problems in our healthcare system are: medical errors, physician time with patients, access to care and end of life care. Reassuringly, there are many feasible innovative solutions and great minds dedicated to fixing these issues.

PTSD (Post Traumatic Stress Disorder)

Taylor Thompson with Dr. Kara Pratt

University of Wyoming

Oral Presentation

Honors

Cody, WY

Stress on the human brain that results directly from a traumatic event leads to a vast array of psycho-emotional and pathological problems, including Post Traumatic Stress Disorder. PTSD creates a serious public health concern, which has inspired further research in an attempt to find new perspectives and deeper understandings. This increase in awareness and research allows for future development and refinement of the current modes of treatment and intervention. Current treatments include various forms of trauma-focused psychotherapies and pharmacotherapies. Along with these treatment methods, increasingly effective methods of detection and diagnosis have been better established. Overall, the intense individual suffering and serious public health concern PTSD poses has resulted in a clear and defined evolution in research, treatment, and diagnosis of the disorder.

A comparison of methods for estimating density from live capture and telemetry data

Trevor Thorvaldson, Jerod Merkle, and Merav Ben-David

Department of Zoology and Physiology

University of Wyoming

Oral Presentation

Honors and INBRE

Casper, WY

Estimating animal density is critical for understanding ecological processes and managing wildlife populations. To estimate density, researchers typically set up an array of detectors and use capture histories of individuals and a capture-recapture model (CRM). Occasionally, telemetry data are also collected on individuals that are a part of the capture-recapture study. Our objectives were to compare estimates of density from Huggins close population and Spatial Capture Recapture (SCR) models using a suite of estimated sampling areas determined with and without telemetry data. We used a three-year dataset of 200 least chipmunks (*Tamias minimus*) in Southeastern Wyoming, of which 73 individuals were also tracked using telemetry. Densities ranged from 0.65 to 8.11 chipmunks per hectare based on the method used. Including telemetry data significantly increased the size of estimated sampling areas (from approx. 8 to 70 ha), which resulted in most of the variability in density estimates. SCR methods tended to estimate lower densities than Huggins models with similar estimated sampling areas (4.2 chipmunks per hectare for SCR, and 5.4 for Huggins models). Adding telemetry data to SCR models did not influence density estimates, nor their standard errors. We conclude that researchers must be careful with how they integrate telemetry data into CRMs. The lack of change to SCR estimates after telemetry data are integrated may be due to the assumption of unimodal home ranges for all individuals. We found evidence of multi-modality in chipmunk home ranges.

Luteinizing Hormone Dysregulation in Polycystic Ovarian Syndrome

Tighe¹, R., Khan¹, S., Navratil¹, A.

¹¹¹Zoology and Physiology,

University of Wyoming

Polycystic ovary syndrome (PCOS) is complex reproductive disorder with unclear pathophysiology. One of the hallmarks of PCOS includes elevated plasma luteinizing hormone (LH) levels that in combination with elevated insulin and excess androgen lead to reproductive abnormalities. Despite recent advances, the precise mechanisms that are involved in PCOS LH hyper-secretion directly at the level of the gonadotrope are largely unknown. Our preliminary data suggests that the expression of enzymes called Peptidylarginine deiminases (PADs) in gonadotropes are increased in a mouse model of PCOS. Specifically, the isoform PAD4 is elevated. We suggest that increases in PAD 4 expression can lead to the modification of histones (proteins that assist in close packaging of DNA) to unspool DNA and provide access to LH gene expression machinery leading to an increase in LH production. We are hopeful that the experiments outlined will help in understanding the underlying mechanisms of increased LH secretion in the pituitary and provide critical insight into the pathophysiology of PCOS and impaired reproductive function.

Russell Todd Abstract

We live in a 3D world, and the ability to perceive and interact with 3D objects is fundamental and functional for success in numerous daily living and occupational tasks. Previous studies have shown that the Ebbinghaus Illusion is robust to impact people's perception of 2D object size and the movement used to grasp the object. It is unknown whether the illusion continues to impact people's interaction with 3D objects and whether the sudden change of the surrounding features of the 3D object will impact the quality of reach-to-grasp movement. Using a state-of-the-art VR integrated electromagnetic motion tracking system, the investigator proposes four experiments to examine the effects of static and dynamic Ebbinghaus Illusion on people's task performance in reaching to grasp a 3D object in an immersive VR environment. The findings from this project will shed some light on developing simulation tasks for highly detailed and perception-intensive tasks like medical students practicing microsurgical operation on 3D organs. In microsurgical operation of 3D organs, the surgeon has to view through a microscope and reach the target organ surrounded by other organs to perform the operation. An accurate perception of the target organ size and smooth action on the organ are both critical for success of the operation. Such an operation is also challenged by the zooming function of the microscope, where the view of the target organ could suddenly change with the inclusion or exclusion of the surrounding organs. Therefore, understanding the perceptual and motor control mechanisms underlying the task of grasping a 3D object with or without Ebbinghaus Illusion will be highly beneficial for developing simulations for highly detailed and training intensive tasks like microsurgical operations.

Vague in Belfast: Examining the Belfast Agreement and Its Contributions to Lasting Animosity in Northern Ireland

Shelby Lewis, Madeline Smith-Baker, Anne Todd
Li Chen, International Studies
University of Wyoming
Oral Presentation

Honors College

*Shelby Lewis, Cheyenne, WY
Madeline Smith-Baker, Fort Collins, CO
Anne Todd, Vail, CO*

The Troubles in Northern Ireland caused conflict for 30 years in the late 20th century. In 1998, the Belfast Agreement was signed with the purpose of establishing peace between Catholic Unionists and Protestant Loyalists. This study evaluates the influence of the Belfast Agreement in preventing a resolution to the conflict and acting as a source of continued tension. First, this investigation conducts a discourse analysis and review of the Belfast Agreement. This includes a primary source evaluation of the document, considering its language, ability to outline a suitable agreement between the opposing parties, and its capacity to act as a foundation for future reconciliation. Second, the study further considers whether the inclusion of distinct language for transitional justice is crucial in contributing to prevailing tensions. By looking into "the top-down," governmentally centralized initiatives in comparison to "the bottom-up" actions of many communities, it aims to attain a fuller grasp at which attempts at transitional justice still prevent the region from achieving the next stage of reconciliation. The final portion of the investigation evaluates if the failure to include the distinction between perpetrator and victim influences perceptions and emotions that continue the reign of animosity and grief within the region. Ultimately, this exploration of the Belfast Agreement considers its effects of the victims of the Troubles, why the population of Northern Ireland is still so divided, how it may have contributed to the collapse of the government, and future of Northern Ireland and other regions experiencing similar strains in achieving true reconciliation.

