
*University of Wyoming*
*April 29, 2017*

**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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*Rick Matlock, Wyoming EPSCoR*
*Lisa Abeyta, Wyoming EPSCoR*
*Emily Vercoe, Wyoming EPSCoR*

**Production of Recombinant Spider Silk Proteins for Biomedical Material Applications**

Tianna M. Aikey[1] and Hunter McCurdy[1,2] with Patrick Johnson[2] and Florence Teulé-Finley[1]
[1]Zoology and Physiology, [2]Chemical and Petroleum Engineering
[1]University of Wyoming at Casper, [2]University of Wyoming

Oral presentation

*Wyoming INBRE* *Casper, WY*

Spider silk protein-based materials represent a new generation of biomaterials with tunable mechanical properties for a wide range of biomedical applications. The ability to engineer silk genes and recombinantly produce spider silk proteins is key to generation of tailored silk-based biomaterials. It paves the way for potential uses as biocompatible and high performance tissue scaffolds for tissue regeneration, artificial tendons or ligaments, sutures or nanofiber mats for wound dressings. The dragline and flagelliform web silks from orb weaver spiders are strong and elastic respectively, while being equally exceptionally tough. These properties lay in the presence of key structural amino acid sequences in these highly repetitive silk proteins. Spider silk-like genes are easily engineered for silk protein recombinant production due to the native modular repetitive nature of spider silk proteins. In this study, two roughly 60 kDa chimeric flagelliform-dragline Spider Silk-Like Proteins (SSLPs), differing slightly in their amino acid sequences, were produced in recombinant *Escherichia coli* clones. The bacterial silk clone cells were harvested following expression of the recombinant silk gene. The total protein recovered through standard bacterial cell lysis methods was heat treated and all Hisitidine-tagged recSSLPs were recovered using immobilized metal (nickel) affinity chromatography (IMAC). SDS-PAGE/Coomassie and Western blot analyses confirmed the presence of the purified SSLPS. All SSLP samples were dialyzed prior to lyophilization. These "dry" SSLPs are used in the electrospinning of nanofiber mats. The biocompatibility of these mats will be evaluated as wound dressings.

**Cat Canyon Thermal Injection Project**

Abdulaziz Z. Alattar, Daniel A. Lovick, Tanner M. Jenkins, Garret Vonkrosigk
Dr. Brian Toelle
Petroleum Engineering Department
University of Wyoming

Oral and Poster Presentation

*Petroleum Engineering Senior Design* *Laramie, WY*

Cody Energy worked with Vaquero Energy as a consultant for their four leases in the Cat Canyon Oil Field in Southern California. The leases are producing from the Sisquoc Formation, which consists of a high viscous oil ranging between $6 - 15\,°API$. Vaquero Energy is using the cyclic steam stimulation method. The process is a steam injection through deviated wells, the wells are shut-in for a period to allow oil loosen, and then produce from the same injecting well. This is a successful method used in Canadian heavy/ extra heavy oil recovery projects. This project required calibrating the design of a horizontal well program for the Vaquero Energy leases and the challenges associated with sand control. The project had four main phases. First, creating the team and project workflow determined the problem, solution, projections, screening, and the methodology. Second, the team gathered and analyzed geological data. Then researched the project's environmental and safety regulations. Third, the team moved to simulation software, economic analysis, and designing the horizontal well program. Fourth, delivery of quality control, results, and the outputs for the client. In summary, the team recommended alternative solutions for gravel packing in horizontal wells. Finally, the team evaluated the project economically through software simulation proving the reduction of long-term costs and maximized profits through increasing oil recovery and production.

**Body Building Bumblebees: How Exercise Affects Bumblebee (*Bombus impatiens*) Flight Muscle**

Kaylee Alles with Dr. Michael Dillon
Zoology & Physiology
University of Wyoming

Oral Presentation

*Honors* *Cheyenne, WY*

Insect flight muscle is the most metabolically active tissue known, allowing for production of the large forces necessary for flight. Flight ability varies among insects and with insect age, which is partially due to differences in muscle. However, very little work has examined whether and how insect muscle may respond to exercise. One key response may be a change in the amount of flight muscle relative to body mass ("flight muscle ratio", FMR), analogous to bulkier muscle in bodybuilders. We examined differences in FMR among bumblebee (*Bombus impatiens*) sisters differing in body size and in "training". We trained the bees by periodically having them lift beaded strings during flight. This approach allows direct observation of how many weights are being lifted (their performance), and ultimately, provides a starting point for determining how exercise may affect insect flight muscle. Aside from changes in FMR, bees that regularly exercise may have elevated mitochondrial density and increased enzymatic activity.

**Wireless Lighting Control System**

Chris Nickell, and Trevor Alley with Dr. Jerry Hamann
Department of Electrical and Computer Engineering
University of Wyoming

Oral and Poster Presentation

*Bakersfield, CA Sheridan, WY*

The use of wireless systems has become more and more mainstream as of the start of the 21st century. These products have continually decreased in price, and have seen an increase in popularity for a variety of markets. There are products ranging from speakers to routers all using different types of wireless communication. The goal of this project is to create and implement a method for easily integrating wireless capabilities to a home's existing electrical system. This project will demonstrate the use of Wi-Fi to communicate at range with a receiver in order to toggle existing spot lights on or off. Secondly, as a proof of concept, it will have ability to point a given light using motors along its axes. The system's main control will be a handheld device that allows for portability, rechargeability, and convenience. All the receivers will have the ability to be retrofit into an existing electrical system with minimal effort.

**Dry Reforming of Methane to Syngas other Subsequent Products**

Hussain Alsukairi, Alexander Fox, Sean Kasprisin, Tim Poppert, Nykta Vovk
Chemical Engineering
University of Wyoming

*Senior Design* *Laramie, WY*

Synthesis Gas, or syngas (Hydrogen and Carbon Monoxide) can be used in multiple chemical processes. Utilizing Steam reforming (SRM) of methane (CH4) has been the accepted method to create syngas and utilized industrially. SRM results in the formation of Carbon Dioxide, CO2 (a greenhouse gas) has to be dealt with to minimize the environmental impact. Dry-reforming of methane (DRM) uses CO2 as a feed, instead of a by-product with a better stoichiometric conversion to syngas. Acetic acid, CH3OOH, (the desired product) is very common in chemical processes, with a variety of uses. The accepted method for CH3OOH synthesis uses a Methanol (CH3OH) intermediate. This requires multiple reactors and a gas-liquid shift reaction. Directly converting from syngas to CH3OOH (and other products) allowing the favorable stoichiometric amounts of syngas from DRM to be utilized without involving an additional reactor for the process. The goal of the process was to determine if it was possible to directly convert CH4 and CO2 into syngas through the DRM process and then directly convert it to CH3OOH and other subsequent products for sale. The project focused on what were the necessary items to create this process and would it be economically feasible. Due to the limited amount of literature information on these processes the project's end state was to determine what necessary steps in the research and development phases were needed to create a catalyst with certain properties to make the process technically possible, and economically viable.

**EOR Screening**

Abdullah Alyami, Dalveer Channey, Moataz Elgwarsha, Zachary Kurtenbach, Ahmed Salem
with Douglas Cuthbertson
Petroleum Engineering University of Wyoming

Oral Presentation

*EPSCoR* *Alwafra Kw, Calgary AB, Calgary AB, Denver CO, Cairo Eg*

Enhanced Oil Recovery (EOR) is a very important process in the life of an oil field, it aids in extracting the largest quantity of oil possible. When it comes to enhanced oil recovery there are many techniques that are available to choose depending on the characteristics of the reservoir. These characteristics are then used to screen for an applicable EOR technique, at which point in time you factor in whether there is an economic benefit. The goal of this project is to assess 1400 fields/reservoirs provided by Enhanced Oil Recovery Institute (EORI) which will be viable candidates for EOR application in the state of Wyoming. This will be done using many characteristics such as permeability, porosity, viscosity and the type of formation. These characteristics will then be used as screening criteria to determine which EOR technique is the best fit for that field/reservoir. Our project will also involve using specialized EOR software obtained from a Norwegian company, International Research Institute of Stavanger (IRIS). This software known as SWORD will rank our prospects and allow us to pick the appropriate technique such as CO2 injection, chemical flooding, polymer and thermal recovery.

**Microgravity Testing Platform – Controls Team**

Mitch Anderson, Gideon Baldwin, Shane Cornell, Nick Hein, Austen Motily
with Dr. Kevin Kilty
Mechanical Engineering
University of Wyoming

Oral Presentation

*Mechanical Engineering Senior Design* *Laramie, WY*

The NASA Microgravity Project consists of Mechanical Engineering Senior Design projects that aim to develop a new process for testing CubeSats in a microgravity environment below $10^{-3}$G. To accomplish this, five senior design teams are working on various aspects of a small drop package, released from a weather balloon, to test CubeSats by simulating microgravity conditions in freefall. The monocoque will fall from 100,000 feet during which the testing platform will experience about 20 seconds of quality microgravity. The goal of the Controls Team is to develop a proof of concept control system that corrects for any perturbations during the fall; this prolongs the period of acceptable microgravity. Implementing a reaction wheel system within the drop package achieves this goal. The system consists of a flywheel driven by a DC motor that applies a corrective torque to the monocoque. An inertial sensor determines the absolute orientation of the package using a 3-axis accelerometer, gyroscope, and magnetometer. An Arduino Uno running a Proportional Integral Derivative control loop outputs appropriate commands to the motor. This control system allows for responsive attitude control of the monocoque during freefall and maintains the microgravity environment throughout the CubeSat test.

**Caspase Recruitment Domain-Containing Protein 9 (CARD9) Knockout Attenuates Myocardial Ischemia and Reperfusion Injury**

Samantha E. Haller, Alyssa J. Sanders, Matthew R. Peterson, Luiza M. Bosch, Aspen Smith, Jelard Aquino, Tracy Ta, Paul Thomas, and Guanglong He
School of Pharmacy, University of Wyoming

Poster Presentation

*INBRE* *Cheyenne, WY; Rock Springs, WY; Guernsey, WY; Palmas, Brazil*

Ischemic heart disease is one of the leading causes of morbidity in the US. Reperfusion of the ischemic area, along with neutrophil infiltration increases the degree of injury. The adaptor protein caspase recruitment domain-containing protein 9 (CARD9) plays an important role in innate immunity, so we hypothesized that CARD9 knockout would provide some protection against ischemic and reperfusion (I/R) injury through a decrease in inflammation. The left anterior descending (LAD) coronary artery in male C57BL/6 wild-type (WT) and CARD9$^{-/-}$ mice was occluded for 45 minutes, followed by reperfusion for 24-h. Area at risk (AAR) and infarct size were measured by Evans blue and triphenyltetrazolium chloride (TTC) staining. Frozen heart sections were stained with anti-mouse GR-1 antibody to detect infiltrated neutrophils. Concentrations of cytokines/chemokines TNF-α, IL-6, CXCL-1 and MCP-1 were determined in heart tissue and serum by ELISA. Western immunoblotting analyses were performed to measure the phosphorylation of p38 MAPK. Following I/R, infarct size was significantly smaller in CARD9$^{-/-}$ mouse hearts compared to that of WT mice. The number of infiltrated neutrophils was also significantly lower in the hearts of CARD9$^{-/-}$ mice compared to WT mice. Levels of TNF-α, IL-6, CXCL-1 and MCP-1 were significantly reduced in heart tissue and serum of CARD9$^{-/-}$ mice compared to those of WT mice. CARD9$^{-/-}$ mice also exhibited significantly lower levels of phosphorylated p38 MAPK compared to that of WT mice. Our results suggest that CARD9 knockout provides protection against ischemic and reperfusion injury, possibly through reduction of acute inflammatory signaling, and reduced neutrophil infiltration.

**Coal Dust Exposure and Cardiovascular and Pulmonary Dysfunction**

Luiza Bosch, Samantha Haller, Aspen Smith, Alyssa Sanders, Jelard Aquino, Tracy Ta, Matthew Peterson, Wenyang Lu, Maohong Fan, Sara Fults, Jeff Snider, and Guanglong He
School of Pharmacy, University of Wyoming College of Health Sciences, School of Energy Resources, Energy Innovation Center, College of Engineering and Applied Science.
University of Wyoming

Poster Presentation

*Wyoming INBRE* *Laramie, WY*

Exposure to coal mine dust has been associated with increase of respiratory and heart disease as well as overall increase mortality among coal miners. A common consequence of particulate matter exposure is the development of chronic low-grade inflammation, mainly with macrophage infiltration and continuing pro-inflammatory cytokine production, which leads to cell damage and organ dysfunction. However, a mechanistic understanding of these disease conditions associated with coal dust exposure is lacking. This project is designed: to characterize the concentration and size distribution of coal dust in a custom-made aerosol exposure system; and to determine the mechanistic effect of coal dust exposure on the progression of lung and heart disease in mice. A custom-built exposure system was designed and tested for particulate matter exposure on small animals. Wild-type mice were exposed to coal dust generated from water suspension of 35 mg/L for 3 hours/day and 30 days followed by transverse aortic constriction (TAC) for 10 days to study exposure effect on the exacerbation of TAC-induced cardiac hypertrophy and dysfunction as well as pulmonary fibrosis. We hypothesized that coal dust exposure induces pro-inflammatory cytokine production leading to exacerbation of pulmonary and heart injury through an inflammasome signaling pathway. Cardiac function was determined by P-V loop measurements followed by tissue collection on: lung lavage and inflammatory cells, heart, liver, as well as brain. Western immunoblotting analyses and ELISA assay will be performed to determine protein expressions and cytokine production on NLR family pyrin domain containing 3 (NLRP3)-associated inflammasome signaling pathway.

**Under-Counter Kitchen Pantry**

Arfan Ariff, Justin Brown, Genie Corr, Eric Hansen
Mentor: Kevin Kilty
Department of Mechanical Engineering

Oral Presentation

*Senior Design* *Laramie, WY*

The Under-Counter Kitchen Pantry is an automated kitchen pantry that efficiently stores and retrieves goods via a user-friendly application interface. The pantry will be easy to use by any individual, especially the elderly and those who suffer from physical and/or mental disabilities. Our goal is to design a low cost, convenient, and safe consumer appliance. Our current design includes an accurate retrieval mechanism, a database of current inventory of goods, and plans for other features such as automated grocery lists and recipe suggestions. By meeting all these objectives, we will be able to produce an automated under-counter pantry that is affordable and marketable to the public.

**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

*INBRE* *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.

**Electronic Stethoscope**

Dylan Ashburn with Dr. Cameron Wright
Electrical Engineering
University of Wyoming

Poster and Oral Presentation

*Electrical Engineering Department* *Casper, WY*

In almost every encounter with a medical professional, the one thing that can be counted on is that someone will record vital sign data. It only makes sense because some of these vitals, like heart rate and condition, make up the body's most basic functions. However, when listening to the heart, it can sometimes be tricky to notice specific cues through natural acoustics alone. On top of that, the patient loses the opportunity to listen to, and learn from, these moments as well. The goal of this project was to create an electronic stethoscope capable of transmitting data through Bluetooth signals to a receiver. This receiver could then be plugged in to different audio systems, depending on preference of the user, to listen to and evaluate the human heart. A 9-volt signal is run through a pre-amplifier, to prepare it for the impeding gain. Then, the signal makes its way through two operational amplifiers, a potentiometer for gain control, and finally a low noise audio amplifier before being delivered to the stereo audio output and then to the various Bluetooth devices.

**Examining the Networking and Behavior of Gonadotropes in Intact Mouse Pituitaries using GCamp6 Imaging**

Daniel Asman and Amy Navratil
Zoology & Physiology
University of Wyoming

Oral Presentation

*Wyoming INBRE* *Monument, CO*

Pituitary gonadotropes are an integral part of the Hypothalamo-pituitary-gonadal axis. Gonadotropes synthesize and secrete luteinizing hormone (LH) and follicle-stimulating hormone (FSH) when acted upon by gonadotropin-releasing hormone (GnRH) from the hypothalamus. Activation of gonadotropes by GnRH induces a rapid biphasic elevation of intracellular calcium. The importance of calcium in gonadotropes are largely from cell culture experiments that lack any spatial resolution to address calcium activity at the population level. To address this gap in knowledge, we have taken an innovative approach of using a **genetically encoded calcium** indicator (GCaMP6) to detect fluctuating **calcium** signals within gonadotropes *in vivo*. Utilizing CRE/Lox technology, we have created a gonadotrope specific GCaMP6 expressing mouse that is highly responsive to GnRH. First, the pituitary was explanted from our GCamp6-positive mice and placed in oxygenated CSF where it was exposed to a pulse of GnRH to assess calcium kinetics. We analyzed the amplitude and frequency of $Ca^{2+}$ transients from gonadotropes. Several gonadotropes displayed regular oscillations upon GnRH agonist application (57%), while others showed irregular oscillatory behavior (43%). Additionally, synchronization of GnRH-induced calcium transients was observed in several clusters of gonadotropes that were in proximity to one another. Gender differences in GnRH-induced gonadotrope responses were identified. The proportion of gonadotropes exhibiting increases in amplitude was significantly higher in females than males ($p<0.05$, $\square^2$). This study, although still preliminary, shows promising steps forward in the exploration and understanding of calcium signaling within gonadotropes in response to GnRH.

**Strategically Separating Rare-Earth elements from Oil and Gas Produced Waters**

Savannah R. Bachman, Dr. Jonathan A. Brant
Department of Civil Engineering
University of Wyoming

Oral Presentation

*Civil Engineering, Center of Excellence for Produced Water Management* *Houston, TX*

Rare earth elements are metals found in the lanthanide group ranging from atomic mass 51 to 73. Each metal exhibit unique properties that make them essential in technological advancements. The lanthanides are efficient conductors and magnets. These properties make them essential to compact hardware and green technologies that are effective at storing and converting energy. These elements have a wide array of applications and are integrated into common technology, they are a necessary component to daily life. Contrary to their name, rare-earth elements are abundant and commonly found in soil, rocks, and water, but are dispersed in low concentrations, which complicates extraction methods. The purity of these metals must be 99.999% for optimizing application. Processes used to purify rare-earths is costly and results in an increase in market value. Currently, rare earth metals are extracted from sedimentary deposits that contain lanthanide-rich minerals: monazite, xenotime, and bastnäsite. Rare-earth purity is contingent upon total and complete separation of metals from the mineral matrix. This process requires mining large masses of soil, which disturbs the environment and often causes radioactive material leaching into groundwater. The extracted product must be further processed to reach purity. An alternative method has

been investigated to optimize extraction and produce pure rare earth products while minimizing environmental disturbances. This method strategically separates rare earth elements from oil and gas produced waters and treats the water to non-potable standards. This method will potentially reduce waste, reuse water, and recover valuable elements with minimal environmental impact.

**Influence Of Parasites On Life History Characteristics Of Western Sagebrush Lizards (*Sceloporus graciosus*)**

Sarah E. Bailey with Dr. Will Clark
Department of Biology
Western Wyoming Community College

Poster Presentation

*INBRE* *Rock Springs, WY*

The limited energy available to organisms is traded off between growth, reproduction, and self-maintenance, according to need. Parasitic infections constrain energy allocations, as significant amounts must be apportioned to immune function. Individuals were sampled from two locations, an urban and rural site. Assessments were made of immune characteristics, glucose levels, diet, and parasite incidence. We used general linear models (GLM) and t-tests to evaluate relationships between body measurements and immune features with location, reproductive status (male or female), diet, and parasite load. No significant variation was noted in glucose levels between males and females sampled at both locations. When assessing glucose variations among sites, both males ($P = 0.002$) and females ($P = 0.02$) at the rural site were observed to have lower levels than individuals at the urban site. Individuals sampled from the urban site had a significantly greater malaria incidence rate than those sampled from the rural site ($p = 0.015$). Our findings that increased glucose levels are correlated with human disturbance corroborates the results of a 2003 study by Jessop et al., in which increased glucose levels were observed in capture stressed crocodiles. A 1995 study by Dunlap and Schall found that malaria and glucose levels are negatively correlated in Western fence lizards. Summer of 2017 collection will aim to reveal any relationships between glucose levels and infection incidence. By assessing the affects of human disturbance and parasitic infections on glucose levels, this study helps to elucidate the energetic response of environmentally and immunologically stressed reptiles.

**Refining Volume Calibration in Pressure-Volume Loop Analysis**

Sarah E. Bailey and Benjamin A. Sabat with Dr. Bud Chew
Department of Biology
Western Wyoming Community College

Oral Presentation

*INBRE* *Rock Springs, WY*

Pressure-volume loops comprehensively analyze heart function from an intraventricular catheter. For accurate measurement, proper calibration of both pressure and volume transducers are essential. Pressure transducer calibration is relatively straightforward; volume calibration is decidedly more problematic. Two calibrations must be used, a cuvette and a saline calibration. Cuvette calibration allows for conductance units to be converted to volume. A separate saline calibration accounts for parallel conductance ($C_p$), the voltage lost to the myocardium, rather than ventricular blood volume. A number of problems with these calibrations have been encountered using LabChart Pro with PV loop module, the industry standard for analysis. This study attempts to establish best practices in PV loop volume calibration. Cuvette calibration is subject to error, including blood temperature variation, incorrect catheter placement, and inconsistent cuvette well filling. We hypothesized that pooling values yields more consistent, accurate conversions to volume. Preliminary analysis suggests grouped cuvette calibrations resulted in less variation from accepted values in basic parameters such as cardiac output (45.47±0.385, grouped; 51.54±1.022, individuals, $mL \cdot min^{-1}$), stroke volume, and stroke work. For saline calibration, two problems exist: 1) the PV software incorrectly identifies end-systolic volume (ESV), which is essential for $C_p$, and 2) baseline shifts from various phases of the experiment yield inaccurate $C_p$. To overcome these problems, we find it necessary to visually determine ESV and adjust for baseline shifting. Preliminary results suggest more consistent $C_p$ after adjustment. We conclude these adjustments to the PV loop technique yield accurate and consistent results.

**Quantifying the Impact of Population Size on Natural Selection Across the Genome**

Lucas D. Baker with Drs. Vikram E. Chhatre and Hayley C. Lanier
Zoology & Physiology
University of Wyoming – Casper

Oral Presentation

*Wyoming INBRE* *Casper, WY*

In a world of rapid anthropogenic change understanding factors influencing the pace with which a population can respond to natural selection has become a necessity for conservation. Often when considering risk of extinction we take population size into account. However, understanding evolutionary implications of that population size may also be important. Most mechanisms involved in evolution act within a population, such as selection, mutation, migration, and genetic drift. Notably, these processes are not static across species or populations and are often influenced by dynamic aspects such as population size. By comparing among groups that naturally show difference in population size we can better understand the impacts of population size pressures on genetic diversity and the effectiveness of natural selection. In this comparative study of five co-distributed Alaskan mammals—Collared Pikas, Hoary Marmots, Brown Lemmings, Artic Ground Squirrels, and Singing Voles—we tested whether population size influences the ability of a population to respond to selection using genomic data and predictive simulations. Our results show species with larger population sizes display more genomic variation, suggesting that selection may be working more effectively in larger populations. Meanwhile, smaller populations are more likely to lose advantageous loci by chance alone. In conclusion, evolution is not a static process, but rather, as we found, selection response is dynamic in relation to population size.

**Student Learning Outcomes Examining Note-taking and Exam Modes**

Lucas D. Baker with Drs. Li Li, and Maria Kuznetsova
Psychology and Communication
University of Wyoming – Casper

Poster Presentation

*Psychology* *Casper, WY*

Examinations are practiced in most educational institutions to assess student learning outcomes. Closed-book and open-book examinations are two common modes that have been studied. Multiple studies debate on which mode of exams is superior in terms of how each mode influence students' learning outcomes (see Moore & Jensen, 2007; Agarwal, Karpicke, Kang, Roediger III, & McDermott, 2008; Gharib et al., 2012). In all, scholars' opinions differ as to how the modes of examination influence student academic behaviors and learning outcomes. Moreover, such studies have been conducted in a naturally occurring context and experimental designs are rare. We are intrigued by ongoing conversation exploring the effective ways of promoting students' learning. Specifically, our study investigates how the examination mode and quality of students' notes during lecture time will affect students' actual learning and perceived learning in an IRB approved experimental design setting. Students ($n$ = 40) were randomly assigned and participated in one of the following four conditions: open-book with booklet; open-book with notes; open-book with booklets and notes; closed-book (no booklet or notes). Students took a pretest, watched a lecture, took a post-test, and then returned one week later for a retention test. Currently, a quantitative analysis is being done on the relationship between testing conditions and test scores, while a qualitative analysis is being done to identify successful note-taking styles.

**Spiral Petroglyphs and the Solstice: Archaeoastronomy in the Wind and Bighorn River Basins**

Sara Bales & Bailey Lewis, Prof. Todd Guenther
Natural and Applied Sciences
Central Wyoming College

Oral

*EPSCoR, INBRE, NASA* *Lander, WY*

The Central Wyoming Field School discovered a spiral petroglyph, reminiscent of those common in the desert southwest, on a large boulder in the foothills of the Absaroka Mountains. Sighting from the spiral, over the point of an adjacent boulder, leads to a series of cairns on high points extending at least four miles to the southeast. The fact that similar petroglyphs in Chaco Canyon, New Mexico are associated with a variety of astronomical events caused field school students to wonder whether this is a calendric site. Other researchers have documented that a similar petroglyph near Thermopolis marks the Summer Solstice. This paper discusses the results of student research on four possible calendric petroglyph sites near Lander, Meeteetse, and Hyattville, Wyoming.

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

Lyndon Bare, Cortney Johnson 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 purpose of this investigation is isolating the anticoagulation protein to evaluate its incorporation in degradable polymers for drug eluting stents (DP-DES). The protein was separated by using ion exchange chromatography. The isolated protein was then combined with several different degradable polymer formulations. Details of venom isolation as well as DP-DES results will be reported.

**A Plan for a Long Term Investigation of Human Exposure to West Nile Virus in Fremont County, Wyoming**

Joy Watkins, Kaylan Schilling, Kelvin Kinyatta, Grant Hosking, Adam Conner, and Shanda Barlow with Steven McAllister
Division of Health Science and Public Safety
Central Wyoming College
Oral and Poster

*INBRE* *Riverton, WY, Machakos, Kenya*

West Nile Virus (WNV) was originally discovered in Uganda in 1937. WNV belongs to the Flaviviridae family and is in the same genus as Dengue Fever, Zika virus, and Yellow Fever. Flaviviruses are persistently emerging and of great concern globally. Individuals contracting WNV may be asymptomatic, experience mild symptoms of fever, malaise, or develop a severe disabling illness such as meningitis, encephalitis, or polio-like paralysis. WNV was first detected in the U.S. in 1999, and rapidly migrated to the West Coast over the course of ten years reaching epidemic proportions in Wyoming in 2007. The majority of these cases were found in Fremont County with 118 infected, twelve neuroinvasive cases, and one death. Its persistence in Fremont County is evident from our testing of the vector *Culex tarsalis* mosquitoes and from our human serosurveys in 2011 and 2012. Interestingly, our previous serosurveys in 2011 and 2012 identified three subjects with abnormally high levels of IgM antibodies at least five years after self-reported initial infection. This coincides with similar observations from other serosurveys. This interesting humoral response to WNV is currently of great interest. Our proposed investigation will conduct a longitudinal study to identify and track subjects infected or previously exposed to WNV with the specific goal of identifying additional subjects expressing high levels of IgM long after initial exposure. It is planned to observe the seroconversion in these subjects to gain insight into this phenomenon. We also plan to test these individuals for cryptic infection through reverse transcriptase PCR.

**Microgravity Testing Platform Parachute and Frame Team**

John Barsotti, Travis Dooley, Samuel Z. Martin, Kevin Poyer, and Ryan Nadon
Advisor: Dr. Kevin Kilty
Mechanical Engineering Department
University of Wyoming

Oral Presentation

*Mechanical Engineering Senior Design* *Laramie, WY*

The microgravity environment is an expanding research area. As the frontier of space becomes gradually revealed as an awesome wonderland of scientific discovery—an area for research and exploration of untapped potential—the effects that such a low-gravity environment can cause on human and mechanical processes need to be fully evaluated. To this end, the NASA Microgravity Project was born. Split into several groups, the overarching goal of the project is to create a simple, cost-effective method for testing microgravity environments. The task-specific goals of the Parachute/Frame Design Team have been to design and procure a parachute tailored specifically to the 6-lb. microgravity vehicle that serves as the primary testing platform of the project and to design a sturdy yet versatile frame providing structural integrity to the inside of the vehicle. In accordance with these goals, computational methods for deriving freefall descent of a parachute–payload system were used to determine the requisite size of the parachute. Advanced material selection, three-dimensional modeling, and finite element analysis (FEA) were used to design and manufacture the CubeSat frame and subsequent fixturing components.

**Understanding Individual Personalities in North American Raccoons *(Procyon lotor)* and their Implications for Cognition**

Hailey Barton with Dr. Sarah Benson-Amram
Department of Zoology and Physiology
University of Wyoming

Oral Presentation

*EPSCoR* *Emmett, ID*

Personality is defined as consistent behavioral differences among individuals, across time and in different contexts (Sih & Del Guidice, 2012; Sih et.al, 2004). Researchers are curious as to whether varying and distinct personalities among animals is a reliable indication of their cognitive abilities and how that then relates to their survival and fitness. Raccoons in particular are a species thought to be very clever in that have become very successful in adapting to live alongside humans, and therefore an excellent study subject. My primary goal was to determine whether raccoons do display evidence of differing personalities by evaluating their behavior and then organizing that data into a quantifiable "score". Each individual was assigned a score indicating their placement on a shy versus bold scale of behavior. Individuals were evaluated in a four stage process over two separate trapping sessions during the summer of 2016 in the greater Laramie, Wyoming area. Personal observations in conjunction with video recordings were used to evaluate and score individual personalities using a behavioral assessment that was developed specifically for use by the University of Wyoming Raccoon Project (UWRP). The data collected was analyzed to compare potential scoring differences among juveniles and adults, males and females, and urban and rural individuals.

**Robo-Ops Offseason Modifications 2016-2017**

Beau Batista, Jordan Edson, Kaden Legault and Seth Quayle. Advisor: Kevin Kilty
Mechanical Engineering
University of Wyoming, Laramie

Oral Presentation

*Mechanical Engineering Senior Design* *Laramie, WY*

We were tasked with improving the 2015-2016 NASA RASC-AL Robo-ops rover. While it competed well at the Johnson Space Center, it needed a large number of improvements. These included mass reduction, adding an external on-off switch, increasing stability, improving mast deployment, redesigning the wheels, replacing plastic parts that broke during competition with metal versions, improving communications, and creating a turning algorithm. The specific improvements we decided to tackle were mass reduction, adding an external on-off switch, improving stability, improving mast deployment, adding more compliant wheels, replacing plastic parts with metal versions, and making design improvements to the lid and sample collection system. To reduce mass the collection tray was redesigned with a mesh bottom, some additional mass was removed by minimizing the arm support. An external on-off switch was added near the front of the rover. Stability was increased by widening the wheel base. To improve mast deployment a motor was added to assist the spring in raising the mast and ensure proper deployment. The base of the mast was replaced with metal brackets. The lid was redesigned into multiple parts independent of each other in order to aid in accessing the electronic components. Sample collection was improved by changing from a gripper attachment to a bucket, as well as increasing the length of the collection tray.

**Medication Reminder and Tracking System**

Josiah Batson with advisor Dr. Steven F. Barrett
Electrical and Computer Engineering
University of Wyoming

Oral and Poster Presentation

*Senior Design, EE Department* *Worland, WY*

Remembering to take medication can be a hassle for many people in the busy lives of today. Whether it be distractions of work or the novelty of a new medication, a missed medication is not uncommon. In many cases a skipped medication may just result in some discomfort or anxiety. However, in certain situations this can have dire repercussions. Disregarding humanities proclivity to forgetfulness some people with diseases such as Alzheimer's are inherently impeded in this process. Alternatively, overdosing on medication and addiction are blatant problems as well. Subsequently, while these widespread problems cannot be solved by one initiative or another the integration of the Medication Reminder and Tracking System is designed to help attenuate these issues. The basic premise of this project is to provide a reliable reminder system throughout the day. If you didn't take your medication the device will send a reminder through Wi-Fi to a phone app. The system dispenses medication, tracks whether you have taken medication, and uploads this information to a database so someone can reference this information latter. In terms of theft and overdosing, it provides reliable security and warning systems. Therefore, this device sends an alarm if it's being tampered with as well as if someone has forgotten medication repeatedly. Also, if medication has been taken it will not dispense medication unless the emergency override is utilized.

**Flash Gas Management Analysis**

Luke Behrends, Tayln Costello, Josh Knight, Thomas Shaffer, Tylynn Smith
Mentor: Doug Cuthbertson
University of Wyoming

Oral Presentation

*Petroleum Engineering Senor Design* *Parker, CO, Pinedale, WY, Bakersfield, CA, Pinedale, WY, Ruidoso, NM*

The petroleum industry is always evolving and improving, both in profitability and environmental responsibility. Jonah Energy in Pinedale, Wyoming is a on the cutting edge of that innovation. As a senior design team, they have asked us to specifically investigate the economic viability of different flash gas management solutions. The first option is to install a Vapor Recovery Unit (VRU). This unit routes the flash gas through a scrubber for dehydration, through a compressor for pressurization and then into the sales line. This is both economically and environmentally more beneficial than flaring the gas. However, certain flash gas rates are required to cover the initial and maintenance cost of the VRU. The second option is to install a Power Generating Combustor (PGC). This combustor is cutting edge technology and will route the flash gas into a combustor to create power, this power can then be used on site at the production facilities, lowering cost and emissions. However, certain flash gas rates are required to produce a sufficient amount of power. Through our Flash Gas Management Analysis our overall project objective is to reduce emissions and increase capital efficiency through the installation of VRUs or PGCs and associated electric powered equipment. As a team we have analyzed at what rates of condensate production the volume of flash gas is sufficient to efficiently operate each of these technologies.