Analysis of synergism between exercise and TRPV1 activation to counter obesity

Heather Townsend and Kyle Biehl

with Baskaran Thyagarajan

Molecular Signaling Laboratory, School of Pharmacy

University of Wyoming

Oral Presentation

Wyoming Research Scholars

Douglas, WY

Tinnath, CO

An imbalance between energy intake and expenditure causes obesity. Current strategies to combat obesity include restricted energy intake and regular exercise. Exercise enhances energy expenditure by increasing movements and stimulating AMPK. Similarly, activation of transient receptor potential vanilloid subfamily 1 (TRPV1) by capsaicin stimulates AMPK, increases energy expenditure, and protects mice from obesity. Since both exercise and TRPV1 activation stimulate AMPK, we hypothesized that the synergism between capsaicin and exercise will prevent high-fat diet induced obesity and subsequent metabolic dysfunctions. We studied the synergistic effect of TRPV1 activation and exercise by feeding mice oral capsaicin in a high-fat diet (HFD) and exercising the mice on a rotarod. We used wild-type and AMPK kinase-dead (skeletal and cardiac tissue specific) mice. The mice received a HFD (60% kcal) \pm Capsaicin (0.01%). The mice performed a 24-minute exercise regimen on the rotarod four days a week. The expression of TRPV1, AMPK, and sirtuin-1 in gastrocnemius muscle and adipose tissues was evaluated. We also measured the fasting blood glucose, intraperitoneal glucose tolerance test, respiratory quotient, and heat production of these mice. Our results suggest that capsaicin improved exercise endurance and prevented weight gain. capsaicin increased the expression of TRPV1 and sirtuin-1 in both wild-type and AMPK-KD mice. We did not find any difference between capsaicin (\pm exercise) groups, which suggests a significant effect of capsaicin to enhance metabolic activity independent of exercise synergism. This translational data is of great significance in combating metabolic disorders in humans.

Cooperative Cooking: A Novel Virtual Environment for Upper Limb Rehabilitation

Minh Ha Tran

Electrical and Computer Engineering

University of Wyoming

Oral & Poster Presentation

INBRE

Laramie, WY

An estimated of up to 7.2 million Americans above 20 years of age had suffered a stroke. Up to \$17.9 billion dollars has been spent as the result of stroke medical cost. 80% of stroke patients suffers some loss or limitation of motor function, making motor function rehabilitation the primary focus of stroke rehabilitation. Through motor rehabilitation technologies, stroke survivors can recover their motor function significantly. Motor rehabilitation technologies commonly include virtual environments that motivate patients to exercise more often or more intensely. In this research, I present a novel virtual rehabilitation environment in which two people work together to prepare meals. The players' roles can be fixed or undefined, and optional challenges can be added in the form of flies that must be swatted away. A preliminary evaluation with 12 pairs of unimpaired participants showed that participants prefer cooperating over exercising alone and feel less pressured when cooperating. Furthermore, participants enjoyed the addition of flies and preferred not to have defined roles. Finally, no significant decrease in exercise intensity was observed as a result of cooperation. These results indicate that cooperation could improve motor rehabilitation by increasing motivation, though the virtual environment needs to be evaluated with participants with motor impairment.

A Brief History of Medicine and Future Healthcare Improvement

Trey Thompson, Donal Skinner
Honors College, Molecular Biology
University of Wyoming
Oral Presentation

Honors, Institute for Healthcare Improvement

Cheyenne, WY

Medicine is and always has been an essential part of human existence. Throughout history, our ancestors have been consistently striving to cure disease, ease pain and prolong life. Although medicine has drastically evolved through time, these goals still define the core of today's medicine, and thus history intimately connects us with our ancestors. This link allows humanity to learn from countless years of human experience, and gain valuable information that enables incredible improvements. By implementing knowledge from past successes and failures in medicine, changes can be focused, efficient and evidence based. Therefore, the undeniable synergy between the history of medicine and healthcare improvement, warrants a thorough review of medicine's past, present and future. Healthcare has rapidly developed through history and its progression is still rapidly increasing. A once barbaric and chaotic trade has evolved into one of the most precise and calculated professions in the world. Although medicine has become highly advanced with cures for complex diseases and innovative treatments, that is not to say it is perfect by any measure. In fact, our US healthcare system is badly broken. There are numerous improvements to be made, primarily to improve the quality, access and cost of good healthcare. More specifically the major problems in our healthcare system are: medical errors, physician time with patients, access to care and end of life care. Reassuringly, there are many feasible innovative solutions and great minds dedicated to fixing these issues.

Accessibility & Non-Violence in Video Game Design

Lois Rachocki, Dustin Rubin, Long Tran, and Talitha Trippel
With Dr. Mike Borowczak, Madison Davis, and Rebecca Major Computer Science
University of Wyoming
Oral & Poster Presentation

Violent mechanics are everywhere in the current video game market and accessibility features are limited in most major releases. There is an increased demand and an untapped market for nonviolent video games, and accessible gameplay widens the potential audience. Accessibility also improves overall user experience. When faced with these problems we decided to make our own game. We were unable to use existing gameplay designs due to their dependence on combat. Subsequently, we were required to design gameplay from the ground up. Accessibility includes many components, and resources for development in this area are minimal. We learned that game development environments are not often designed with accessibility features in mind. After extensive research into accessibility-conscious development, we created our own settings to personalize gameplay. In addition, we chose to base gameplay on decision-making rather than combat interactions. With this in mind, we created a tutorial level demo and essential components to be used in constructing the rest of the game. We proved that a non-violent game with accessible features can be created by incorporating those elements from the initial design phase.

Transfection of Regulatory T Cells with Optogenetically Responsive Genetic Circuit

Hayden J. True
Department of Pharmacy,
University of Wyoming

INBRE

Casper, WY

Patients who have received visceral composite allografts (VCAs) are at high risk for rejection of transplanted tissue due to host immune responses. Regulatory T cells (Tregs) are important for mediating immune responses by suppressing activity of immune cells that cause inflammation and destroy transplanted tissue. The therapeutic use of Tregs has been examined for reducing allogenic transplant rejection, however, the efficacy of Tregs after implantation is inconsistent likely due to variabilities in the in vivo environment after implantation. The overall project seeks to develop a method to make Tregs more effective by enabling a method of localized control after cell implantation using optogenetics. To achieve this, Tregs are to be genetically modified with an optogenetic circuit that makes them responsive to externally applied light. This circuit is upregulated in response to specific wavelengths of light, thus inducing activation and proliferation of the cells. Such a system would enable the control of implanted cells by external application of light. The specific aspect of the overall project has been to develop methods to insert the optogenetic cassette into Tregs. Data shows that Tregs were poorly receptive to both chemical transfection and nucleofection; cell viability and percent of cells transfected were too low to be considered a viable option for continued research and expression of reporter genes was not maintained. We therefore switched to a lentiviral method. This method and procedure was new to the lab and has shown promise; methods to produce the virus have been optimized and viral-infected Tregs continue to express reporter genes at high levels. With this in place, subsequent steps will be to clone the optogenetic cassette into the lentiviral vectors for insertion into the Tregs.