**Sub-chronic Oral Safety Studies of Capsaicin**

Laurel Markert, Liesl Zimmerman, Jane Bennis, Justine Frantz
Padmamalini Baskaran and Baskaran Thyagarajan
Molecular Signaling Laboratory, School of Pharmacy
College of Health Sciences
University of Wyoming

Poster Presentation

*School of Pharmacy, INBRE* *Laramie, WY*

Capsaicin (CAP), an agonist for transient receptor potential vanilloid subfamily 1 (TRPV1) protein, causes browning of white adipocytes and upregulation of thermogenic gene expression to counter obesity. Although, our sub-chronic CAP-feeding neither altered the energy intake nor caused any adverse reactions in mice, it is essential to demonstrate the safety of CAP in preclinical toxicological studies in mice. Keeping this goal in mind we conducted a dose response for various CAP concentrations in high fat diet-fed wild type mice. We conducted histological studies and analyzed the plasma levels of metabolic markers, liver and kidney functions in the mice. Further, to ensure that CAP does not cause adverse reactions when in normal chow diet (NCD), we fed wild type mice a diet containing 0.01% CAP in NCD. Our data show that CAP inhibited diet-induced obesity at concentration above 0.001% (0.133 mg/kg body weight) and the theoretical EC50 of CAP is determined to 0.00157% (0.2881 mg/kg body weight). HFD feeding increased fasting plasma glucose, triglycerides and cholesterol levels and significantly elevated serum alanine aminotransferase and creatinine levels, and CAP antagonized this. HFD-induced obesity was associated with hypertension and dietary CAP prevented it at all concentrations except 0.003%. Feeding CAP in NCD neither promoted weight loss in mice nor caused any pathological changes in histology sections of vital tissues. Our study validates the safety of CAP in mice and is valuable for advancing the clinical uses of CAP to counter obesity in humans.

**Predictability in an Experimental Delta**

Samuel Berg with Brandon McElroy
Department of Geology and Geophysics
University of Wyoming

Poster

*EPSCoR* *Saint Louis, MO*

The goal of this research is to assess the predictability of deltas based on the results of controlled experiments. Prediction is an important aspect of further scientific inquiry that has significant practical applications. Chaotic behavior puts a significant road block in the predictability of earth systems. For example, atmospheric systems behave chaotically and models become inaccurate over a matter of days. This research aims to look at our potential ability to model a delta system, and for how long said model may be accurate. Six experiments have been run for this research in an experimental basin at the University of Wyoming. The data from these experiments were recorded by an overhead camera taking pictures every thirty seconds. These images were processed in order to look at consistency in the locations of channels and islands throughout time between each of the six experiments. This research will be of importance for the livelihoods of many people around the world that live on or around deltas. The ability to predict the movement of channels will protect lots of people and property. Since deltas are unstable over a human timescale, there is risk involved with living in a delta. Being able to understand the stability of this system will allow mitigation of the involved risk for many people around the world.

**Machine Learning in Fighting Games**

Brant Dolling, Kegan McIlwaine, Jay Bishop, Jordan Cooper with Ruben Gamboa
Computer Science
University of Wyoming

Oral Presentation

*Computer Science* *Laramie, WY*

Super Smash Bros. Melee (SSBM) is a fighting game developed in 2001 for the Nintendo Gamecube. SSBM has grown into a competitive fighting game that some top players make a living playing. Since the game was made in 2001, SSBM does not have online capabilities. This makes it hard to play at a competitive level, because the default computer AI is easily exploited, and to play with another human you have to be in the same room. So playing SSBM at a top level in rural areas would be almost near impossible. The goal of this project was to create a machine learning bot that would learn how to play SSBM at a level that was close to the competitive level that humans present in the game. The machine learning algorithm Asynchronous Advantage Actor-Critic (A3C) was used to train the different bots against each other. Models of trained neural networks could then be saved and loaded for players to play against. Using A3C the bots learn how to play SSBM at a competitive level, but the amount of time needed to train the bot doesn't make this solution better than playing another player.

**The Design Process of Superhero Origin Comic Books**

Haley Biswell with Michael Brown
Communication and Journalism
University of Wyoming

Oral and Poster Presentation

*Honors* *Wellington, New Zealand*

The design process for superhero comic book artists is an overwhelming task and an art in and of itself. Artists face the unseen pressures of spacing limitations, difficulties with the writers or editors, and the fans and fandoms of comics can be harsh critics. There are also a vast number of roles in the comic book creation process and the final product relies on the work of writers, pencilers, inkers, colorists, and letterers. Depending on the company or individual behind the comic, there can be multiple people working on a single comic or just one person performing all the roles. For this project, I developed the concept art and basis for a superhero origin comic book, working as the creator, penciler, inker, and colorist. There is no script and the focus of this project is entirely on art design. The aim is to demonstrate the amount of work it takes to develop a style, a system, and finally a character and world. It is also important to recognize the significance of icons, signs, symbols, and colors within the comic book artwork. Using inspiration from legendary comic book greats, I have catalogued my design process and detailed my experiences using both traditional and new media techniques. Adobe Photoshop served as my primary design program when polishing, inking, and coloring my free-hand sketches.

**Lupulin Extraction of Hops**

Brandon Blesi, Samuel Clyde, Dylan Knapp, Halie Lacey, Darren Redden, Joseph Roseno
With Dr. Michael Stoellinger
Mechanical Engineering
University of Wyoming

Oral Presentation

*Mechanical Engineering Senior Design* *Laramie, WY*

Wyoming Public Radio reports "…The Brewers Association reported a 12.8 percent increase in craft-beer sales [in Colorado] and estimates the [entire] market at $22.3 billion." Colorado, one of Wyoming's most populous neighbors, is having a massive explosion in the micro-brew scene. There is an increasing pressure on breweries in the region to use hops grown in the rocky mountain region. Originally, the purpose of this project was to create a mobile hops processing unit that could be shared between farmers. The unit would contain a dryer, hammer mill, and pelletizer; these are the "traditional" pieces of equipment used to process hops. A mobile processor would make hops processing more economical by removing the need for individual farmers to purchase their own equipment. This idea proved to be economically and technically unfeasible. This led us to rethink our initial idea and purpose for this project. After much deliberation, we are now developing a system to separate lupulin from hops. Extensive testing has revealed the best method to extract the lupulin is using dry ice to cryogenically pulverize the hops. The lupulin is then separated from the hops through a fine mesh filter. The final product is a powdery, waxy substance that will be used directly in the beer making process. The machine that performs such a task can still be transported to hop farms to process hops, which retains the original intention of creating a mobile processing unit.

**Biomass Utilization of Carbon - *The Algalrithm***

Catherine Brame, Katie Hopfensperger, Traci Reusser, Mary Uselmann (Anchorage, AK)
Dr. John Oakey
Chemical Engineering
University of Wyoming
Oral Presentation

*Senior Design Chemical Engineering* *Laramie, WY*

The goal of this project was to address the environmental implications of an algae biomass system that sequesters carbon dioxide to produce economically valuable products (Oakey, 2016). The Algalrithm, a theoretical company driven by reducing $CO_2$ emissions, chose a final product based upon the results of economic analyses that considered potential carbon capture and utilization incomes, as well as the value of diverse products under various commodity pricing constraints. Many algae-based bio-products were considered before narrowing in on a specific product that would encompass the volume of typical utility-scale electricity producing plants, a wide range of future carbon costs, and the scalability of the proposed carbon utilization process. Due to the economic viability of algal-based products in prominent industries, a full analysis has led to the selection of bio-surfactants, a widely applied, high-value product. The Algalrithm's company will produce lipids that they will sell to a surfactant producing plant and a major algae cake by-product will be produced and sold as a soil amendment. As the Algalrithm moves forward based upon conclusive research and evaluations of both the economics and the unit operations, it will establish a company that is both marketable and environmentally-friendly.

**The influence of changing rainfall, parental traits, and nest traits on parental care in a tropical bird**

Sarah Brannon with Dr. Corey Tarwater
Zoology and Physiology
University of Wyoming
Oral Presentation

*EPSCoR, WRSP* *Westminster, MA*

The extent of parental care may be highly variable within individuals and across years. In the tropics, parents provide extensive care and this strongly impacts juvenile survival, a period that strongly impacts population growth. We asked the following research question: How do traits of the parents (age, sex), traits of the nest (age of young, time of year), and climate (rainfall, temperature) affect parental care? We examined parental care in a well-studied tropical bird species, *Thamnophilus atrinucha*, in Panama during two extreme years (El Niño/La Niña years). Nests were videotaped during incubation and nestling stages to determine nest attentiveness, provisioning rates, and food load. Nest attentiveness, total food brought to the nest, and prey loads were lower in the wetter La Niña year compared to the drier El Niño year, while provisioning rates and on- and off-bouts did not change. Females reduced nest attentiveness with older eggs and altered incubation on- and off-bouts in response to time of year and monthly rainfall, while male behaviors did not change. Older nestlings received more food than younger nestlings. Although rainfall over the breeding season decreased parental care, in months with higher rainfall, females had higher prey loads. Our results suggest that changing rainfall (predicted with climate change), traits of parents, and age of young may alter parental care, and subsequently may alter juvenile survival and recruitment.

**Honors Program Web and Mobile Application**

Brett Brist, Meghan Haukaas, Chris Ruiz, Ronghui Zuo with Dr. Ruben Gamboa
Computer Science
University of Wyoming

Oral Presentation

*Department of Computer Science* *Laramie, WY*

The University of Wyoming Honors Program provides its students with access to special coursework, scholarships, and priority class registration. Administrative overhead is generated as a result of providing these services. Currently, students are advised of scholarship opportunities and events via email. Priority registration occurs through the use of paper sign-up sheets to collect student information. Students currently do not have a method of saving general information for use with Honors Program-specific scholarship applications. The project's goal was to provide a comprehensive platform that addressed the administrative needs of Program staff. We chose to use a LAMP stack due to its flexibility. A web interface was created in a self-hosted CentOS 7 virtual environment using the PHP MVC framework Laravel, powered by a MySQL database. The interface allows for administrators of the site to add/edit/delete items such as News Articles, Web Pages, Program Events, and Scholarship Opportunities. The interface allows administrators to send alerts and notifications to the student base. Registration events can be created and posted so that priority registration and event attendance can be tracked and associated with either a student's login information or a one-time code. The application utilizes QR codes as a method of quickly registering a student as having attended an event. We also created a side-by-side Android mobile application to allow students to quickly and easily access the data from the web interface via our web API and allow for the administrators to update students via push notifications.

**Electric Huskies**

Erik Pivik, Shane Brodine and John Mackrell with Dr. Aidhy
Mechanical Engineering
University of Wyoming

Oral Presentation

*Senior Design* *Rock Springs, WY*

The purpose of this project was to develop a prototype electric over-the -snow vehicle. The first semester of this project was determining the size of motor needed and amount of amp hours required to provide for a three hour run time at an average speed of 6 mph over various mountainous terrain. The second semester of this project was to dyno test the motor purchased, complete a track friction test, and calculate other parasitic losses. The vehicle design data proves that this vehicle is unable to meet the necessary performance specifications and goals established at the beginning. Future research can be done on alternative battery options along with possible alternative motor and drive options.

**Nitrogen Containing Graphitic-Like Materials**

Jordan Brophy with Dr. John Hoberg, Dr. Bruce Parkinson
Chemistry
University of Wyoming

Poster

*Wyoming Research Scholars Program* *Wray, CO*

In 2015, an analog of graphene containing uniformly placed hexagonal holes and nitrogen atoms was synthesized via a simple, wet-chemical reaction. This was an important advancement, as the presence of nitrogen holds immense promise for many other adaptations. As a result of a NSF-REU program and a collaboration between the Hoberg and Parkinson groups in the University of Wyoming's Department of Chemistry, modifications have successfully been made to this proven method to synthesize additional holey two-dimensional polymers with altered properties. In further work, a bromine derivative of the new polymer will be constructed by replacing one of the starting materials, tetraaminobenzene, with dibromotetraaminobenzene following known, published procedures. Once fashioned, known methods for the substitution of such bromine atoms with any other atom or functional group will be invoked to construct derivatives with tunable properties. Such properties include modifying the size of the hole, adjusting the pH of the molecule, coordinating metals and other functional groups into the hole, and modifying the hydrophobicity and hydrophilicity of the molecule to tailor-make new nitrogenated two-dimensional structures with any number of practical uses. These new molecules will be characterized using standard techniques to verify the structures and properties and give insight into possible real-world applications.

**European Bog Bodies: From the Iron Age peat bog to the 21st century**

Samantha Brown with Dr. Rick Weathermon
Anthropology
University of Wyoming

Oral Presentation

*Honors* *Phoenix, AZ*

Well preserved bodies dating from the prehistoric era to the 19th century have been found across northwestern Europe; specifically, in the peat bogs of Ireland, Great Britain and Denmark. These discoveries were especially prevalent in the late 19th and early 20th centuries when mass peat extraction was at its height. Many of these finds have been dated to the Iron Age and seem to represent patterns of ritual violence. This paper focuses on three finds from the Iron Age: Graubelle man, Tollund man, and the Weerdinge couple. All of who's deaths have been at some point attributed to ritual sacrifice. This project intends to exhibit the types of information which have been and can be gleaned from the European bog bodies, and by doing so illustrate that Archaeologists have a responsibility to examine these individuals. several specific examples from across northwestern Europe.

**Arcosanti – Inclined Greenhouse**

Katie Johnson, John Plunkert, Aidan McDonald, Ting Bruderer
Dr. Jonathan Naughton
Mechanical Engineering
University of Wyoming

Oral Presentation

*Mechanical Engineering and Energy Systems Engineering* *Laramie, WY*

The small community of Arcosanti, AZ has previously completed partial construction of an inclined greenhouse with the intention of using the excess heat to provide climate control to nearby living spaces. The senior design team was tasked with evaluating the feasibility of this design and to provide alternatives that may be more practical. The team consulted with professors at the University of Wyoming, professional engineers, members from the community, and previous technical documentation developed for design. From these sources, a series of equations and a MATLAB program was developed to evaluate the energy gathered from the inclined greenhouse. From the analysis performed using these equations, the team was able to make some recommendations for how to use the excess heat. Due to the desired element of passivity, the original use of this excess heat, to heat living spaces, is infeasible. However, many alternatives were considered. Of these, the most practical approach is to use the excess heat to preheat domestic hot water, with this water stored in insulated tanks for later use by the community. Additional hot water, if available, may be used to run an absorption cooling process to help provide air conditioning to select buildings at Arcosanti. During the summer months, less hot water is required for domestic water purposes, and more of the hot water could be used to run an absorption chiller and A/C system. Over the winter months, when air conditioning is unnecessary, the hot water could be used entirely for domestic hot water purposes.

**Varying Water Quality Variables Effects on Plant Growth, Nutritional Status and Physiology**

Marta Brungart Rosenberg[1,2], Braden Praska[1] with Ami Erickson[1] and Sadanand Dhekney[2]
[1]Natural Science Department, Sheridan College
[2]Department of Agriculture, University of Wyoming, ShREC

Poster Presentation

*EPSCOR and INBRE* *Sheridan, WY*

Successful plant growth requires proper water pH, mineral levels, and conductivity. The purpose of the experiments was to identify any differences of plant growth, nutritional status and physiology when plants were watered from different water sources. Following a summer field project examining the effect of high SAR ground water on vegetable production, two greenhouse experiments were conducted comparing different water source effects on plant growth under controlled conditions. One experiment examined the effect of high SAR ground water on growth and physiology (pH 8; EC 1880 umhos/cm; Ca 174 mg/L and Na 83 mg/L) compared to city water (pH 8; EC 95 umhos/cm; Ca 5 mg/L and Na 9 mg/L). Twenty one-gallon pots containing three bean seedlings were divided with ten pots watered with groundwater and ten pots with city water. Water conductivity, SAR, pH were measured and plant growth and physiology was evaluated. In another experiment we attempted to determine the cause of apparent nutrient deficiency of grapevines grown in the greenhouse. Our hypothesis was that city water used to irrigate grapevines had a high pH, which interfered with nutrient uptake. Twenty grape plants showing no sign of nutrient deficiency were watered using city water (pH 7.84) or water treated by reverse osmosis (RO) (pH 7.25). Water pH and temperature were tested when the plants were watered. To assess

plant nutritional level and physiological response for both experiments, photosynthetic rate, stomatal conductance, chlorophyll content, and dry weight were collected.

**The Effect of Salinity on Grape Embryo Growth and Physiology**

Kaylee Weeden, Teresa Giandonato, Marta Brungart Rosenberg
Ami Erickson and Sadanand Dhekney
Natural Science Department, Sheridan College
Department of Agriculture, University of Wyoming

Oral and Poster Presentation

*INBRE* *Sheridan, WY*

The growth of grape somatic embryos can be affected by elements in their surrounding environment. Improving grapevine tolerance to salinity necessitates the optimization of protocols for screening response of various grapevine species and cultivars to salt stress under in vitro conditions. We germinated Thompson Seedless somatic embryos on MS medium containing 1.0 µM BAP and varying levels of sodium chloride. Salt treatments included MS medium containing: 1) no sodium chloride (control), 2) 5 mM NaCl, 3) 10 mM NaCl, 4) 25 mM NaCl, 5) 50 mM NaCl, 6) 100 mM NaCl and 7) 200 mM NaCl. Cultures were placed in a growth room. The plates were monitored regularly, photographed, and rated on a growth scale of one to four weekly over six weeks. Dry weights were collected, root samples were fixed in Histochoice, and embedded in paraffin to examine root tissue development. Increased NaCl led to decreased growth and development. Shoot and root structures were inhibited. Severe inhibition in shoot and root growth of germinated embryos was observed above 50mM NaCL concentration. Frontenac grape embryos will be tested next. Once the concentration of NaCl that inhibits growth and development of somatic embryos is identified, this method will be used to screen genetically modified embryogenic cultures that carry genes inserted for salinity tolerance. Our in vitro screening technique should allow for rapid identification of embryo lines that exhibit salinity tolerance following genetic modification.

**The Effects of Negative Appraisals on Behavioral Inhibition and PTSD**

Tara Brunner
Psychology Department
University of Wyoming

Poster

*McNair* *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. In addition, other studies connect behavioral inhibition to emotion-based and avoidance-based coping styles, suggesting a possible tendency toward negative appraisals. This study will examine whether negative appraisals mediate the relationship between PTSD and behavioral inhibition. It is hypothesized that negative appraisals will positively correlate with both behavioral inhibition and PTSD, thus mediating for the relationship.

**Cattle Fodder System Feeder**

Trevor Gray, Zach D'Amico, Parker Bryant, Lance Schatz with Dr. Rob Erikson
Department of Mechanical Engineering
University of Wyoming
Oral Presentation

*Senior Design* *Laramie WY*

The purpose of this project is to mechanize a system intended to help livestock producers overcome challenges associated with drought and feed expenditures. The previous system was labor-intensive, especially in the collecting and feeding processes. Our objective was to mechanize the process to minimize the labor required. To address issues with these processes, the team designed and constructed a feeding apparatus which utilizes hydraulic components to spread the cattle fodder in varying locations on the property. Benefits of this apparatus include highly reduced manual labor and increased efficiency of the Cattle Fodder System, as well as the potential for economic advances of the operation.

**Lifestyle Health-Related Self-Concept in the Context of a Lifestyle Intervention**

Kimberly Burbank, Taylor Chaulk-Pikula, Megan Griffith, Hannah McNamee, Kayla Stonier, Tessa Woods, Bhibha Das, PhD, Jenifer Thomas, PhD
University of Wyoming
Oral and Poster

*School of Nursing* *Laramie, WY*

Past research indicates self-efficacy and supervised exercise are effective interventions for prevention of chronic conditions. Despite well-known health improvements associated with moderate (MPA) and vigorous physical activity (VPA), less than 20% of US adults meet physical activity guidelines. Examination of psychosocial factors provide additional insights into lifestyle intervention participation and, subsequently, desired health outcomes. Health-related self-concept (HRSC) indicates positive (i.e., promote well-being) and negative (i.e., decrease adaptive health behavior) perceptions of health. The purpose of this study was to examine the relationship between Lifestyle-HRSC questionnaire and physical activity. The Lifestyle-HRSC scale (79-items) was implemented within a 12-week type 2 diabetes prevention intervention. Data were gathered from 71 participants. Linear regressions were calculated to predict physical activity based on Lifestyle-HRSC items. From pre-intervention results, problem solving items predicted increased MPA. (e.g., $F(1, 68) = 4.23$, $p = 0.04$, $R^2 = 0.06$). Physical activity, problem solving, and self-monitoring items predicted increased VPA (e.g., $F(1, 68) = 10.97$, $p = 0.001$, $R^2 = 0.14$). Post-intervention data are being analyzed. Physical activity effectively prevents chronic conditions, including heart disease and type 2 diabetes. Psychosocial factors could enhance our understanding of adherence to physical activity guidelines. Physical activity, diet, social support, and behavior change techniques have been proven to contribute to greater success in interventions. To ensure successful participation and adherence to physical activity, it is important for providers to understand these factors. Lifestyle-HRSC may provide an innovative screening to distinguish among participation in moderate and vigorous physical activity.

## Evaluation and Mapping of Antibiotic Resistance Genes in the Resistome: A Metagenomics Approach

Hannah Burrough, Lane Schimpf, Kaylee Schimpf, Gavin Lawless, Leah Quealy, John Chase
[1]Casper College, [2]University of Wyoming

Poster Presentation

*INBRE* *Casper, WY*

The emergence and spread of antimicrobial resistance genes poses one of the most threatening health care problems to the world's populations. Although the problem is significant, little research has been completed on antibiotic resistance and the resistome (1,2,3). A metagenomics approach was adopted, to evaluate the presence of ß-Lactamase and Klebsiella Pneumoniae Carbapenemase (KPC) genes within the environmental resistome. Various natural aquatic systems and environmental soil samples in Wyoming were analyzed utilizing this method. Samples were collected along with data on sample type, GPS location, pH and dissolved oxygen. The samples were differentially filtered to isolate eukaryote, prokaryote and bacteriophage communities. After metagenomic DNA extraction, randomly amplified shotgun libraries (RASLs) were created for each sample. PCR was used to test for the presence of ß-Lactamase and KPC genes. Isolated genomic sequences revealed evidence of resistance genes within the samples. Additionally, a large proportion of the sample sites were positive for resistance genes. This evidence suggests that horizontal gene transfer of resistance genes within the environment can lead to the emergence of resistant bacterial pathogens. (3,4,5,6).

## Lignin to Adipic Acid

Jose Cabrera, Amanda McAliney, Kristina Quick, Holly Ramseier and Sedona Rockwood
with Dr. Karen Wawrousek
Chemical Engineering
University of Wyoming

Oral

*Department of Chemical Engineering* *Laramie, WY*

Lignin is a heterogeneous mixture of aromatic polymers found in plant cell walls. Cellulosic ethanol plants, whose feedstocks are made up of plant materials such as corn stover, produce lignin as a coproduct along with ethanol. Currently, that lignin is burned as a low energy fuel, but since the production of ethanol from cellulosic feedstocks is expected to increase significantly in the next few years, alternative uses for lignin are being researched. The National Renewable Energy Lab (NREL) has demonstrated that lignin can be converted to adipic acid, a precursor to nylon-6,6, which has many uses. Using a genetically engineered strain of *P. putida* to funnel lignin to muconic acid and then hydrogenation to produce adipic acid, NREL's production of adipic acid is more environmentally friendly than the current petrochemical method. The goal of this project was to analyze NREL's lab scale procedure of making adipic acid and determine if it could be viably industrialized. This was accomplished by designing and building an industrial process model based on NREL's methods and data and the current availability of lignin. Economic and sensitivities analyses were completed and safety and environmental concerns were researched and addressed. All of this was taken into consideration in order to determine if industrializing the production of adipic acid from lignin is feasible, and if the process could compete with the current petrochemical method.

**$Mo_2C$ – Pt System for Fuel Cell Applications**

Jose Cabrera R. with Dr. Dongmei Li
Chemical Engineering
University of Wyoming

Oral Presentation

*EPSCoR* *Guatemala City, Guatemala*

The global need for energy is constantly increasing, and with that the need for alternative energy sources. Our research focuses on the potential of proton exchange membrane fuel cells (PEMFCs) as an alternative solution to our current global energy high demands. The beauty of PEMFCs lies in the fact that it serves as a connecting piece between fossil fuels and the new era of hydrogen economy because: 1) stationary PEMFCs allow use of natural gas or syngas as their feedstock, but with a much higher efficiency than simply burning them; 2) hydrogen as a commodity is still produced mainly from fossil fuels. The major drawback is the high cost of PEM fuel cells resulting from the high loading of precious metal electrocatalyst as well as assembly durability. This project takes advantage of the current, and rapidly increasing nanofabrication techniques to synthesize phase-pure molybdenum carbide ($Mo_2C$) nanotube. Subsequently, by further modifying the $Mo_2C$ system through the addition of platinum, an expensive noble metal, via atomic layer deposition (ALD), it is desired to study and understand the synergy between Pt and phase-pure $Mo_2C$ nanotubes. Such understanding will allow further Pt loading reduction without compromising desirable catalytic activity, increasing the longevity and performance of the cell, while further reducing the cost.

**Lignin to Adipic Acid**

Jose Cabrera R. with Dr. Karen Wawrousek
Chemical Engineering
University of Wyoming

Oral Presentation

*Honors* *Guatemala City, Guatemala*

Second-generation lignocellulosic ethanol plants make a byproduct consisting primarily of lignin, a heterogeneous mixture of largely-aromatic polymers that provides plant cell walls their structural strength and recalcitrance to biologic attack. The chemical industry has not been able to make money from lignin because a boiler to generate steam and electricity from lignin is expensive. This capital would be avoided if an alternative use for lignin is found. An economical projection estimated that lignin, as raw material, would be available at a price of half of its fuel value (Humbird et al, 2011). The National Renewable Energy Laboratory (NREL) is working under this premise to make lignin a profitable byproduct. NREL has demonstrated an integrated process from corn stover-derived lignin to cis,cis-muconic acid, followed by high yield recovery and hydrogenation to adipic acid (Vardon et al, 2015). Adipic acid is the dicarboxylic acid produced industrially in the largest quantity (Chenier, 2002). Alternatively, adipic acid can be synthesized from the conventional petrochemical process. This process is well developed, however the high cost of the raw material (cyclohexane) as well as the environmental impact ($CO_2$ and NOx gas emissions) leave room for improvement and present a business opportunity. The question then arises as to whether the NREL process is competitive when scaled up from laboratory to industrial basis, or if it needs significant new inventions to be economically viable in replacing the conventional approach. This project addresses the question by investigating the conversion of lignin to adipic acid alternative. Moreover, the project develops, industrial scale, the process demonstrated by NREL, laboratory scale, to identify limitations and opportunities of its implementation.

**Conservation of the Black-and-Chestnut Eagle in Ecuador**

Ashkia Campbell
Dr. David McDonald
Zoology and Physiology
University of Wyoming

Oral

*EPSCoR* *Casper, WY*

My research had two aspects; 1) Field research of the Golden-winged Manakin (*Masius chrysopterus*) 2) A literature search and interdisciplinary meeting on endangered Black-and-Chestnut Eagles (*Spizaetus isidori*). The endangered Black-and-Chestnut Eagle is one of the least studied raptor populations in South America. With the rapid deforestation found in South America, specifically Ecuador, the population continues to decline. I participated in the initial meeting of a project to understand habitat use, population size within the Tandayapa Valley, and juvenile survival rates. This information will be used to institute and promote conservational efforts for the cloudforests of the western Ecuadorian slope. I contributed by describing the current status of published research on the eagle. I found two published papers (Valdez and Osborn, 2004 and Zuluaga and Echeverry-Galvis, 2016) that reported the elusive nature and continued conflict with human-eagle interactions aiding in final decision to focus on the Black-and-Chestnut Eagle population in Ecuador.

**Socket Golf – Building a Google Cardboard Game in Unity**

Caleb Carlson with Dr. Ruben Gamboa
Computer Science
University of Wyoming

Oral Presentation

*Honors* *Casper, WY*

Virtual reality is a new and emerging technology in the field of computer science designed to immerse the consumer into the product. To study and learn more about this technology, a four-person team of graduating seniors set out to build a mobile game for Google Cardboard. The game created uses the Unity game engine along with Unity multiplayer servers for the development tools. The application was designed to be run using both a Google Cardboard headset and an android controller to allow the user to control the game without removing themselves from the immersive experience. The idea for the game came from an existing game called Rocket League where the premise is to play soccer with a car. Throughout the design process the ideas for the game changed, but the final product, rightly named Socket Golf, is a mixture of soccer and golf. Each player spawns a bean-like character and plays a game of golf with a soccer ball. The player is provided with three different kick angles and kick strengths they can cycle through to assist them in getting the ball into the hole. The final product of the project consists of three main components for the game which include a tutorial where the user can learn the controls, single player where the user wants to make a hole in as little strokes as possible, and multiplayer mode where two players can fight each other to be the first to get the ball in the hole.

**Shifting Landscapes**

Emma Carlson with Courtney Carlson
University of Wyoming

Oral

*Haub School* *Greely, CO*

With a densely populated coastline and a core almost void of human habitation, Australia allows a unique perspective into the dual natured actions and beliefs of humans and our environment. Looking toward shifts in the landscape both natural and cultural, my research focused on these interactions both internationally in Australia and domestically. I present it now compiled together with images and thoughts in a self-published magazine.

**Socket Golf – Building a Google Cardboard Game in Unity**

Caleb Carlson, Nathan Spaulding, Brandon Neff, Cameron Leach with Dr. Ruben Gamboa
Computer Science
University of Wyoming

Oral Presentation

*Computer Science* *Casper, WY*

Virtual reality is a new and emerging technology in the field of computer science designed to immerse the consumer into the product. To study and learn more about this technology, a four-person team of graduating seniors set out to build a mobile game for Google Cardboard. The game created uses the Unity game engine along with Unity multiplayer servers for the development tools. The application was designed to be run using both a Google Cardboard headset and an android controller to allow the user to control the game without removing themselves from the immersive experience. The idea for the game came from an existing game called Rocket League where the premise is to play soccer with a car. Throughout the design process the ideas for the game changed, but the final product, rightly named Socket Golf, is a mixture of soccer and golf. Each player spawns a bean-like character and plays a game of golf with a soccer ball. The player is provided with three different kick angles and kick strengths they can cycle through to assist them in getting the ball into the hole. The final product of the project consists of three main components for the game which include a tutorial where the user can learn the controls, single player where the user wants to make a hole in as little strokes as possible, and multiplayer mode where two players can fight each other to be the first to get the ball in the hole.

**Banging our heads against a cell wall: genomic extraction in filamentous fungi**

Frain, W., Carpenter, C., Reitmeyer, T., Springer, C., Wangeline, A., Roehrs, Z.
Department of Natural Science
Laramie County Community College

Poster Presentation

*Wyoming INBRE* *Cheyenne, WY, Fort Collins, CO*

Genomic research has allowed scientists to find answers to once elusive questions in the genetic code, as well as begin to manipulate useful compounds found in organisms for alternative uses (e.g. pharmaceuticals). *Alternaria astragali* (A3) is a fungus with an exceptional metabolic tolerance to otherwise toxic concentrations of selenium (Se). Se tolerance in A3 is hypothesized to be attributed to yet uncharacterized metabolic pathways. Further, we have isolated two anti-cancer compounds in this fungus. Mapping the A3 genome would not only provide insight into this particular species, it would also contribute to our understanding of *Alternaria* in general, a genus that contains many economically important plant pathogens. Historically, extraction of intact genomic DNA from some filamentous fungi has been difficult, largely due to chemical components of their cell walls, such as chitin, glucan, and cellulose. In this work, lyophilized tissue from A3 was treated with two types of chitinase (*Streptomyces griseus* and *Trichoderma viride*) and a $\beta$-glucanase (*Trichoderma longibrachiatum*). After cell wall digestion, the DNA was purified and isolated using a Qiagen Genomic-tip column. Fluorescence quantitation of the product verified that we had 24.9 μg of high molecular weight DNA suitable for genomic sequencing. This genetic information will provide the foundation for further research including selenic dependent gene expression of A3 and characterization of its potentially medically useful compounds.

**Examination of Permutations and the Pancake Problem**

Clay Carper with Bryan Shader Mathematics
University of Wyoming Poster Presentation

*McNair Scholars* *Riverton, WY*

This research will explore questions related to the “Pancake Problem” from theoretical computer science. The “Pancake Problem” asks: for a given positive integer n, what is the maximum number of flips required to sort a list of n numbers, where a flip consists of reversing the order of the leading entries in the list? This research will study the expected number of flips needed to order a list of numbers using techniques from abstract algebra, combinatorics and matrix theory.

**The Coffee Ring Effect on Particle Deposition**

Amanda Carson mentored by Dr. John Oakey
Department of Chemical & Petroleum Engineering
University of Wyoming

Poster Presentation

*Wyoming INBRE* *Green River, WY*

The coffee ring effect describes the formation of a dark residual ring upon evaporation of a coffee drop. The physics of the effect has only recently been conclusively described, and is starting to be applied as a way of controlling particle deposition by liquid evaporation from previously suspending the particles. Understanding this phenomenon has allowed for subsequent experiments to be performed to test the possibility of creating shapes and designs from the particles that can be useful for many applications. The purpose of this study is to create an inverse opal design using photodegradable polyethylene glycol (PEG) beads as the particles, in addition to understanding the coffee ring formation upon various materials. Devices to test the formation of the coffee ring effect will be created using poly(dimethyl siloxane) (PDMS). Various trials will test the deposition properties of neutrally buoyant polystyrene beads in water where evaporation and permeation of the liquid will be controlled. Following this, the polystyrene beads will be replaced with PEG beads, and finally the solution mixture will be replaced with PEG. Using PEG beads will allow the creation an inverse opal structure that can further be used to test the effects of microtubule asters nucleatd from encapsulated artificial microtubule organizing centers (aMTOCs) in the inverse opal structure.