A Review of Monoclonal Antibodies (ZMapp) as Treatment for the 2014-2015 Ebola Virus Outbreak in West Africa

Rachel Graham¹, Daniel Lancaster¹, Amber Lemaster¹, Hayden True¹

Ramesh Sivanpillai, PhD
University of Wyoming
Oral Presentation

Department of Zoology and Physiology

*Riverton, WY
Green River, WY
Cheyenne, WY
Casper, WY*

Exposure to the Ebola virus in humans and animals may result in severe hemorrhagic fever. Transmission of this virus occurs through exposed mucosal membranes (mouth, nose, eyes, etc.), open skin abrasions, and by direct parenteral transmission. Current treatment options include administering favipiravir, brincidofovir, ZMapp, or convalescent plasma. Among these options, ZMapp has shown the most promise. ZMapp is a new monoclonal antibody cocktail drug synthesized from two antibody cocktails, MB-300 and ZMab. These antibodies are synthesized in tobacco plants or in Chinese Hamster Ovary cell cultures. Several studies have been conducted with monoclonal antibodies and reported relatively very few adverse reactions. ZMapp is not yet approved by the US Food and Drug Administration for wide scale human use. However, there have been several animal trials and a few human clinical trials showing success in treating the Ebola Virus Disease. Patient's showed improved immunity and survival rates went up to 90% if administered within 5-days of infection. Additional testing is needed, but ZMapp is emerging as a viable treatment option for those exposed to the Ebola virus.

A Study on the Relationship Between Anxiety and Depression and Criminal Behavior and Intent

Alexis Trujillo and Dr. Robin Barry
Psychology
University of Wyoming
Poster

McNair Scholars Program

Loveland, CO

Although there are many studies depicting mental health in incarcerated inmates, little research is done to understand the mental health illnesses such as Anxiety and Depression in individuals who have thought or acted on Criminal Behavior and Intent, who were not incarcerated. This study will examine the relationship between Anxiety and Depression and its relationship to Criminal Behavior and Intent. I hypothesize that individuals who have engaged in or have thought about participating in Criminal Behavior and Intent, will have higher symptoms of Anxiety and Depression than others. Analysis will be conducted by grouping the participants responses according to a scale survey that will ask questions regarding Anxiety, Depression, and thoughts about acting on Criminal Behavior and Intent. Survey questions concerning these topics will be used in Non-Experimental fashion. Data will come from a sample of over 100 adults over the age of 18, both male and female. This study will open new information about mental health illnesses, particularly Anxiety and Depression, and the effects it has on Criminal Behavior and Intent.

**Speech Language Pathologists Serving Students with Traumatic Brain Injury:
A Qualitative Inquiry**

Holly Trujillo with Erin J. Bush, Ph.D., CCC-SLP
Division of Communication Disorders
University of Wyoming
Poster Presentation

McNair Scholars Program

Sheridan, WY

Students with TBI typically struggle with language skills, reading, attention, memory and executive functioning. In 2011 researchers found that there were 26,000 U.S. students who had incurred a TBI. The previous challenges listed should be treated by school-based speech language pathologists (SLPs). A study conducted by Dr. Erin Bush and her colleagues investigated how comfortable practicing SLPs were with treating student survivors of TBI. Latent Cluster Analysis results revealed that SLPs fell into 3 groups, high comfort, moderate comfort, and low comfort. Significant differences were found across the three groups regarding years of experience with students with TBI, caseload size, work setting, and training. However, aggregate scores regarding the SLPs' self-efficacy, sense of school, and beliefs regarding instructional practices were not significant among the group members, nor were several demographic variables analyzed. Purpose: The purpose of the study is to further explore SLPs' experiences treating students with TBI using qualitative research methods. This methodology will provide a more in-depth view of other factors that contribute to comfort levels of these practitioners. Methods: I will be conducting between 5 and 7 semi-structured interviews with a subset of SLP participants from Dr. Bush's survey study. Principles of maximum diversity will be used during recruitment. Qualitative analysis will be conducted on the interview transcripts. Significance: This research aims to highlight the strengths and challenges of SLPs' working with students with TBI and to improve services. More efficacious treatment services could lead to more academic and occupational success for student survivors of TBI.

New Gender Differences in High School Mathematics

Kaylee Tuttle with Dr. Lynne Ipiña

Mathematics

University of Wyoming

Poster Presentation

McNair Scholars Program

Rock Springs, WY

This research will focus on the differences between females and their male counterparts. One objective of this research is to investigate whether females in high school struggle earlier in mathematics than males. For this project the population that will be studied will be high school students taking mathematics in Laramie, Wyoming. Data collection methods will include a survey and possibly a follow up questionnaire after the initial survey. The data can then be analyzed qualitatively using statistical software to produce graphs and charts. Analyzing the data will help to find in what way females struggle in high school mathematics more than males. This study is important for teachers and parents alike to understand possible reasons behind their child or student falling behind in math.

Bilingual Attitudes towards Spanish-English Code-switching in Wyoming

Mike Uribe with Irene Checa-Garcia

Department of Modern and Classical Languages, Spanish

University of Wyoming

Oral presentation

Honors

Cheyenne, WY

This study investigates the perceptions and attitudes that bilinguals hold towards Spanish-English code-switching in Wyoming. "Code-switching is the alternation of two languages in a single discourse, sentence or constituent" (Poplack, 1980). Many studies including, Hidalgo (1988), Toribio (2002), Parama, Kreiner, Stark, Schuetz (2017), and others have researched the sociolinguistic attitudes towards code-switching. This study will focus on sociolinguistic attitudes as well, by looking at the general sentiment towards code-switching between English and Spanish in a rural area. It is hypothesized that subjects will hold a similar attitude towards code-switching as shown in the studies mentioned, a dislike of the sound and use of switching between languages in a single turn of speaking. Attitudes and perceptions are evaluated by a questionnaire that each subject fills out. Their attitudes are rated on a five point Likert scale. The purpose is to discover if a less populated place with a smaller Hispanic population, like Wyoming, will show negative attitudes or will rather align with a more favorable view, despite a low amount of linguistic contact (Escobar y Potowski, 2015) and Hispanic population. Results will also show how the sentiments have extended or have changed from 1988 to 2018 based on findings from Hidalgo (1988).

Bighorn Basin Productions

Corey McSwain, Kyle Redenbaugh, Brittany Vigil

Dr. Tawfik Elshehabi, Petroleum Engineering

University of Wyoming

Oral Presentation

Petroleum Engineering Senior Design

Corey McSwain Denver, CO

Kyle Redenbaugh Cheyenne, WY

Brittany Vigil Manderson, WY

The Manderson field in the Bighorn Basin is the location of interest for the course of our project. We are examining a dozen oil and gas wells currently in production. In order to determine if each well can be optimized using different artificial lift methods. Bighorn Basin Productions is building well diagrams and simulated borehole behavior using PipeSim and Petrel software. We will use PipeSim software to analyze if each well can be optimized using another method of production. We will use the Petrel software to build models of all the wells creating a reservoir model. In order to recommend a change in the artificial lift method, the improved production revenues will need to cover the cost of the new lift method and downtime to install new equipment. The main outcomes from our report will clarify whether the well should be abandoned, left alone, or optimized using a new artificial lift method. Bighorn Basin Productions will complete a financial report created in Excel to outline the results and recommendations of our project.