**Locating ground water with electrical resistivity tomography (ERT) in the Eocene and Oligocene White River Formation, Converse County, Wyoming**

Michael J Carter, Colter Reed, Terra Hess Mentor: Dr. Kent Sundell
Geology Dept. Casper College

Poster Presentation

*EPSCoR* *Casper, WY*

The resistivity method of shallow geophysical analysis is an inexpensive and effective method of locating shallow reservoir rocks that may contain significant groundwater in terrestrial fluvial systems. The White River Formation studied contains 90-95% very conductive clay-rich mudstones and siltstones representing over-bank floodplain deposits along ancient river systems. The formation also contains highly resistive lenses of coarse grained quartzofeldspathic sandstones and minor conglomerates, representing ancient stream channels often compose less than 5% of the formation and hence are difficult to locate by random drilling methods. The team at Casper College used the Advance Geoscience, Inc. SuperSting R8 with a 56-passive electrode array equidistantly placed at five meter intervals. Geolocating was performed with Garmin GPS and ArcMap by ESRI. Changes in elevational grade along the transects were measured with a Brunton hand transit, Jacob's staff and tape measure. The acquired data was processed using AGI SuperSting Administrator and AGI EarthImager software. The initial processing of data from 2016 was not accurate as to depth caused by non-unique solutions. Shallow extremely resistive sandstone bodies represent air filled pores and are dry reservoirs. Close proximity of multiple anomalies within the target area processed together as one anomaly. By reprocessing our data with previous and post drilling measurements, we were able to improve the geophysical imagery and location of the aquifer. This formation, covering hundreds of square miles of dry surface lands in Wyoming, Colorado, Nebraska and South Dakota often contains unrecognized and undiscovered ground water resources.

**Obstacles for the Implementation of Fertility and Family Planning Initiatives in Post Conflict Rwanda**

Elizabeth Cave with Yarong Ashley
Global and Area Studies
University of Wyoming

Oral

*Honors* *Cheyenne, WY*

Increased measures by the State to educate people on Family Planning and to provide access to contraceptives has had promising results in many countries in reducing poverty and raising the standard of living. However, it remains unclear whether these measures can have similar results in a post-conflict setting. Rwanda is the ideal setting to study these questions. The horrible genocide that occurred in Rwanda had a dramatic effect on the population in terms of infrastructure, fertility rates, and trust in the government. As the country is the most populous in the African continent as well as the site of intense ethnic conflict, Rwanda's fertility rate could have important consequences on both the poverty rates and the conflict cycle. Therefore, successfully lowering the fertility rates through family planning strategies is not only beneficial but essential. The Rwandan government has implemented a new planning to increase family planning awareness but the policy faces many possible obstacles such as religion, the post- ethnic conflict setting, education, culture, and poor infrastructure in rural regions, may block this initiative. While the current initiative has had promising successes, there is still room for improvement in the policy and implementation.

**Migration and Far Right Politics in Eastern Central Europe**

Margaret Cave with Dr. Yarong Ashely
University of Wyoming

Oral Presentation

*Honors* *Cheyenne, WY*

This research seeks to deconstruct how the fear of migrants from Muslim majority countries into the Central European countries of the Czech Republic, Hungary and Slovakia bolstered far right political parties in the three respective countries. This paper looks at the how the themes of xenophobia, nationalism and Islamophobia have led to the increase of presence of far right and extreme right groups across Europe in response to the so called Refugee Crisis. Understanding that populist rhetoric influences policy and human behaviors, we seek to understand how this rhetoric informs attitudes and policy regarding migrants and refugees in these countries. Lastly, we propose policies changes that would decrease the rise of hate speech and rhetoric and increase the quality of life for refugees, migrants and minority populations in Central Europe.

**Lichen the odds: Search for novel antibiotics in lichen secondary metabolites**

Chanthongthip, S., Kimble, E.J., and Cuddy, M. F.
Biology and Chemistry
Northwest College
Oral Presentation

*INBRE* *Lovell, WY*

Currently, an increasing concern exists about antibiotic resistance in pathogenic and potentially pathogenic bacteria. As a result, many researchers are searching for novel antibiotics from environmental sources (i.e. other bacteria, animals, lichen, etc.). Our research focuses on some of the native lichen species (*Xanthoparmelia chlorochroa*, *Caloplaca citrina*, *Usnea lapponica*, *Peltigera canina*, and *Bryoria fuscescens*) in Wyoming and their ability to inhibit pathogens. To test the lichens' secondary metabolites' ability to inhibit potential infection we used three pathogens: *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa* via the Kirby-Bauer disc diffusion protocol. With a dosage amount of 50 µL, results showed zones of inhibition by all lichens on *S. aureus*. *X. chlorochroa* was also able to inhibit *Pseudomonas*. This demonstrates significant implications for the future of lichen-derived antibiotics and their efficacy against *S. aureus* and *Pseudomonas aeruginosa*. The antibiotic-producing lichens' secondary metabolites will be analyzed through nuclear magnetic resonance (NMR) and liquid chromatography (LC) to identify specific properties that inhibit pathogens.

**Rocky Mountain Power's Voltage Control with Distributed Energy Resources**

Nathan J. Chapman, Tyler R. Wille, and Clark M. Rosenlund
Mentors: Victor Bershinsky, Dr. Dongliang Duan, and Dr. John O'Brien
Department of Electrical and Computer Engineering
University of Wyoming
Poster and Oral Presentation

*EPSCoR* *Craig, CO; Littleton, CO; Sheridan, WY*

Rocky Mountain Power has come to us with the opportunity to advance the distribution system in many ways. As the system sits now, there are no large concerns about providing electrical services, but instead there are concerns on how to stay atop the best, and most reliable, utility services in the nation. With the continuing construction of residential generation, and advancing loads at the distribution level, there will be many new contributions to the original power system in the near future. With these come complex voltage control and power factor correction configurations. Our goal has been to optimize the control strategy and effectively protect electrical equipment through voltage regulators currently deployed in the field. Through research, simulation, and actual "in field" data, we have been able to realistically interpret future demands while creating a feasible voltage regulating device. If done correctly, our research will be built upon for many years to come.

**Magic Use in Roman Sexual Performance**

Anne Chenchar with Dr. Laura DeLozier
Classics
University of Wyoming

Oral presentation

*UW Classics Program* *Cheyenne, WY*

The Roman civilization was incredibly dynamic as it grew and accepted new citizens over the years of its rule. Through the diversity of the culture Romans integrated superstition, and magic use into their society. Roman society put value on the ability to produce viable offspring, and be a competent sexual partner in marriage. Through the stress of this value, Romans who fell short sexually turned to magical practices to help heal them. This idea was so prominent in the society that Gaius Petronius wrote *Satyricon* a novel about a man and his journey of magical sexual healing. The goal of this project is to investigate the different magical practices that the Romans utilized to cure them of sexual dysfunction. Primary texts in translation from the Roman Empire were used as well as secondary scholarly articles to gain a better understanding of the practices used by the Romans. Magical use through spells and potions were examined, as well as the social aspects of magical use to increase sexual performance.

**A Look at Gendered Speech Patterns**

Kaden Cheney and Dr. Dana Pertermann
Anthropology
Western Wyoming Community College

Poster Presentation

*Anthropology* *Rock Springs, WY*

This research is to show the correlation between how, over time, men and women have developed different patterns of speech that correspond socially with their identified gender. This idea that men and women use different speech patterns has directly affected how the transgender community has made their transition from either male to female or female to male. The issue at hand however, is whether or not some of these speech patterns oppressing to use more so against the female gender. I did research, surveys, and interviews of different genders in Rock Springs, WY to find out if people realized these speech patterns, if women or men felt oppressed by some way of these speech patterns, and if people could tell the difference on whether or not these speech patterns were easily noticed when done by the opposing gender that generally used them. These speech patterns are largely based on how vocal fry is used to sound more masculine and how upspeak is used to sound more feminine. This research also shows how tag questions have become a more female trait to ask. And finally this research will show where these patterns of speech oriented from and how they came to be a social norm.

**Antibiotic Resistance of *Enterococcus spp.* and *E. coli* in Mule Deer**

E. Lauren Hinckley, Hunter C. Christner, Eisaac C.O. Flowers,
& Jay W. Dickerson
Biology Department
Northwest College
Poster Presentation

*INBRE* *Lovell, WY, Shipshewana, IN, Powell, WY*

*Enterococcus spp*. and *Escherichia coli* are bacteria found in the intestinal tract of mammals. Some strains can be harmful. Antibiotic resistance is a recent issue as antibiotics have been introduced into the environment by humans. This study is a comparative analysis of urban and rural deer populations and its relationship to antibiotic resistance. The hypothesis is that bacteria found in the urban deer will be resistant to a greater number of antibiotics as a result of their association with human waste water, pollution, fertilizers, pesticides, etc. Fecal samples are being collected to obtain *Enterococcus spp*. and *E. coli*. These bacteria are being isolated using mEnt agar or EMB respectively. Then the isolates are confirmed with Enterococcosel broth or Nutrient agar with MUG respectively. Once *Enterococcus spp.* and *E. coli* are found, the Kirby-Bauer disk diffusion method will be used to test antibiotic resistance. Data analysis will be conducted to determine the significance of antibiotic resistance.

**VOS: The Virtual Reality Computing Environment**

Kyle Clayson, Michael Lamb, Rafer Cooley, Luke Hays with Ruben Gamboa
Computer Science
University of Wyoming
Oral Presentation

*Computer Science Department* *Laramie, WY*

Today's computing is performed on one or more 2D planes we call desktops, with a half-hearted nod towards 3D visuals. This is not intuitive. We live in a 3D world so why should we not have a 3D computing environment. Flynn Industries brings to you VOS: A Virtual Reality Computer Environment where you exist within the computing space. Today's presentation is a proof of concept for the possibility of fully interacting with a computer inside of the virtual world. We will show our thoughts for how writing a program, looking through your files, and controlling a command line could possibly be implemented within this virtual computing environment. Our goal was to develop a proof of concept of a 3-d computing environment. We used the HTC Vive, Leap Motion Hand Tracking Technology, and the Unity Game Engine to produce VOS. We went beyond this VOS to develop CBlocks to demonstrate what can be created for this environment.

**Got Teeth? How the Oral Microbiome and Diet Affects Our Oral Health and the Future of Dentistry**

Joellen Coates and Dr. John Willford
Microbiology
University of Wyoming
Oral Presentation

*Honors Program* *Laramie, WY*

Within the last decade, the human microbiome, especially the gut and oral microbiomes, has been heavily researched to understand its relationship to our health and its diversity. The oral microbiome has become of increasing interest in the last few years to determine how the microbiome affects oral health and the presence of dental diseases, such as dental caries, or cavities, and periodontitis. It has been suggested that the oral microbiome is in a state of imbalance, or dysbiosis, during oral diseases and can be affected by several factors, such as genetics, oral hygiene habits, and more importantly diet. Ancient dental remains, specifically dental calculus, have been analyzed to provide a better understanding of ancient civilizations and emergence of modern diseases in relation to diet and oral microbiome changes. To better understand the relationship between the oral microbiome, diet, and teeth, a literature review of current research articles on the oral microbiome and diet, and the impact of those on oral health were examined. The extensive research on the oral microbiome, and the impact of diet on oral and overall health, could shape the future of dentistry. Current research suggests that it will become more important to incorporate the knowledge of the benefits of the oral microbiome and its relation to oral diseases when treating a patient. A patient's unique individual oral microbiome is expected to be utilized to prevent oral diseases from occurring and as an indication of health.

**Microgravity Testing Platform Manufacturing and Assembly**

*Presenters:* Andrew Cobb, Matthew Kelly, Geryd Erbele
*Advisors:* Kevin Kilty, Nancy Peck
Mechanical Engineering
University of Wyoming College of Engineering
Oral Presentation

*College of Engineering Senior Design* *Laramie, WY*

The members of the Microgravity Testing Platform Manufacturing and Assembly Team have been developing a testing platform to create artificial microgravity environments within $10^{-3}$ g. The Microgravity Team was broken up into 5 active research departments. This presentation focuses on the assembly and manufacturing methods of monocoque halves, as well as creation of fabrication tools to ease the assembly and manufacturing process. The chosen material to build the monocoque was [FiberGlast's Epoxy 2000/Kevlar 49] $[(0/90)_2]$ cross-ply using a hand-wet layup process. The material properties were determined to meet all design requirements for specific stiffness and radio transparency, and a negligible coefficient of thermal expansion. A central axis of symmetry allowed us to use a bearing shaft for a datum. Manufacturing and alignment tools for cutting and assembly were attached to the datum making it a multi-purpose system. It is important that all procedural documentation be passed along to students who will be working on the microgravity project in the future.

**Solar Sail Abstract**

Haley Cohn, Jason Hickman, Cody Nice, Dr. Han
Mechanical Engineering Department
University of Wyoming
Oral Presentation

*Senior Design* *Laramie, WY*

A solar sail is a low-cost means of propulsion in space. Solar sails work by transfer of momentum in collisions with photons emitted by the sun to accelerate a spacecraft. Once outside Earth's atmosphere, a solar sail requires no fuel for propulsion. Solar sails have many potential applications in the future of planetary science, including interplanetary travel, supply drop-off missions, sample return missions, and asteroid deflection. Solar sailing is a cost-effective alternative for any mission with a large time table. A solar sail's acceleration is minute but, with a large flight time, can achieve significant change in velocity. The primary goal of this project is to design a passive deployment mechanism for a solar sail. The design is a redesign of the previously launched Lightsail-1 spacecraft, built by The Planetary Society. The deployment mechanism will fit inside a 2U CubeSat volume and will not impede the mass restrictions of a standard 3U CubeSat. The design incorporates a momentum wheel to induce rotation on the spacecraft, which causes a centrifugal force reaction that pulls the sail outward. To assist the solar sail in deployment, tip masses will be attached to the ends of the solar sail's folded strips. Upon a successful deployment, this passive deployment method will significantly increase mission payload mass compared to active methods.

**Impacts of Norse Culture on the Viking Incursions of Britain**

Zachary Cook with David Messenger
History
University of Wyoming
Poster Presentation

*History Department* *Cheyenne, WY*

The end of the 8th century and the beginning of the so-called Viking Age was characterized by a substantial ‘outburst’ of Scandinavian expansion, exploration, and conquest throughout much of Europe that would last into the 11th century. The British Isles bore the brunt of Viking expansion during this period as Vikings raided and settled the various smaller islands and ultimately conducted outright military invasions of the British Mainland. Scholars have generated several theories in attempt to explain the Viking outburst including: economic incentives, overpopulation in Scandinavia, environmental changes and more. This project will explore certain aspects of Norse culture leading up to and during the Viking age, such as family dynamics, religious practices, and societal influences with the aim of offering further explanation for the Viking incursions into Britain.

**3D World for Reddit**

Matthew Cook, Kay Seidel and Caleb Whitman with Dr. Ruben Gamboa
Computer Science
University of Wyoming

Oral and Poster Presentation

*College of Engineering* *La Grande, OR*
*Cheyenne, WY*
*Laramie, WY*

Reddit describes itself as "the front page of the Internet." It is a popular website that aims to help connect people and discover new things. Anybody can join this website, or anonymously browse its more than one million subreddits (discussion boards). The website is designed in a simple fashion; when logged in, users can customize their view, but it is generally laid out as a simple forum website. Our group aims to visually represent the existing Reddit community and give Reddit users a new and fun way to discover content on Reddit. Using the Unity game development engine, we have created a real-time 3D world for Reddit. Subreddits are represented as buildings within a city, and threads are represented as pictures within the building. From this 3D world, users can interact with subreddits and threads by viewing or commenting on them.

**Clinical Correlates of Health Literacy in People with Serious Mental Illness**

Kadi Cooley, Dr. Christine McKibbin
Psychology
University of Wyoming

Oral

*Honors* *Powell, WY*

People with serious mental illness (SMI) experience health disparities (Hert et al., 2011). Low health literacy could be an important factor for health outcomes in the SMI population (Krishan et al., 2012). The association between demographic and clinical variables was examined in people with SMI as possible predictors of health literacy. Participants were recruited by paper and electronic advertisements to assess health behaviors in adults with serious mental illness and/or a diagnosis of type II diabetes. Participants completed a battery of tests including The TOFHLA to assess health literacy, the PANSS to assess positive and negative psychiatric symptoms, and the DRS to assess cognition. Data for adults with serious mental illness only were analyzed using SPSS version 23. Participants ($N$ = 56) were predominantly Caucasian ($n$ = 48; 85.7 %), female ($n$ = 34; 61.8 %), and lived alone ($n$ = 26; 47.3%) or with someone else ($n$ = 26; 47.3%). Overall, the sample had high total health literacy ($M$ = 84.54; $SD$ = 10.973). Total DRS scores correlated with total health literacy ($r$ = .428; $p$ = .001,), as did living situation ($r$ = .270; $p$ = .047). The PANSS positive scores weakly correlated with reading health literacy ($r$ = -.262; $p$ = .051). The results vary by TOFHLA subscale. Using a multiple linear regression model, cognition was found to be the strongest predictor of health literacy in people with SMI ($F(2,51)= 2.498$, $p<.092$, $R^2 = .089$; $F(3,48)= 5.466$, $p<.003$, $R^2 = .232$). Understanding the relationship between cognition and health literacy in people with SMI could help providers improve health disparities that this population experiences.