A study of how international students, specifically, Spanish speakers and Portuguese speakers, express the six basic emotions through English as a second language

Juan Diego Vintimilla with Dr. Benjamin Wilkowski

Department of Psychology

University of Wyoming

Poster

McNair Scholars Program

Cuenca, Ecuador

The English Language now is the most commonly learned language to communicate in the world. Many people learn it because almost all the sciences and research fields use English. However, what about the non-native English speakers that have to study in English but do not know the nuances that native speakers use to express their emotions in the language? Not only does the language that non-native English speakers use to express the emotion change, so do the emotions themselves change. Many linguistics and cross-cultural studies have investigated the expression of emotions in a second language but not all of them clearly explain why the six basic emotions change and how the culture that surrounds the language influence this. This research has the goal of clarifying how the Spanish and Portuguese languages and cultures, mainly in Latin America, influence non-native English speakers when they have to express the six basic emotions in English, their second language. This study will reference previous psychological cross-cultural and linguistic studies focused on Portuguese and Spanish. It will survey a population of international students coming from Latin America. The sample size for the experiment will be around 50 to 60 students between 18 and 26 years of age. The data will be collected, analyzed and compared, using quantitative methods. This study will help to clarify how international students might better express the basic emotions when they use English.

Using Measurements at Individual Nanoparticles to Screen Electrocatalysts for Hydrazine Oxidation

Joshua Walmsley with Dr. Caleb Hill
Department of Chemistry
University of Wyoming
Poster Presentation

Wyoming Research Scholars Program

Douglas, WY

The use of nanoparticles (NPs) in electrocatalytic applications is now ubiquitous, due to their inherently high surface areas and the possibility of tuning reactivity through variations in shape and/or size. However, their heterogeneous nature presents a challenge to fundamental investigations seeking to establish relationships between NP structure and reactivity. Employing analytical techniques which probe individual NPs is a promising strategy for overcoming this challenge, though correlating structure and function in electrochemical systems at the single NP level remains difficult. Here, a novel analytical approach to determining how the geometry of individual NPs affect their electrocatalytic properties is presented. The structure and reactivity of individual NPs are analyzed simultaneously using a combination of high resolution optical and electrochemical measurements, using optical spectroscopy to probe the structure of individual NPs and Scanning ElectroChemical Cell Microscopy (SECCM) to evaluate catalytic activity. Initial results applying the developed methodology to the study of hydrazine oxidation at individual Au triangular nanoprisms will be presented.

Role of TRP Channels in Pain Signaling

Menglan Wang with Dr. Baskaran Thyagarajan
Pharmacy
University of Wyoming
Oral Presentation

UW School of Pharmacy & Honors College

Laramie, WY

Transient receptor potential (TRP) channels are non-selective cation channels that are found throughout the body. Categorized into several sub-families such as TRPVanilloid, TRPAAnkyrin, and TRPMelastatin, TRP channels respond to a wide variety of stimuli ranging from heat, cold, pressure, and chemical stimulation. Due to their high expression on nociceptors, TRP channels have been implicated in pain transmission. Therefore, achieving a better understanding of these channels can lead to the development of novel pain therapies. The goal of this project was to determine the role of TRPV1 and TRPA1 in pain transmission when mice are injected with a local inflammatory mediator. Agonists of these channels, such as carrageenan and formalin, were used to induce inflammation in the hind paw. Both wild type (WT) and TRP-knockout (TRPV1 and TRPA1) mice were used in the study to maintain good control. We then mechanically stimulated the injected site with Von Frey Filaments using forces ranging from 0.008g to 300g to measure the pain response. Additionally, we measured the paw width and thickness of each mice to track the size of inflammation across the study.

A comparison of feline immunoglobulin G4 (IgG4) levels in two shelter environments

Mckayla Ward with Rachel Kristiansen

Department of Psychology

Northern Wyoming Community College District – Sheridan College

Poster Presentation

Wyoming INBRE

LaGrange, WY

We collected fecal samples from cats at Second Chance Sheridan Cat Rescue (SCSCR) in Sheridan, WY, (N = 12) and the City County Animal Shelter (CCAS) of Gillette, WY, (N = 12) to determine their levels of immunoglobulin G4 (IgG4), an antibody that is significantly moderated by affective states such as stress. We hypothesized that cats in a free-roaming environment at SCSCR will have lower levels of IgG4 compared to cats housed in kennels at CCAS. We used a 96-well microplate cat immunoglobulin G4 (IgG4) ELISA (enzyme-linked immunosorbent assay) kit and a BioTek Epoch 2 microplate reader to analyze fecal samples from the cats. A 4 parameter logistic regression (4PL) was employed on the six standards to generate a predicted standard curve. The standard curve was significant, $F = 1563.36$, $p < 0.001$, $R^2 = 0.999$, $\text{adj } R^2 = 0.999$, $SE = 0.011$. Mean IgG4 concentrations ($\mu\text{g/ml}$) between the two shelter populations were compared using a one-way ANOVA in SPSS. There was not a significant difference between the two populations ($F(1, 22) = 2.1$, $p = 0.161$). We did observe a significant difference in IgG4 concentration by sex, $F(2, 21) = 4.163$, $p = 0.030$, with males having a significantly lower concentration ($M = 35.808 \mu\text{g/ml}$, $SD = 15.529$) than females ($M = 54.695 \mu\text{g/ml}$, $SD = 16.821$). This study had several limitations and future research should include a relatively equal number of males and females from each population, and a more diverse age dispersion across samples.

Pad Drilling & Development in the Bakken

Petroleum Engineering

Chad Wathen

Within this project plan, you will find our intended methods to drill, complete, and produce a set of horizontal oil/gas wells for our client in the Bakken oil and gas play in North Dakota, USA. Outlined in this initial project plan is data, work breakdown, work flow plan, gantt chart, and risk assessment. Our workflow plan includes five phases with assigned deliverables:

Phase 1: Well Location and Surface Plans and Surface Plan Report

Phase 2: Drilling the Well and Drilling Prognosis

Phase 3: Oil Well Completions and Completion Prognosis

Phase 4: Production and Facilities and Production & Surface Facility Design Report

Phase 5: Economic Analysis and Financial Report

Problem-Solving Performance and Personality in Pairs of Zebra Finches

Joy W. Watkins¹, Lisa P. Barrett¹, Sarah Benson-Amram¹

¹University of Wyoming, Animal Behavior & Cognition Lab, Zebra Finch Project
Oral Presentation

INBRE

Laramie, WY

The strength of a social relationship may influence how well conspecifics can coordinate their behaviors. The monogamous zebra finch (*Taeniopygia guttata*) is well-suited for studies of coordination because pair-bonded partners strive to coordinate their parental care efforts to increase reproductive success. This study evaluates how captive zebra finch mates coordinate their behavior to jointly solve a cognitive challenge. To do this, we are monitoring pairs' success at solving a two-part coordination task. A training phase was administered to shape the behavior of each partner, such that each partner eventually learned to solve one step of the two-step task and their mate learned to solve the other step. Together, they can then combine their knowledge to solve the complete task. Results from this study will provide further insight about pair-bond coordination in a monogamous species. Future work will assess the importance of individual personality within a pair, where we will examine whether similar personality pairs are more successful on the task than dissimilar pairs.

Microbial Succession vs Plant Developmental Effects on Rhizosphere Community Structure in *Arabidopsis thaliana*

Monique Weaver, Marcus Brock, Mallory Lai, Cynthia Weinig
Department of Botany, University of Wyoming
Oral Presentation

McNair Scholars Program

Evanston, WY

Plants grow in association with diverse microbes, potentially including tens of thousands of different taxa. Prior studies have shown that the microbial communities of the rhizosphere, the area in close physical proximity to the roots, shift over the course of a plant's development, but these studies fail to account for the impact of microbial succession on microbial community formation. Using *Arabidopsis thaliana*, the project compared the rhizosphere microbial composition of two early flowering genotypes, one wild type genotype, and two late flowering genotypes. By sampling at multiple time points, it is possible to separate the effects of plant developmental stage from ongoing microbial succession. Samples were collected two weeks after germination, and at each of the three flowering times. The 16S rRNA region of the microbial genomes was amplified and sequenced to test for differences in microbial community composition between time points and host plant developmental stage. The sequence data showed differences between communities of each time point, except time points three and four which were not significantly different. We did not see differences in microbial communities for plants at different developmental stages within a time point, for any of the three time points with plants at distinct developmental stages. These results indicate the microbial succession is driving overall community structure in the rhizosphere. The results of this study could help researchers understand the complex relationship between plants and their root microbes.

Martian Analog Hydro-Geophysics in the Red Desert

John Westenhoff with Andrew Parsekian

Geology and Geophysics

University of Wyoming

Oral and Poster Presentation

Wyoming NASA Space Grant, Department of Geology and Geophysics

Reston, VA

Field-based research on other Mars is extremely challenging, requiring space travel and generous funding. An alternative to directly investigating Martian ice or hydrological systems is study of analog systems on Earth. The Red Desert of Wyoming represents one such hostile but potentially informative environmental analog. The climate and dune movement of the Red Desert of Wyoming, and other cold-climate sand dune fields produces distinctive ice layers within dunes. Observations of these Red Desert ice traps dating back to the 1970s suggest that melting of these layers is a slow process. Slow melting of ice would keep a moderate moisture level in the dune for a large part of the summer; possibly year round. This aeolian process is a possible causal mechanism for areas of Mars that have been remotely imaged to hold subsurface ice. The potentially seasonal presence of moisture has profound implications in the search for life on Mars. The possibility of large sources of frozen moisture trapped in dunes has exciting consequences for future Martian exploration. Little work has been done to observe the fate of these frozen layers throughout the year in Earth's deserts; previous studies have all attempted to identify distinct sedimentary structures that could be observed in sandstones to be able to distinguish the particular climate of their deposition. This study utilizes previously-novel-for-this-study area geophysical electronic methods to understand how aeolian ice deposits change through the warm months and provide moisture to this highly arid environment.

Denver Student Teaching Practicum

Kayla Whiting mentored by Dr. Amy Spiker

College of Education

University of Wyoming

Oral and Visual Presentation

Honors

Aurora, CO

During my research semester, I have had the opportunity to work with a group of thirty, third grade students to improve and grow in my teaching before I have my own classroom. My practicum experience was in the heart of Denver at Teller Elementary School. My cooperating teacher is in her 34th year of teaching; she has taught and guided me through additional ways to research. The purpose of this practicum experience was to learn how to support and grow future students in their needs academically and social-emotionally. The capstone project assigned is a project that is assigned country wide and purposed to measure student teachers before then enter into the classroom. Some states require a passing grade on this assessment in order to become a licensed teacher in that state. This process is called ed-TPA (Education Teachers Performance Assessment). The overall process of ed-TPA is to have pre-service teachers learn how to best enter into the classroom and practice, through research, planning, and reflection. Within this project, I was instructed to reflect on my teaching using extensive research and planning. Through this project, I was able to learn how to best meet the needs of a large group of students that have a great range of comprehension of varying content areas. Presenting in Undergraduate research day, I would like to share and reflect on my time being a student teacher. I would like to share what I had the opportunity to learn throughout my entire semester planning, researching, and teaching.

Effects of Dietary Zinc Concentration during Gestation on Ewe Somatic Cell Count, and Progeny Performance from Birth to Weaning

Melanie Whitmore with Dr. Whit Stewart
Department of Animal Science
University of Wyoming
Oral Presentation

Honors

Evanston, WY

Mastitis is one of the leading reasons for culling ewes from U.S. flocks, and subclinical mastitis indicated by high somatic cell counts (SCC) in milk has also been shown to negatively impact ewe productivity. However, means to reduce subclinical mastitis and consequential effects on lamb production are sparse. A previous study which found deprived zinc levels in ewes with high SCC suggests that ewes supplemented with zinc may exhibit lower SCC and increased lamb performance (Murphy et al., in review). In this study, yearling ewes (n=74) were provided zinc above dietary recommendations during gestation and the effects on lamb performance measured by visual scores at birth and by weight gain. Ewes were divided into three treatment groups in which each ewe received one pound of a zinc sulfate fortified supplement containing 40 mg/kg zinc (control), 500 mg/kg, or 1000 mg/kg from approximately day 70 of gestation until parturition. Lamb vigor and suckling scores were assigned at parturition, which indicated time required after birth for lamb to stand and time until first suckle. Lamb weights were recorded at birth, 10 days, 60 days, and at weaning at 90 days. In addition to decreasing the prevalence of subclinical mastitis, zinc supplementation during gestation would allow sheep producers to boost flock health, decrease cull rates, and simultaneously increase pre-weaning lamb growth.

Water distribution system design for EWB project in Guatemala

Brandon Wilde with Michael Urynowicz
Chemical Engineering
University of Wyoming
Oral Presentation

Civil Engineering, Honors

Laramie, WY

For the past 5 years, the University of Wyoming's chapter of Engineers Without Borders (EWB-WYO) has worked with a small community in Guatemala to renovate the town's water distribution system. Comunidad Maya has always received its supply of potable water from two spring box systems installed into nearby hills, but has suffered lately from insufficient water delivery. EWB-WYO has sent multiple teams to analyze the predicament from various angles and to ascertain the primary causes of the water shortage. These trips have been followed by periods of design and redesign, as we have sought the best long-term solution for the community. In recent months, a team of 4 students has created a functional model of the entire pipe network, seeking to discover the regions of most critical loss within the system, and propose implementable changes. Various alternative designs were investigated and processed through multi-criteria decision and cost-benefit analyses. The most cost-effective, sustainable modifications were then selected for implementation, which is expected to take place in upcoming months.