**Feasibility Pilot of Using Functional & Transition Profiles to Improve Transition Planning for Those with Cerebral Palsy**

Payton Crawford with Dr. Mary Jo Cooley Hidecker
Division of Communication Disorders
University of Wyoming

Oral Presentation and Poster Presentation

*INBRE* *Newcastle, WY*

As adolescents move to adulthood, they experience additional expectations such as postsecondary training or education, employment, and independent living. Adolescents with cerebral palsy often have a more difficult time in accomplishing these tasks. With added obstacles such as motor difficulties, communicative impairments, and lack of self-efficacy, they are less likely to obtain post-secondary education, live independently, and obtain employment in the community. With improved planning in areas such as education, employment, finances, housing, and transportation, these individuals may achieve higher levels of independence. In the last ten years, new classification systems were developed that may assist a support team working with an individual with cerebral palsy in evaluating their current abilities and future needs. These classification systems address communication, walking (gross motor movement), and hand function. When used together, they may help individuals determine the level of assistance needed in areas of education, employment, and independent living. **The aims for this project are as follows:** 1) Evaluate possible transition needs between adolescents and adulthood and 2) determine usefulness of classification systems and transition profiles in discussing planning with practitioners, individuals with cerebral palsy, and their families. Researchers will collect information about the individuals using three classification systems and one transition profile. The tools will be evaluated for usefulness when discussing future needs in areas like education, employment, and independent living.

**The Invisible Shackles:**
**How incarceration affects changes in mental health and substance abuse**

Danielle Creech with Dr. Thomas Mowen
Criminal Justice
University of Wyoming

Oral Presentation

*Honors Program* *Johnstown, CO*

Mental illness is stigmatized and often difficult to treat in the United States, and even more so within the criminal justice system. A disproportionate number of inmates in America struggle with some form of mental illness due to a dysfunctional health care system (Chandler 2009). There are also an overwhelming number of people who are incarcerated due to drug charges. After America declared the war on drugs, prison populations skyrocketed, filling with a broad range of drug offenders (Lamb 2004). Those with substance abuse problems commonly struggle with co-occurring disorders, often some form of mental health issue (Swartz 2007). While there is extensive literature on rates of mental illness within the criminal justice system as well as on substance use patterns of those incarcerated, little has been done to determine how incarceration affects mental health and how that relates to substance abuse. This research aims to fill the gap in literature by utilizing the SVORI dataset, which includes survey data from over 7,000 prisoners spanning across 14 states. This research seeks to determine how incarceration affects changes in mental health and how those changes in turn can affect substance abuse.

***Detecting Halogeton in Antelope Scat using DNA Analysis***

Nelly Cyuzuza with Dr. Megan Lahti
Math & Science
Western Wyoming Community College

Oral Presentation

*INBRE* *Kigali, Rwanda*

Many plants contain secondary metabolites such as oxalic acid and oxalate (Libert and Franceschi, 1987). The higher the concentration of oxalate, the more poisonous the plant is for many animal species (Libert and Franceschi, 1987). *Halogeton glomeratus* belongs to the Amaranthaceae family which is known for having high concentrations of oxalate. *Halogeton glomeratus* originates from Asia and since the 20th century has spread around in my countries, including the western U.S. (Whitson et al., 2004). In the Red Desert region of Wyoming, the largest migrating pronghorn antelope (*Antilocapra americana*) population occurs, and anecdotal evidence suggests these antelope will forage on *H. glomeratus* (Severson and May, 1967; Dr. Will Clark, pers. comm.). The purpose of my research is to determine if *H. glomeratus* DNA is detectable in Pronghorn antelope scat using DNA analysis. The QIAamp DNA Stool Mini Kit was used to isolate *H. glomeratus* DNA from positive control scat (sheep and goat) and pronghorn antelope scat. Primers for 4 cDNA genes are being used to detect *H. glomeratus* using PCR (Wang et al. 2015). The PCR products will be sequenced to confirm whether the DNA is from *H. glomeratus*. This research will determine whether *Halogeton glomeratus* DNA is detectable in scat and to potentially offer a new method for dietary analysis.

**Synthesis of Novel Diazeniumdiolate and Sydnonate-N-oxide Products**

Sophia Kwende Daisy and Dr. Navamoney Arulsamy
Department of Chemistry
University of Wyoming

Poster Presentation

*NASA* *Bamenda, Cameroon*

Nitric oxide (NO) is known to react with carbanions and secondary amines as a cis-dimeric molecule (cis-$N_2O_2$) to form useful NO-donor reagents known as NONOates. Rare examples for trans-$N_2O_2$ addition are also known. Active methylene-group containing $\alpha$-alkylcarboxylates undergo trans-$N_2O_2$ addition leading to the formation of sydnonate-N-oxide salts. The diazeniumdiolate and sydnonate-N-oxide products exhibit varying levels of stability in aqueous media, and some of them are capable of releasing NO under physiological conditions. Such compounds are of great recent interest as pro-drugs for NO-delivery in the treatment of heart diseases. Interestingly, the two classes of products also exhibit high-energy density properties and are potential monopropellants. In this project, we synthesized new diazeniumdiolate and sydnonate-N-oxide products, and studied their decomposition properties. Methyl cyanoacetate reacts with NO in the presence of ammonium hydroxide and alkali hydroxides forming an unstable and reactive diazeniumdiolate. The poorly characterized product decomposes in aqueous solutions releasing NO and forming a stable sydnonate-N-oxide. The final product is stable, and is characterized by UV-Vis, IR and NMR spectroscopic data, and single crystal X-ray diffraction analysis as potassium trimethyl 1,3-dinitrilopropenyl-1,2,3-tricarboxylate. The release of NO from the less stable diazeniumdiolate in aqueous media at pH 7.4 under ambient conditons is verified by the trapping of the free radical with the well-known NO-trapping reagent $Fe(MGD)_2$. EPR spectral data measured for the NO adduct of $Fe(MGD)_2$ exhibits the expected three-line pattern.

**Semiautonomous Robotic Arm**

Andrew Dameron, mentor Domen Novak
Electrical Engineering
University of Wyoming

*Senior Design* *Douglas, WY*

Autonomy has been on the up and up for quite some time and chances are it will be here to stay. There are many industries out there which automate their processes. The type of equipment and process used will depend largely upon the task at hand. Some people may use cameras and software that sends alerts when a problem is detected. Other people might use robots to help automate their task. The purpose of our project is to design and build a robotic arm which will be able to autonomously pick up objects that it is taught to recognize. The objects it is taught to recognize will most likely be various beer bottles, cans, and other simple objects such as blocks. The arm itself could have several potential applications in different work environments such as picking objects up off of an assembly line or recording a presentation by holding a camera which follows a presenter as they move around. There are many other potential uses for the arm aside from what we are trying to accomplish. These other tasks could be accomplished with some slight modifications to the design.

**The impacts of post-fire succession on native bee diversity within the Rocky Mountain Ecosystem**

Kendra David and Dr. Hayley Lanier
Zoology & Physiology
University of Wyoming at Casper

Poster

*INBRE* *Casper, WY*

Allowing natural fires to occur in Rocky Mountain forests may be an important factor in increasing native bee populations, as larger populations of native bees have been found in early successional stages of post-fire forests in other forest systems. Burned dead trees are preferred nesting sites for cavity-dwelling bees and the bare ground from fires is important to ground-dwelling bees. In this work, I examined how the two recent fire disturbances on Casper Mountain (2006 and 2012) impacted native bee diversity and abundance. Since fire opens up more area for flowering plants, I hypothesize that more native bees will be found in early post-fire succession than later post-fire succession or nearby non-burned (control) areas. I tested this hypothesis by collecting 4690 native bees within burned and non-burned areas of the mountain then counted and identified the collected specimens using morphological and molecular techniques. Overall, bees were more abundant and more diverse in burn areas than in the control areas. This is important information for fire management practices in regards to native bee conservation.

**Effect of mid-flight trunk motion on landing mechanics**

Daniel Davis with Dr. Boyi Dai
Kinesiology and Health Promotion
University of Wyoming

Oral Presentation

*INBRE* *Gillette, WY*

ACL injuries are highly prevalent and problematic in day-to-day life, and especially in an athletic domain. Often ACL tears occur when the athlete lands in a non-vertical position, rendering them unable to utilize both legs symmetrically in landing. This subsequently increases the ACL load of the landing leg, which is at least a partial cause of the injury. Mid-flight trunk motion may cause athletes to land in this non-vertical position. The goal of the current study was to analyze the effect of mid-flight medial-lateral trunk motion on Center of Mass (COM) distribution and subsequent landing mechanics. Forty-one recreational athletes (18 males and 23 females) participated. Forty-four markers were placed on each participant's body and were tracked using 3D cameras. Peak Vertical Ground Reaction Force (VGRF) was measured with two force plates. Participants were instructed to jump vertically, reach straight up, left, or right, and land naturally. Each medial-lateral reach condition (left or right) produced asymmetric landing between legs, with the leg ipsilateral to reach direction landing first (mean difference of 14.0 ms reaching left and 16.7 ms reaching right). Peak VGRF was also greater for the ipsilateral leg in these conditions (2.6 times body weight for both left and right reaching conditions) compared to the contralateral leg (1.7 times body weight). These results indicate that mid-flight trunk motion can cause athletes to land in a non-vertical position, placing more stress on the leg ipsilateral to the reach direction, and increasing their risk of ACL injury in that leg.

**E-Baja Design Team**

Greg Davis, Giovanny Djoko, Isaac Linneman
Department of Mechanical Engineering
University of Wyoming

*Senior Design* *Laramie, WY*

Every year, the University of Wyoming sponsors an SAE Baja competition vehicle. This vehicle is designed and built by students and is raced against other teams. Therefore, those with the best design have the greatest chance at winning. This year however, the team goal has been changed to creating an electric Baja using the superior frame of the gas-powered Baja. The goal of the project is to design and fabricate parts to retrofit existing E-Baja components to the gas-powered Baja frame. Design considerations for the retrofit include parts mating with the existing frame without sacrificing stability and an increase in vehicle performance from previous E-Baja designs. The gas-powered Baja frame was selected because it more adequately accommodates the new E-Baja design requirements for several reasons. The Baja frame is lighter, has better steering, and has much better suspension than the frame for the previous E-Baja. Other design considerations include vehicle reliability and a quieter vehicle. Since much of the noise comes from the chain, a toothed belt will replace it. This required replacing and redesigning the rear-end in order to accommodate the new belt system. The new E-Baja will also have a higher speed, while maintaining its maneuverability. The new E-Baja will be better equipped for racing and for a more enjoyable ride.

**Feminine or Masculine?**
**The Acquisition of Spanish Noun Gender**

Hannah Deardorff, Irene Checa-García
Modern and Classical Languages
University of Wyoming

Oral Presentation

*Honors* *Brighton, CO*

The agreement between nouns and their respective articles are of upmost importance within the Spanish language. Although some L2 Spanish learners may believe that noun gender is not an important aspect of the Spanish language, it has shown to be very vital in the overall construction of a sentence, in the form of the adjectives and other grammatical tools being used (Vargas-Barn, 1952). There are many aspects that contribute to the difficulty of acquiring the gender of a Spanish noun for learners of Spanish as a second language. This includes characteristics of the learners such as their age, their sex, their exposure to the Spanish language, their exposure to other foreign languages, etc (Sagarra & Herschensohn, 2011, Lindsey & Gerken, 2012). In addition, some nouns' gender is harder to acquire than others', depending on their endings, their meaning, and their semantics (Alarcón, 2009, Clegg, 2011). However, little is known about the learners' attitudes towards noun gender acquisition and its relationship to its acquisition. This study aims to present the potential relationship of learners' attitudes towards the importance of noun gender and their ability to correctly identify the gender of nouns. Also, the study will explore the relationship between perceived difficulty of gender, as part as the attitude towards it, by learners, and its relationship to gender acquisition. In order to do so, a survey will be given to two university Spanish classes with a questionnaire asking their age range, Spanish exposure, etc., as well as their perceived importance of learning how to properly identify the correct genders of nouns. After this short questionnaire there will be a series of questions in order to test their current ability at determining noun gender. With the results of this study, teachers will be able to utilize the information and be able to instruct their students on the importance of noun gender within the Spanish language, and hopefully increase the knowledge of their pupils.

**The potential role of RBM20 in protection from obesity and diabetes in rats**

Denise De Loera[1, 2], Mingming Sun[1], Maimaiti Rexiati[1], Wenliang Zha[1], Chaoqun Zhu[1], Zhilong Chen[1], Andrea Sanchez Walk[1, 3], Jun Ren[4] and Wei Guo[1]
[1]Department of Animal Science, University of Wyoming
[2]Microbiolgy Program, University of Wyoming,
[3]Department of Molecular Biology, University of Wyoming
[4]School of Pharmacy, University of Wyoming

*INBRE* *Laramie, WY*

Obesity and Diabetes are public health problems with more than one-third of US adults (35.7%) afflicted with obesity. The obesity is known to predispose to chronic diseases such as type II diabetes, non-alcoholic fatty liver disease (NAFLD), heart disease, stroke and certain types of cancers. It is postulated that the hormonal imbalance, insulin resistance and low grade inflammation are the potential risk factors for the adiposity. However, the molecular mechanisms for the progression are still unclear. It is proposed that around half of mutations linked to disease affect alternative splicing (AS) and several splicing factors (SRp20, CUG-BP1 etc.) have been found to regulate AS of obesity and diabetes genes. Recently, we found that the expression and downstream effects of RNA binding motif 20 (RBM20), a splicing factor that regulates gene AS mainly in muscle tissues, can be regulated through the PI3K/Akt/mTOR and insulin signaling. Therefore, it could not only regulate AS

of cardiac proteins mastering the stiffness of ventricular wall but also play a role in the progression of obesity and/or diabetes by regulating glucose uptake via insulin signaling. In this project, we hypothesize that RBM20 regulates insulin signaling associated genes and thus influences lipid and/or glucose metabolism. To test this hypothesis, wild type (WT) (N=12) and RBM20 knockout (KO) rats (N=6) were fed high-fat diet (HFD) and normal diet (ND) for 6 month to induce obesity type and its metabolic, oxidative, and functional complications such as diabetes. Body weight and food consumption were measured and glucose tolerance test (GTT) was performed. The results indicated that body weight of WT rats was significant higher than that of KO group and the food consumption has no significant difference between two groups. GTT showed that KO group has faster glucose uptake than the control group, suggesting active insulin and insulin receptors in KO rat skeletal muscles since RBM20 is highly expressed in muscle tissues with less or none expression in other tissues. Therefore, in the future, it would be interesting to study whether RBM20 increases insulin sensitivity in skeletal muscle by regulating alternative splicing of insulin signaling associated gene. All together, these preliminary data suggest that RBM20 could play a role in the development of obesity and/or diabetes.

**Analysis of Titin Expression in Heart Tissues from IUGR Maternal and Fetal Baboon**

Denise De Loera[1,2], Mingming Sun[1], Chaoqun Zhu[1], Andrea Sanchez Walk[1,3], Peter W Nathanielsz[1], Stephen P. Ford[1] and Wei Guo[1]

[1]Center for the Study of Fetal Programming, Department of Animal Science, [2]Microbiolgy Program; [3]Department of Molecular Biology,
University of Wyoming, Laramie, WY;

Poster Presentation

*INBRE Fellow* *Rock Springs, WY*

The fetal environment is considered a key factor in the etiology of cardiovascular disease later in life. Undernutrition in fetal development, which can be marked by intrauterine growth restriction (IUGR), can lead to an adverse fetal environment and molecular and physiological adaptive changes. Although these adaptive changes allow fetal survival, they may result in long-term consequences such as marked alterations in the physiology and structure of the heart and other organ systems. Titin, a giant sarcomeric protein that is responsible for ventricular wall stiffness and produces passive tension during contraction. Titin has two major classes of isoforms: N2B and N2BA. The normal ratio of N2B to N2BA in healthy human heart is about 70:30. The alteration of this ratio has been shown in diastolic or systolic cardiac dysfunction. The ratio of N2B to N2BA can be switched with development and under environmental stress. Therefore, we hypothesize that IUGR will change the titin ratio in both maternal and fetal heart and thus lead to cardiac dysfunction. To test this hypothesis, we used baboon as the animal model to induce maternal undernutrition. Heart tissue was collected from the IUGR and control baboons along with their offspring. Titin ratio was examined and quantified in tissue samples by using 1% SDS-agarose gel. Titin isoforms were separated by using SeaKem Agarose gel electrophoresis. Protein loading amount was adjusted accordingly to titin band intensity on first round running with 5ul of sample lysate, and second round running will be used for quantification.