TraA and TraB: The Dynamic Duo of Outer Membrane Exchange in *Myxococcus xanthus*

Abigail Wilkins¹, Dr. Dan Wall¹

¹University of Wyoming department of Molecular Biology
Poster

INBRE

Laramie, WY

In order to survive, bacteria in the environment require food, water, and the ability to procreate just as wild animals do. Just as many mammals live and hunt in family groups, so does the nonpathogenic soil bacterium, *Myxococcus xanthus*. *M. xanthus* is known for its unusually high level of cooperative behavior including biofilm formation, swarming, and formation of complex, spore-filled fruiting bodies. One particularly interesting behavior is known as Outer Membrane Exchange (OME). In OME, cells can transiently fuse their outer membranes to exchange outer membrane proteins and lipids, repairing damaged cells and promoting phenotypic homogeneity within the population. This exchange is mediated by two outer membrane proteins, TraA and TraB, which provide kin recognition specificity and support respectively. While previous research suggests TraA and TraB form a complex *in vivo*, this interaction has not been experimentally confirmed. We use co-immunoprecipitation (CoIP) to investigate the relationship between TraA and TraB in *M. xanthus*. Two previously constructed strains were tested, one expressing TraA under native promoter and overexpressing TraB-FLAG, and the other overexpressing TraA-HIS and unlabeled TraB. While promising results were obtained from the first strain, the TraA expression was too low under native promoter to obtain clear results. A new strain was constructed to overexpress both TraA and TraB-FLAG and was used in subsequent immunoprecipitation and Western Blot analysis. Preliminary results indicate the interaction between TraA and TraB may be transient or labile.

Analysis of the CDC National Immunization Data from 2009 to 2015 using R

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INBRE

Lander, WY

In the United States, vaccinations are required by law for school aged children upon enrollment in public schools. These vaccinations protect against diseases such as diphtheria, tetanus, and pertussis (DTaP); inactivated poliovirus (IPV); Hepatitis B; and measles, mumps, and rubella (MMR). Additional immunizations such as Hib, Influenza, Hepatitis A are also mandatory in some of the states. Our goal was to understand the trends in both mandatory and optional vaccinations in the continental United States across multiple years. The Centers for Disease Control (CDC) annually surveys a sample of parents for immunization status of their children between 19 to 39 months of age. We obtained these publicly available data for years 2009 through 2015 and analyzed it using the R programming language and data analysis package. Using this data, we asked (1) whether insurance status of the surveyed population influences child vaccination rates particularly for diseases with low severity and are not mandatory for enrollment in United States public schools, (2) are there any obvious trends in immunization rates across the survey years and (3) if any regional trends are apparent when grouping the states into four geographical regions. Preliminary results indicate that the majority of children obtained mandatory immunizations regardless of their insurance status. However, uninsured children were less likely receive non-mandatory immunizations. We discuss our results using national level trends we observed across the years, within the context of public perception of immunization.

Computational Fluid-Structure Studies of Myocardial Dynamics

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Oral Presentation

INBRE

Anchorage, AK

Research conducted by Dr. Wei Guo at the University of Wyoming and Dr. Bud Chew at Western Wyoming Community College suggests that the main cause of diastolic dysfunction in heart failures is a consequence of alterations in heart wall muscle (myocardial) tissue stiffness [1]. However, the mechanistic behavior of heart failure due to cardiac wall stiffness variations, and the amount of stiffness restoration needed to treat the condition are unclear. Astronauts are especially susceptible to decreased cardiovascular performance due to the effects of residing in zero gravity [2]. Upon return to earth, astronauts struggle with a lazy cardiovascular system that puts them at higher risk of heart disease, that even regular exercise while on mission cannot combat [3]. This research will utilize computational fluid dynamics (CFD) and computational structural dynamics (CSD) modeling to gain insight into complex hemodynamic flows and their interactions with tissue dynamics that cannot be studied using traditional methods such as experimental fluid dynamics (EFD). The computational fluid-structure interaction (FSI) model will be a powerful engineering tool that simulates the intricate dynamical interactions via an iterative computer program. By using computational FSI, quantitative information regarding the stress state on heart and blood vessel walls can be gathered.

Electric Baja Vehicle Design and Fabrication

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The Electric Baja (eBaja) is an all-terrain vehicle powered by an electric motor with lithium ion batteries. The eBaja provides an electric alternative to more prevalent gas powered all-terrain vehicles. This project seeks to explore a possible diversification of the off-road industry into the field of electric powered vehicles. Cleaner electric designs can appeal to certain off-road enthusiasts who would like to cut down on their environmental footprint. In order to accomplish this goal, the existing frame from previous eBaja iterations was used. To test the feasibility of the eBaja, the design had to be completed and functioning. Various driving systems had to be designed and built, such as the powertrain, steering, CANbus control system, and driver safety equipment. Thorough testing of the vehicle will be performed including range, acceleration, turning ability, and ability to travel over obstacles. One objective of this project is to compare the results of this performance testing to known results from similar all-terrain vehicles. If the eBaja does not meet the performance results of other gas powered model, future iterations of this project will be tasked with improving and redesigning the subsystems of the vehicle until comparable results are achieved.

The relationship between denitrification and respiration in Wyoming rivers

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University of Wyoming

Oral Presentation

Space Grant Consortium

Laramie, WY

Naturally occurring biogeochemical processes can remediate nitrate polluted water within the context of aquatic resources. During the remediation of nitrate pollution, denitrification converts nitrate into nitrogen gas, while the coupled biogeochemical process respiration converts oxygen into carbon dioxide. The ratio of denitrification to respiration rates naturally varies in aquatic ecosystems. However, the relationship between respiration and denitrification rates is currently unknown. Additionally, in low nitrate ecosystems nitrogen fixing organisms can use nitrogen gas to produce reactive nitrogen. The goal of this project was to quantify the relationship between respiration and denitrification and the relationship between nitrogen fixation and photosynthesis. I hypothesized that denitrification rates would be positively related to nitrate concentrations and respiration rates while nitrogen fixation would be positively related to photosynthesis. I measured variation in denitrification and respiration rates in seven Wyoming rivers. Three sites in Grand Teton National Park were used as our control streams due to low pollution from agriculture and humans. Four sites within the Laramie River watershed were chosen due to the proximity of the river to a pollutant source (Laramie, WY) and the amount of agriculture in the Laramie Valley. Denitrification was weakly related to respiration, but was not significant. Nitrogen fixation increased as gross primary production (GPP) increased, and 3.5% of GPP energy was used in nitrogen fixation. These findings further our understanding of nitrogen cycling within Wyoming rivers.

Rock the Blockchain Vote User Interface

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Computer Science

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Poster

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All electronic voting systems require a secure interface for voting. These interfaces must be easy to use, visually appealing, and convenient for voters of all demographics. This new interface reduces overhead, simplifies the current process, and improves upon voting systems currently employed throughout Wyoming. We created a way for the user to interact with either of the voting blockchains through a modular Java desktop application as well as an android mobile application. The Java desktop application is run on an all-in-one touchscreen computer with an optional mouse and keyboard. The mobile application introduces the idea of remote voting and the possibilities that blockchain technology opens for voting systems. In addition to the regular ballot, voters can access information about the candidates as well as legislative amendments. The applications allow for users to go back and forth between offices as well as see all of their selections before finalizing them and sending their vote to the chain. It ensures secure access to the chain as well as verification throughout the process. Further, we created an administrative application that allows voting officials to register and verify voters, enter ballot information, and launch the blockchain. These three interfaces work together with each blockchain to create a secure voting system free of third party interests.

Kaybob Reservoir Characterization

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Oral Presentation

Bakersfield, CA

Cheyenne, WY

Al-ahmadi, Kuwait

Alqasr, Kuwait

The Kaybob oilfield is located in Alberta, Canada and is part of the Montney shale formation. This project focuses on characterizing, modeling, and determining the best possible enhanced oil recovery methods (EOR). The first step to begin modeling the Kaybob was acquiring the reservoir data from the University of Wyoming. The acquired data must then be converted into a format that can be uploaded into the programs necessary to create the desired models. In order to create the static model, we needed to create porosity logs by converting density logs in petrel. We also needed to create stratigraphic surfaces using the depth information from the deviations surveys. Using both porosity logs and stratigraphic surfaces, a 3D-geographic model can be built. Permeability, porosity, and geographic design properties can then be taken from the 3D-model to start characterizing the reservoir and building a dynamic model. The dynamic model is built by integrating the geographic model and fluid properties in the reservoir. Also, porosity and permeability calculations are needed to analyze the physics of the fluid flow in the reservoir. Understanding the physics of the fluid flow helps in determining the best EOR method. Selecting the most economical EOR method will involve comparing the cost and the production increase for each method. Using the dynamic model the future production of the reservoir after implementing an EOR method can be determined. The Economic cost of each EOR method will be calculated and analyzed to determine the most economically viable plan.

Silence in a Ghost Town: The Complexity of Child Mortality in Gebo, Wyoming

Samantha Worden with Mark Neels

History Department

Western Wyoming Community College

Oral Presentation

Sweet Memories: Historical Research Group

Rock Springs, WY

A chilling narrative of child mortality ran as the headline news in Thermopolis, Wyoming more than 100 years ago. The story reported that Mr. and Mrs. Kavich's son, at only two-and-a-half-years-old, tragically died in Gebo, Wyoming. On the evening of August 17, 1917, Mrs. Kavich had laid her son down for bed, and proceeded to carry on with her evening chores. Shortly thereafter, a fire broke out in an upstairs bedroom of the family home consuming the house quickly. One child escaped, attempting to get help. However, the fire incinerated the home before Mrs. Kavich's baby could be rescued. Mrs. Kavich was distraught as she watched the flames engulf her home, with her baby inside. According to the *Thermopolis Record* a week later, Mrs. Kavich found comfort in the fact doctors believed her son did not suffer, as he most likely had died before flames consumed his body. The Kavich family was one of many in Gebo confronted with the harsh reality of child mortality in the twentieth century. While many stories regarding the loss of children remain silenced in the history of this ghost town, newspapers, memoirs, and epitaphs reveal heartfelt memories of love and tragedy. The varying sources focused on death, reveal the multitude of ways children perished in this coal mining town, such as illnesses and accidents. Historical documents and sites from the 1900s reveal a new, complex narrative of infant, child, and adolescent mortality in Wyoming's history.

Superior's Silent Graves: Complexities within Child mortality in a Coal Town

Samantha Worden with Mark Neels
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Western Wyoming Community College
Oral Presentation

Sweet Memories: Historical Research Group

Rock Springs, WY

On June 17, 1921, the Rock Springs Rocket covered fourteen-year-old John Arthur Barwick's terrible accident. The front-page article highlighted an incident that took place in Superior, Wyoming's boarding house, Barwick's place of employment. While going down into the cellar to fetch some vegetables, Barwick attempted to brush a light cord out of his way. Unbeknownst to him, a storm the night before caused two power lines to become crossed. Touching the light therefore caused 2300 volts of electricity to course through his body, resulting in numerous burns. In fact, both his hand and his nose were completely cindered. Given the severity of his wounds, the coroner's inquest the next day revealed that he died instantaneously upon connection with the light. Stories like Barwick's were rampant during the early 1900s, as child mortality was prominent across the United States. However, small mining communities throughout Wyoming noted particularly high numbers. Obituaries and grave markers recount sorrowful stories, as well as hint at childhood death's intricate nature. Illnesses like influenza and scarlet fever took great tolls on children throughout the town, while accidents like Barwick's show a second deadly threat to young lives. Furthermore, sources reveal that these unfortunate incidents affected distinct age groups differently. Altogether, the surviving evidence tells the untold narrative of child mortality in Wyoming's coal towns. In the end, these documents, such as obituaries and death certificates, along with the remains of the numerous communities themselves, show the complexity of child mortality in coal mining communities like Superior, Wyoming.

Autonomous Lawn Care Unit

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Oral and Poster Presentation

Electrical & Computer Engineering

Cheyenne, WY

Laramie, WY

Rawlins, WY

The landscaping industry is a multi-billion-dollar industry. The average consumer spends hundreds of dollars each year on lawn care (National Association of Landscape Professionals). As these costs are for labor, they continue every year. Our product aims to eliminate that yearly cost with a one-time cost. This will help the consumer by allowing them to pay once for a product that will eliminate any labor cost they pay for on a monthly or yearly basis, saving time and money. Our prototype will be modifying an existing lawn mower to be semi-autonomous. The unit will mow a predetermined area of grass and will be equipped with safety sensors to assure no harm is done to people or property. There will be a wireless controller to control the unit with commands such as start and stop. Our product aims to cost fairly low compared to what is offered currently in the market.