**Variable Width Excavator Bucket**

Venkatesh Deshpande, Eric Kenyon; Advisor: Dennis Coon, Neal Miller, Kevin Kilty
Department of Mechanical Engineering
University of Wyoming

Oral Presentation

*Senior Design Project* *Casper, WY, Nashik, India*

Excavators shape the world we live in. Using attachments, they have the power destroy, sculpt, build and rebuild the foundations upon which we exist and further create. This project is an attempt to minimize the amount of buckets (attachments) a customer must purchase. Under advisors, Dennis Coon, and Neal Miller, and sponsored by Kenyon Trucking & Frac Tanks by Bryson Inc. our goal was to design a variable width excavator bucket for trenching and digging while landscaping with a 1-ton excavator. To verify the structural integrity a full static force and friction analysis was completed which found the design to be structurally workable while using a factor of safety of two. Estimated economic feasibility revealed need for a mechanical redesign to negate grossly overpriced hydraulics. In conclusion, this project was a mixture of success and failure leading to solid considerations of future research and development.

**Classification of Differential Bimanual Manuel Motion**

Anthony Praveen de Silva, Academic Mentor – Prof. Domen Novak
Department of Electrical Engineering – University of Wyoming

Oral Presentation

*EPSCoR* *Colombo, Sri Lanka*

There are various fields in which, knowledge of arm movement can help improve the lives of people. These include physical therapy, replacement robots and sports science. Understanding the neural signals that can be found in the course of a motion will add an extra dimension in the quest to classify these types of motion. Bimanual motion is movement of the two hands. The classification of hand movements has been addressed in different ways. This project looks into the possibility of using Electromyography data obtained using a Myo Armband to classify motions. Experiments were designed to break down several arm movements from the elbow up, in an attempt to classify them. Human participants performed several motions under set conditions. This project undertook data from some sample movements performed, and sought to classify the said motion using the analog electromyography data obtained from electrodes in the form of an armband placed on the subjects forearm. The data obtained using this process for various subjects was analyzed to arrive at the conclusions regarding this process of classification. Computer software was used in helping analyze the results of the said process. The presentation presents the results and conclusions obtained during the course of the experiment. It also looks into the possibility of future use of the information gathered regarding classification of motion.

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

Ella DeWolf with Dr. Cynthia Weinig and Dr. Marcus Brock
University of Wyoming

Poster Presentation

*Wyoming Research Scholars* *Laramie, WY*

Soil microbes can have a beneficial effect on 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 Brassicaseae produce secondary compounds called glucosinolates (GLS) help protect against insect damage (Pineda et. al 2010). GLS from brassicaceous plant tissue are used to control soil microbial pathogens in a process called biofumigation (Warton et. al 2001). However little is known about how these compounds influence the overall rhizosphere microbial community. The first goal of our project 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 several 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 and primary metabolite analysis. Rhizosphere soil was collected for GLS analysis and microbial community analysis by 16s rRNA sequencing. The second part of this project will investigate whether the soil microbial community affects GLS production and insect damage. Each genotype from part 1 will be planted outside in both an intact and disrupted soil microbial community. The leaves will be analyzed for insect damage, GLS production, and primary metabolites to test for differences between these microbial treatments.

**Small Mammal Movements In Previously Burned Habitats**

Laura M. Diesburg with Dr. Hayley C. Lanier
Zoology and Physiology
University of Wyoming at Casper

Oral Presentation

*INBRE* *Casper, WY*

Fires have the ability to reshape entire landscapes, changing the composition of plants species as well as the structure of the terrain. Forest fires also leave behind a large amount of coarse woody debris, i.e., downed logs, which can provide small mammals with habitat, cover from predators, and have the potential to alter movement patterns. Movement patterns are also influenced by other habitat features, such as the separation of habitat by a road. For this study I utilized capture-recapture data from burned and unburned study sites in the Yellowstone National Forest as well as genetic analyses to determine both short and long-term movement patterns relative to species, habitat (burned or unburned), and the presence/absence of a road. I focused specifically on the two most abundant species in the intermountain west: red-backed voles (*Myodes gapperi)* and deer mice *(Peromyscus maniculatus)*. Capture data indicated that on average deer mice travel greater distances, and both species have greater average movements in burned areas compared to unburned areas. These results are an important complement to the results from genetic analyses, which suggest a decrease in gene flow across the road. Further analysis is needed to determine the causes of the differences between burned and unburned areas, such as diet requirements and vegetative layout. Understanding the impact fires and roadways have on small mammals will not only expand our knowledge on their ecological role but may also implicate the use of controlled burns as tools for population management.

**Voices of Wyoming Landscapes: Agricultural Traditions and Living Wisdom**

Claire Dinneen supported by mentor Rachel Watson
Department of Microbiology
University of Wyoming

Oral and Poster Presentation

*Honors Program* *Cheyenne, WY*

Knowledge of ageing agriculturalists living in rural spaces of the State of Wyoming reveals a people with profound love for their local land and the community space it offers. Wyoming community members who contribute to local agricultural productions dedicate their lives to operating their land. One quarter of Wyoming's land operators are over the age of 65 and continue to dedicate their lives to preserving Wyoming's geographical landscapes. This research sought to capture the agricultural experiences of Wyoming's ageing population. The project established communication with a rapidly ageing demographic in order to continue archiving knowledge and traditions shared by an under-represented population. This collection of information analyzed historical archives and conversations with ageing ranch and farm operators. Land conservation research that seeks to in include dialogue of people who currently operate Wyoming lands was a successful outcome of this research. Merging politically focused data with lived experiences on local land resulted in a more complete understanding of traditional wisdom. Results of this research produced an artistic model of previously documented historical photographs, correspondence and articles juxtaposed with local reflections of current agricultural practices in Wyoming. The integrity of action research is captured by representing a sense of place and environmental identity.

**Bright Agrotech Quick-Connect**

Taylor Dorans, Tyler Johnson, Mitch Machmuller
Trapper Rieniets
Department of Mechanical Engineering
University of Wyoming

Oral Presentation

*Senior Design* *Laramie, WY*

Bright Agrotech contracted the re-design of a custom quick disconnect coupling to be used in drain, feed and LED cooling lines for the company's vertical agricultural growing system. Design objectives included minimum personal work input to connect/disconnect, water tight when connected, and increased water/feed flow to plants and drain circulation. The project included three separate stages. The first stage included 2D and 3D modeling based on fundamental fluid design using Solid Works. Next, the models were 3D printed and head loss coefficient and fluid flow tests were performed, along with leak testing and pressure resistance testing. The last stage comprised of material selection, manufacturing process, and cost reduction. Through these processes, multiple models were created and are set to be implicated in Bright Agrotech's product line.

**Speaker Classification through Deep Learning**

Alexander Douglass, Jacob Morris, Luke Woodbury, Ben Reed
Computer Science
University of Wyoming

Oral Presentation

*Computer Science Department* *Laramie, WY*

The field of artificial intelligence (AI) has long found that it is the things that humans find very easy to do that are most difficult to achieve. An example of this is the task of sound analysis. Humans are quite adept at making accurate classifications about a speaker based solely on the sounds they make during speech. These classifications include the gender, age, and natural language, to name a few. While such a task seems very simple to most of us, it represents a major challenge for an AI. Such a program could be used in a number of applications, including phone based classification of speakers and speaker verification. The goal of this project was to use deep learning to train an artificial neural network (ANN) to classify speakers from recorded audio. We trained this network using the Speech Accent Archive as the training dataset. This data includes more than 2300 speaker recordings of a paragraph that is designed to cover all of the sounds in the English language, complete with meta-data labels for each speaker. Our software is able to load saved ANNs to be trained, analyzed, or used for classification.

**Design of an Automated Purge System at Dry Fork Station**

Murphy Dutcher, Collin Nordhus, Logan Walker
Department of Mechanical Engineering
University of Wyoming

Oral Presentation

*Department of Mechanical Engineering* *Gillette, WY*
*Henderson, CO*
*Taylorsville, UT*

The Pitot Tube Purge Senior Design Project was initiated by engineers at Basin Electric's Dry Fork Station (DFS), a coal fired power plant located in Gillette, Wyoming. Engineering leadership at DFS desired to improve the frequency of purging their pitot tubes, which measure the velocity of air supplied to a coal pulverizer. Presently, the Pitot tube ports experience a buildup of fly ash causing the pressure readings at the Pitot tubes to become inaccurate. The efficiency of combustion relies heavily on proper air-to-fuel ratios and inaccurate pressure readings result in biased mass flow rates in the air duct. Manual purging of the Pitot tubes at DFS is only performed as time permits, sometimes with periods of up to two months between purges. Hence, the lack of regular fly ash purging has the potential to impact DFS plant efficiency with resulting implications for fuel consumption and emissions.
The UW team was tasked with the design, construction, and implementation of an automated system that purges the pitot tubes on a scheduled basis, such that they will no longer be left unattended for lengthy periods. The automated purge design utilizes solenoid valves, pressurized instrument air, and digital control logic, which seamlessly integrates with the current pressure transmitters. Utilizing this purge design, DFS will achieve increased mass flow rate accuracy, in-turn optimizing air-to-fuel ratios and plant efficiency.

**Restoration of native baboon-plant mutualisms following eradication of the invasive prickly pear cactus (*Opuntia stricta*)**

Student: Marissa Dyck, Faculty Mentor: Anne-Marie Hodge
Zoology and Physiology Department
University of Wyoming

Oral presentation

*Honors Program* *McMinnville, OR*

When mammals select for fleshy fruits of introduced species, subsequent seed dispersal may increase a potential invader's rate of establishment and spread. We assessed whether olive baboons (*Papio anubis*) select for the fruits of an invasive prickly pear cactus (*Opuntia stricta*) on the Laikipia Plateau in Kenya. Baboons function as seed dispersers for native flora across many regions of Africa. By eating the fleshy fruits of *O.* stricta, they also facilitate the establishment and spread of the cactus. We collected scats from eight baboon roosts; the seeds in the scats were identified to species and then counted and weighed. To determine fruit availability, we conducted vegetation surveys of the baboon roosts and quantified fruits per cactus. Using a two-sample t-test, we compared the cactus fruit availability, and the proportion of individual scats' masses that were *O. stricta* seeds, between 2014 and 2016. Fruit availability decreased substantially between 2014 and 2016, however, the proportion of *0. stricta* seeds in the scats did not decrease significantly. Following such a marked decline in *O. stricta* fruits in 2016, we would expect the proportion of *0. stricta* seeds in the baboons' scats to decrease proportionately. Our scat data, however, indicates baboons appear to be consuming a disproportionate amount of *0. stricta* relative to availability. This has important implications for both management of O. stricta around the world and our understanding of native mutualisms between baboons and the native flora on the Laikipia Plateau.

**Genomic assessment of the role of relatedness in spatial overlap among least chipmunks (*Tamias minimus*) in the Laramie Range**

Student: Marissa Dyck, Faculty Mentor: Dr. Merav Ben-David
Zoology and Physiology Department
University of Wyoming

Poster Presentation

*INBRE* *McMinnville, OR*

Recent radio-telemetry studies on least chipmunks (*Tamias minimus*) in the Laramie Range, Wyoming, have shown that core areas (50% contours) of males and females showed little overlap. This pattern persisted for females in the 95% contours of home range estimates suggesting intra-sexual segregation. In contrast, males exhibited higher home-range overlap with females and other males. Such spatial distribution is uncommon among the Sciuridae, in which females usually exhibit higher home-range overlap. Here we address the question whether chipmunks that exhibit higher overlap are more closely related to each other using a combination of genomic analyses (RADseq) and VHF radio-telemetry. In fall 2016, we fitted 22 individuals with radio-collars and tracked them from September through October. We also collected blood samples from these individuals as well as all other trapped chipmunks. We quantified home range size and overlap, and will use genomic analyses to determine relatedness between individuals. Once genetic analyses are complete, we will evaluate the relationship between relatedness and spatial overlap.

**Environmentally Controlled Window Shade**

Corben Eastman with Dr. Jerry Hamann
Electrical and Computer Engineering
University of Wyoming
Oral and Poster Presentation

*Department of Electrical and Computer Engineering* *Gillette, WY*

Window shades and blinds can save money. Blinds can reduce heat gain from a window by as much as 45% in the summer (U.S. Department of Energy). Also, as an example, 1,300 kWh/$m^2$ of heat come through south facing windows in Laramie, WY each year, assuming every day is sunny (Sustainable by Design). The average cost of a kWh in the U.S. in August, 2016 was 12.90 cents (U.S. Department of Energy, 2016). Using these numbers, the energy savings from effective window blind use could be as much as $75.47 per square meter of window per year. For buildings with very large windows, these costs can add up. These energy savings are not seen by most, however. Window blinds or shades are often not adjusted to their ideal position. Additionally, many people have very tall or high-up windows, and using motorized blinds/shades may be the only way for the blinds/shades to be adjusted. The goal of this project was to create a low-cost device which automatically adjusts a window shade based on indoor temperature and outdoor sunlight. Furthermore, the device gives full manual control of the shade through a remote control. On the remote control, the desired indoor temperature is displayed and the remote control can be used to set the desired indoor temperature.

**EKO Oil Company**

Bismarck Echegile, Brent Kebert, and Rostin Okamba with Dr. Brian Toelle
Petroleum Engineering
University of Wyoming
Oral Presentation

*Petroleum Engineering Design* *Laramie, WY*

The project is to develop a static and dynamic model of the Tensleep formation in the Teapot Dome basin North East of Casper, WY in Natrona County. With the static and dynamic models, $CO_2$ injection simulations will be ran as a potential EOR solution. With the results of the simulations, a potential $CO_2$ injection plan is proposed.

**2014-2016 fall phenology of select aspen trees on UW campus**

Logan Eicholzer[1] and Ramesh Sivanpillai[2]
1. Environmental Systems Science, Haub School of Environment and Natural Resources,
2. Department of Botany & WyGISC,
University of Wyoming

Poster presentation

*Wyoming Research Scholars* *Liverpool, NY*

Monitoring phenology of aspen trees is important because of the ecological significance aspen trees have in the Rocky Mountain West. This study analyzed the fall phenology data collected in 2014-2016 in University of Wyoming (UW) campus in Laramie, WY. Data on leaf color and amount of leaves dropping were collected using the Project BudBurst sponsored by the National Ecological Observation Network (NEON). We analyzed changes in fall leaf color and the amount of leaves remaining on each tree to detect patterns of response to different weather conditions that occurred in these three years. Our presentation will highlight the differences in the phenology of shaded and exposed aspen trees.

**Mapping Variations in Pearl Millet Growth using multi-year Landsat images**

Connor Elbert[1] with Dr. Ramesh Sivanpillai[2,3]
1. Department of Geology, 2. Department of Botany, and 3. Wyoming Geographic Information Science Center,
University of Wyoming

Oral Presentation

*WyomingView* *Gillette, WY*

Variability in crop growth in a field negatively impacts farmers by reducing the yield and hence the profit. Mapping patterns of crop growth in a field will provide insights to the farmer about areas of high, average and poor growth. Remotely sensed data collected from satellites and aircrafts from multiple years are used for mapping crop growth patterns. The primary objective of the current research project was to map variations in four fields that were planted to pearl millet. Normalized Difference Vegetation Index (NDVI) derived from Landsat satellite images acquired during three growing seasons were used to analyze patterns of crop growth. NDVI values are higher when crop vigor or health is good, and lower when under stressed or poor growth conditions. Fields were grouped to above or below average growth based on median NDVI values. These composite maps will provide valuable insights to the farmers to identify and prioritize areas for treatment aimed at reducing future variability in crop growth.

**Tabletop Gaming in Augmented Reality**

Rick Matza, Evan Turner, David Reynolds, and Joe Eleshuk with Dr. Ruben Gamboa
Computer Science
University of Wyoming

Oral Presentation

*Computer Science* *Laramie, WY*

The goal of this project was to create a mobile app that, using augmented reality, allows up to four players to play a "dungeon-crawler" tabletop game. Each player controls a character by moving a marker between tiles representing the rooms of a dungeon. Using these markers, the app shows each player character and allows them to battle with enemies placed about the dungeon. Ultimately, players will work together to defeat a powerful boss monster and escape the dungeon.