Differences in blood pressure and heart rate among college students with and with out attention-deficit/hyperactivity disorder (ADHD)

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Poster Presentation

INBRE

Jackson, WY

Attention-deficit/hyperactivity disorder (ADHD) is a psychological disorder that persists into adulthood in most cases. Most manage ADHD with stimulant medications which cause acute increases in cardiovascular health measures, such as heart rate and blood pressure. Although ADHD is often associated with school and occupational impairments, recent research has found those with ADHD engage in less healthy lifestyle behaviors, such as poor eating habits and physical inactivity, which could lead to cardiovascular complications. We sought to understand the cardiovascular health profiles of college students with ADHD, relative to age- and sex-matched non-ADHD peers. Our study is part of a larger project aimed at evaluating the physical health of college students with ADHD and the acute effects of exercise on cognition and mood. We evaluated cardiovascular health by taking resting heart rate and blood pressure. Improving upon the few studies on this subject, we took steps to limit the influence of confounding variables that could influence cardiovascular measures. For instance, participants were required to get adequate sleep and temporarily abstain from stimulant medication, caffeine, and alcohol consumption. Relative to the comparison group, the ADHD group had significantly higher resting heart rates and diastolic blood pressure, but not systolic blood pressure. Elevated heart rate and blood pressure can weaken cardiac muscle and reduce efficiency, thereby lowering cardiac output and increasing the risk for cardiovascular disease. It may be appropriate for clinicians to incorporate lifestyle interventions for college students with ADHD, such as physical exercise, to ameliorate cardiovascular problems and improve over all health.

Characterization of Forest Fragments in the Panama Canal Zone and Fragmentation Impact on *Thamnophilus atrinucha* Territories

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Zoology and Physiology

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Oral Presentation

Department of Zoology and Physiology

Cheyenne, WY

In tropical environments, forest fragmentation is increasing in prevalence as urban expansion continues to increase. One such area of heavy fragmentation is the Panama Canal Zone, an area of urban expansion along the edges of the Panama Canal. Fragmentation is proven to have negative impacts on animals evolved to live in contiguous forest habitats. These negatively impacted animals include understory insectivorous birds such as *Thamnophilus atrinucha*, the Black-capped Antshrike, a territorial bird that can be restricted in habitat selection by forest fragmentation. The goal of this project was to characterize forest fragments in the Panama Canal Zone and determine the potential impacts of territory placement within a fragment. Using playbacks, antshrike territories were mapped. Mapped territories were divided across forest fragments of three different size classes and edge matrices. Five vegetation surveys were conducted in every mapped territory to survey vegetation density, composition, and canopy height. Slope and elevation of fragments was acquired through Google Earth. These data formed a characterization of forest fragments in the Panama Canal Zone. Fragments are

characterized as centered on steeply sloping areas with canopy height decreasing as elevation increases. The densest vegetation is found on fragment edges, where increased sunlight and precipitation increases growth. Mapped territories were divided into two categories, Edge and Interior territories. Fragment characterization was used to determine the potential impacts of placing a territory on a fragment edge as opposed to the interior by analyzing metrics including territory volume, territory footprint, and territory biomass.

Towards a Next-generation Brucellosis Vaccine: assessing the stability and safety of a Nisin-inducible plasmid capable of expressing *Brucella abortus* antigen in *Lactococcus lactis*

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Brucellosis is a worldwide zoonotic bacterial disease that threatens the Wyoming bovine ranching industry. Current vaccines against the pathogen are deficient in protection across multiple species and present a health risk to humans. We propose using live *Lactococcus lactis*, a GRAS (generally regarded as safe) bacteria, to express an envelope-associated protein found in wild type and strain RB51 *Brucella abortus*. A stable food safe vector such as this, paves a road to quick, robust immunization. This project is aiming to gain confidence that this strain will have normal growth, along with adequate antigen expression, and that the antibiotic resistant containing plasmid remains exclusive to the probiotic in a mixed microbial community. Knowing how the DNA vector responds to bovine rumen conditions remains largely unexplored, thus in vitro analyses prior to field deployment should provide beneficial knowledge for the area of probiotic live vaccines. Indigenous pathogens can potentially acquire and express resistance from recombinant DNA-based live vaccines, and the extent of this problem is unknown. Rumen conditions may be unfavorable for a recombinant vaccine strain compared to the local microflora, and various testing must show strain durability and plasmid accountability. We aim to grow the vector-bearing strain in conditions varying in temperature and microbial community, while assessing its survival capability. Rumen bacteria and *E. coli* grown alongside *L. lactis* will be examined for plasma acquisition/expression. Testing the limits and pressures affecting the vaccine-strain should provide insight to this novel vaccine platform.

Concussion Knowledge and Legislation

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Oral Presentation

INBRE

Basin, WY

The topic of concussions among sport-related activities has gained substantial media attention in recent years. The purpose of this research is to identify the knowledge of concussion and concussion legislation resulting from sports-related activities in rural Nebraska. With this information we hope to be able to identify what practices are effective in the concussion protocol and how we could help the professionals with any changes that may be necessary. The study participants were 173 coaches involved with youth athletics in schools in rural Nebraska. The project survey asked a variety of demographic questions including gender, years coached, setting (urban, rural, etc.), economic status, and research outcome questions of interest including awareness of concussions of their athletes, role and what their role includes, the sport coached, how serious their athletes and parents view the issue, general knowledge of symptoms, tools used and legislation, and training. Knowledge of symptoms was of primary interest in this study and was scored as the percentage of correct identification of symptoms. Analysis of Variance (ANOVA) was used to determine if knowledge of symptoms was different among the categories of the other variables. Significant predictors of knowledge will be identified using a linear regression model. Of secondary interest was identifying response variables with correspondence analysis based on the survey questions that explained patterns in the data. The ANOVA revealed that there is a significant difference in knowledge score based on whether the individual had formal training of at either the local, national, or any other level compared to having no formal training. The ANOVA also showed that there is a significant difference in the knowledge of concussions based on whether the individual had additional training at either the school, local, or national level compared to having no additional training.

Does TRPV1 activation by capsaicin protect female mice from high fat diet-induced obesity?

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School of Pharmacy
Oral presentation

INBRE

Cheyenne, WY

Obesity is a chief metabolic disease, which progressively leads to type 2 diabetes, dyslipidemia, hypertension, and cardiovascular diseases. Our laboratory has demonstrated that feeding capsaicin (a TRPV1 agonist) at a minimal dose was very well tolerated by mice and capsaicin promoted the browning of white adipose tissue and brown adipose tissue thermogenesis to counter obesity in male mice. Here, we evaluated the effect of capsaicin on high fat diet (HFD)-induced obesity in female mice. This research is important since demonstrating the gender-independent effect of capsaicin to counter obesity will advance its clinical use in humans to promote weight loss. Our data suggest that capsaicin feeding protected female wild type but not TRPV1^{-/-} mice from HFD-induced obesity. Capsaicin suppressed weight gain in the female mice without altering energy intake. Also, capsaicin increased the expression of thermogenic sirtuin-1, mitochondrial uncoupling protein 1, PRDM-16 (a transcriptional regulator of thermogenesis) and thermogenic bone morphogenetic protein 8b in the inguinal white adipose tissue (iWAT) of wild type mice. Further, capsaicin increased the metabolic activity, respiratory exchange ratio (VCO₂/VO₂) and heat production in the wild type but not TRPV1^{-/-} female mice. Capsaicin feeding suppressed iWAT triglycerides and improved glucose tolerance in the wild type mice. Our data provide evidence for the gender-independent anti-obesity effect of capsaicin. This will advance the use of TRPV1 agonists to treat obesity and metabolic dysfunctions in the human.