**Microgravity Testing Platform - Aerodynamics Team**

Cameron Ellis, Barbara Giffin, Daniel Kerbs, and Chris Marcum
with Dr. Kevin Kilty
Mechanical Engineering
University of Wyoming

Oral Presentation

*Mechanical Engineering Senior Design* *Laramie, WY*

This team's purpose is to lower drag coefficients on the aerobody platform in order to improve microgravity, resulting in a higher quality product. In addition, other aerodynamic properties of the aerobody such as location of the center of pressure, restoring moments, and boundary layer effects have been determined in order to assist other teams on their designs. The optimal aerobody design will be determined after a number of test flights have been performed to verify other team's projects. The drag on the original design has been compared to drag on various aerobody designs, such as the implementation of a ringleb cusp as well as with and without the boom and tail fins implemented in the original design. Testing was performed using the mezzanine wind tunnel, and includes experimentally quantifying drag and observing boundary layer effects through smoke trail testing, as well as analytically determining the center of pressure and restoring moments. Restoring moments of the aerobody will greatly affect the Controls team's design, including how many wheels need to be implemented, as well as motor sizes. Through these various tests and calculations, improvements will be made to the aerobody design in order to lower drag coefficients on the body, thereby improving the overall quality of the microgravity.

**Predator Guards and Increased Reproductive Success of American Kestrel (*Falco sparverius*) Occupying Artificial Nest Boxes**

John "Morgan" Elsom, and Dr. Scott Newbold
Department of Life Sciences, Biology Program Sheridan College

Poster

*Department of Life Sciences* *Buffalo, WY*

The American Kestrel (*Falco sparverius*) is a raptor that has experienced population declines in various parts of the U.S.. Installation of artificial nest boxes is one possible technique to boost populations, but boxes can be targeted by predators. In previous studies at the Wolf Creek Ranch study site, others found that raccoons and magpies were visiting nest boxes regularly. By adding predator guards to the poles of nest boxes, I predicted the number of kestrel young surviving to the fledgling stage would increase. Four predator guards, 2 tin metal and 2 plastic, were installed on the poles of four nest boxes with the most kestrel activity. Kestrel breeding data (e.g., number of eggs) was observed with weekly box checks. Predator activity was directly observed using camera traps and indirectly inferred from box inspections. Preliminary results from 2013-2015 show that raccoons are able to climb the pole all the way up to the nest box itself. In 2015, 18 kestrel eggs were laid and raccoons visited the nest boxes 18 times. In 2015, no kestrel young fledged and camera photos showed raccoons with kestrel young in their mouths. In contrast to these previous results, in 2016 following installation of the guards, kestrel pairs had 21 eggs and 6 nestling survived to fledge. Raccoons made two visits to two separate nest boxes in 2016 and were unable to climb past the predator guard to the nest box. Therefore, the addition of predator guards may be a successful tool in kestrel conservation.

**Parallel genetic pathways contribute to epidermal structure and resistance of biomechanical force during *C. elegans* development**

Kyla Esposito with Dr. David Fay
Molecular Biology
University of Wyoming

Oral Presentation

*INBRE* *Longmont, CO*

During development, biomechanical forces shape the embryo from an oval to an elongated cylindrical form. FBN-1 is a *C. elegans* zona pellucida domain protein that is synthesized and transported to the outside of the worm forming long fibers that bind to the epidermis, allowing for the maintenance of proper shape while undergoing the biomechanical pulling force of the elongating pharynx during embryogenesis. The worm FBN-1 is conserved in vertebrate fibrillin proteins in which mutations cause the disease Marfan Syndrome. The worm SYM-4 is a highly conserved protein in vertebrates and controls endocytic recycling and exocytosis in epithelia. *fbn-1* and *sym-4* work in parallel pathways to enhance Pharynx-ingressed (PIN) phenotype, a larval synthetically lethal phenotype. PIN is characterized by the posterior displacement of the pharynx and buccal capsule resulting in larvae that are unable to feed. The goal of this project was to determine other genes that may be working with *fbn-1* and *sym*-4 to allow the epidermis to resist the biomechanical force of the pharynx as it develops. Two strains of worms were used each containing a hypomorphic allele for *fbn-1* and *sym-4*, respectively. A RNAi screen was performed to look for enhanced PIN in a hypersensitized *sym-4* mutant and produced 32 genes that enhanced the PIN phenotype. These enhancers were then tested in the *fbn-1* background to determine which of the parallel pathways, FBN-1 or SYM-4, the gene was in.

**The Impact of Invasive Tree Species on Birds**

Angelina Evans Hutzenbiler and Micah Humphreys
Agriculture Department
Northwest College, Powell, WY

Poster Presentation

*Range Management Program* *Lovell, WY*

For years agriculturalists and scientists have worked to find more innovative ways to redirect and manage waterways. Doing so, has allowed for canals, ditches, and ultimately irrigation, supporting the growth of many crops, especially in dry areas like the Big Horn Basin. However, changes in the waterways have also caused dramatic changes in the riparian ecosystems. Native trees such as the willows (*Salix* spp.) and cottonwoods (*Populus deltoides* and *P. angustifolia*) require point bars for establishment. In cases where flooding is decreased, these key stream components do not form, causing more tolerant and faster growing non-native species to establish in the area. The hypothesis of negative influences on bird species by invasive Russian olive (*Elaeagnus angustifolia*) and tamarisk (*Tamarix* spp.) trees was investigated along the Bighorn river north of Lovell, Wyoming. The habitat along the river was noted and stand counts of tree species were taken at three points along four transects from the river's edge, outward. Bird vegetation preferences were measured along four transects with three point counts. Each transect was approximately 250m apart and 250m in length. Point count duration was 10 minutes. One morning was used specifically for stand counts and three were used specifically for bird point counts. It is expected that resident bird species will show greater preference for native vegetation such as willows and cottonwoods than non-native Russian olive and tamarisk trees.

**Thompson Creek Field EOR Study**

Ikechukwu Ezugwu, Michael Gill, Domonique Martinez, Josh Miller, James Weiss
Doug Cuthbertson
Department of Petroleum Engineering University of Wyoming

Oral Presentation

*College of Engineering* *Laramie, WY*

In the petroleum industry it is important to expand on enhanced oil recovery (EOR) methods to economically recover hydrocarbons from favorable fields. EOR is considered a tertiary recovery process in which to stimulate and increase production up to an additional 75 percent of recoverable hydrocarbons; proving to be a valuable recovery resource to increase margins for return on investment. The objective of this study was to increase production in the Thompson Creek Field with methods from EOR as it pertains to heavy oil, low temperatures, and shallow formations. The study included additional chemical EOR methods for economic evaluation to determine the optimal recovery specifically for this field's properties. The pilot area consisted of 39 producing wells in the Thompson Creek Field. The field is located in Northeast Wyoming, which produces from the Recluse (Muddy) formation in the Powder River Basin. The static model in Petrel indicated placements of additional horizontal wells to increase the field production in combination with chemical EOR injection methods. The planning, workover, and studies were conducted in a manner as dictated by Federal, State, and Local laws and regulations. Based on the findings, a recommendation and conclusion was provided to the current operator of the Thompson Creek Field, Signal Hill Company, LLC.

**MouseVision**

Cody Fagley, Mark Gradecki, Wyatt Horner, Shane Firnekas with Ruben Gamboa
Computer Science
University of Wyoming

Oral Presentation

*Senior Design* *Laramie, WY*

MouseVision is a project that combines optical tracking and speech recognition software to create a mouse that does not rely on the use of arms and legs. It utilizes the openCV API to find an initial point to track and creates a point vector. Then it detects changes in the point vector to create a corresponding change in the mouse position on screen. It combines this aspect with the CMU Sphinx speech recognition library to perform clicks when the end user says "left click" or "right click". The goal of this project was to make an interface that used cost-effective hardware, such as a webcam and microphone, to allow someone who is quadriplegic, or otherwise physically limited, to operate a mouse cursor. The project is considered successful, because a person without any arms at all is able to do basic computer tasks, such as play chess, using the MouseVision software.

**Determining Consumer Interest in Bacterial Cellulose and Increasing Production Yields**

Logan A. Fairbourn, Rachel M. Watson
Department of Microbiology
Natalie R. Thibault, Drs. Jennifer Harmon and Elizabeth Mitten
Department of Family and Consumer Science
The University of Wyoming

Poster Presentation

*McNair, WRSP* *Cheyenne, WY*

The latest EPA estimates suggest textile waste accounts for nearly 9% of all solid municipal waste, lending to the notion that the textile industry has reached an apogee in unsustainable practices (EPA, 2012). As such, the global community remains in dire need of an eco-friendly textile alternative: a niche bacterial cellulose – the result of fermentation processes by the acetic acid bacterium *Komagataeibacter xylinus* – is uniquely poised to fill due to its being both chemically inert and biodegradable. That said, its potential as a textile alternative is moot so long as consumer interest is not aligned with the product; thus, we aim to determine consumer perspectives on bacterial cellulose in order to further modulate the material to meet consumer demands. Additionally, we will identify common consumer beliefs relating to potential end-uses of bacterial cellulose. Finally, we aim to quantify production increases as a result of adding caffeine, a xanthine, to the production medium – an action that leads to the up-regulation of cellulose production through the inhibition of Phosphodiesterase A (Romling et al., 2005).

**Counteractive Affirmative Action: Correcting Labor Market Discrimination**

Anthony Farmer with Dr. David Finnoff
Economics
University of Wyoming

Poster and Oral Presentation

*Honors* *Cheyenne, WY*

Minorities tend to experience higher rates of unemployment than those of white individuals (Bureau of Labor Statistics, 2017). Controlling for pre-labor market skills, data shows a wage discrepancy resulting solely from race (Antonji and Blank, 1999), which suggests that race plays a role in labor market interactions. In an attempt to understand the causal mechanisms behind this disparate treatment one must turn to the theory of statistical discrimination, which states that the combination employer prior beliefs and imperfect information leads to discriminant hiring behavior (Coate and Loury, 1993). This model of labor market discrimination creates a negative feedback loop that is self-reinforcing. This behavior leads to a higher number of unemployed minorities. This, coupled with de facto segregation leads to a phenomena known as street vice concentration. This phenomena is linked to higher rates of urban crime (Krivo and Peterson, 1996), which results in high societal costs (Kyckelhahn, 2012). The purpose of this project was to create an intervention to counteract the negative externalities of statistical discrimination in the labor market. This project proposes a tax incentive model of affirmative action that will mitigate these externalities. The model is appropriately named Counteractive Affirmative Action. The model is shown to be fully adjustable to differing employer behaviors and responses.

**Understanding the Role of Natural Killer Cell Cytotoxicity on Immune Exhaustion and the Quality of CD4 and CD8 Response During Chronic Infection with *Toxoplasma gondii***

Rida Fatima, Jason Gigley
Molecular Biology
University of Wyoming

Oral Presentation

*INBRE and Honors Program* *Rock Springs, WY*

30% of the world's population is infected by *Toxoplasma gondii* including, more than 60 million people in the USA alone (CDC 2015). Toxoplasma poses a critical threat to individuals with a weakened immune system such as HIV/AIDS patients (Mayo Clinic 2014). In addition, severe birth defects, blindness, and abortion can occur in the fetus when the parasite is transmitted to healthy mothers who are pregnant (Sibley 2012). Thus, understanding how long term immunity protects against this parasite is important for better therapy design. Natural Killer cells (NK cells) are known to be important for early protection against Toxoplasma. Recently, it has been discovered that NK cells can also be detrimental to the proper function of long-term immunity against the parasite. We test what function of NK cells is required to negatively regulate the immune response resulting in parasite reactivation and death of animals. Also, we further explore how this NK cell function impacts the quality of CD4 and CD8 T cells in long term immunity to the parasite.

**Investigating the Role of *ari-1* in *C. elegans***

Jana Favela, Dr. David Fay
Molecular Biology
University of Wyoming

Poster

*INBRE* *Traverse City, MI*

The attachment of one or several ubiquitin (Ub) molecules to a target protein, ubiquitination, is an important post-translational protein modification. Ubiquitination of a target protein may lead to degradation via the proteasome, translocation, or alteration of activity. This process requires an E1 (Ub-activating), E2 (Ub-conjugating) and E3 (Ub-ligase) enzyme. A *C. elegans* homolog of the highly conserved Ariadne RBR E3 (ARIH1), *ari-1 (C27A12.8)* is highly expressed in muscles, neurons, and the germline, and has previously been found to function in pharyngeal development. However, deletion of *ari-1(tm2549)* did not produce any observable effect. This result is likely due to genetic redundancy as *C. elegans* possess two *ari* paralogs, C27A12.7 and C27A12.6. Recently, our lab generated a deletion in all 3 *ari* homologs (*ari3X*) using CRISPR technology. Partial sterility was observed and quantified in *ari3X* null mutants. The data indicate increased sterility OF *ari3X*, compared to wild type controls. Further analyses indicate a Mog (masculinization of germline) phenotype in sterile *ari3X* mutants, resulting in increased sperm production. An RNAi screen of a known E2 partner of *ari-1*, *ubc-18*, revealed increased sterility with *fbf(RNAi)*, which has been shown to function in germline development. Based off this preliminary information, *ari3X* mutants were evaluated on *fbf(RNAi)* to elucidate their role in germline development. A drastic increase in sterility due to Mog, along with an unanticipated multivulval phenotype was observed for *ari3X* mutants on *fbf(RNAi)*. Taken together, these results indicate an important role for ARI-UBC-18 ubiquitination in germline development.

**The Viability of Somatic Coliphage as a Water Quality Indicator**

Eisaac Flowers and Jay Dickerson
Biology Department
Northwest College

Poster

*INBRE* *Powell, WY*

Somatic coliphages are viruses infecting *Escherichia coli and other coliform* bacteria that live in mammal intestines. Recent epidemiological studies indicate that somatic coliphages have potential to serve as indicator organisms of recent fecal pollution in recreational waters. However, concerns exist that somatic coliphages, like bacterial indicators, may replicate in the environment. Our study examines whether the potential for environmental replication is of enough significance to re-evaluate or exclude them from use as a water quality indicator. Environmental coliphages and *E. coli* were isolated from mule deer (*Odocoileus hemionus*) fecal samples collected in Cody, Wyoming, using USEPA Method 1602: Male-specific (F+) and Somatic Coliphage in Water by Single Agar Layer (SAL) Procedure, and eosin methylene blue agar, respectively. All *E. coli* isolates were further confirmed on nutrient agar with MUG. Isolated somatic coliphages were picked, and spot-plated onto TSA plates poured with isolated strains of *E. coli*. After incubation at 37°C for 24h, the formation of plaques indicated the coliphages had successfully infected and burst the *E. coli* cells. The percentage of coliphage isolates capable of causing infecting, and lysing *E. coli* collected from the same fecal sample has been calculated and is reported here.

**Cheyenne Frontier Days: The Accuracy of Representation**

Taylor Fontes with Dr. David Messenger
History Department
University of Wyoming

Oral Presentation

*History Department* *Cheyenne, WY*

The 19th century American west was the period that allowed the West to grow and led many Americans to think about the meaning of settling the West, and how to integrate new values and concepts into the idea of America. Although many historians have examined the West in different lights, there is always the idea that the Wild West had cowboys and Indians. In 1897, during the later 19th century, at a time when most believed that the frontier was closing, to the city of Cheyenne decided to host the first annual Frontier Days. This one-day event in the 19th century is still held today nearly 121 years later as a week-long celebration of the west and is considered the world's largest outdoor rodeo and a large part of the state's history. The concept behind this celebration came from wanting to cherish the ideas and culture of the west that took hundreds of years to create. Throughout the last 121 years, Cheyenne Frontier Days has both depicted, and modified the original meaning of the rodeo to celebrate the American West in the 19th century. By focusing on the depiction of cowboys and Indians at Frontier Days, this project will examine how the event more broadly links the West to American identity.

**Perception vs. Reality: Historical Significance of Japanese Relocation during World War II**

Taylor Fontes with Dr. Renee Laegreid
History Department
University of Wyoming

Poster Presentation

*EPSCoR/McNair* *Cheyenne, WY*

This poster will analyze the differences between how Americans during World War II perceived the treatment of Japanese Americans in relocation centers compare to their actual experiences. The main part of the poster is the research conducted for the research paper and the experience that I had visiting the relocation center as well as the interesting artifacts found at the American Heritage Center. The body analyzes the relocation of Japanese Americans and how the media affected the perception of Japanese American experiences based off of newspapers and political cartoons. The examples of newspaper and political cartoon propaganda give insight into how luxurious white Americans thought relocation centers were in comparison to the realistic harsh and difficult conditions with little amenities due to what the media was feeding the US population. War time hysteria propaganda can be used to make any uninformed citizen fear and hate neighbors who are not enemies. The second part of the project discusses the treatment and perception of Japanese Americans to how Syrian refugees are treated in the 21st century by white Americans. The question that created this poster and research was, how have American experiences with relocation camps taught future generations lessons in collective punishment and incarceration of innocent people?

**Associations Between Perceived Physical Safety, Disengagement, and Trust in a Cohabiting Relationship**

Garrett Formo with Dr. Robin Barry
Psychology
University of Wyoming

Poster Presentation

*EPSCoR* *Laramie, WY*

Physical violence in cohabiting relationships is prevalent and is associated with mental and physical health problems. Indeed, domestic violence accounts for 15% of all violent crime committed in the United States (NCADV 2015). From 2003-2012, more than one-third of domestic violence cases that occurred between intimate partners were serious violent crimes and 64% were simple assault (U.S. DoJ 2014). Although rates of domestic violence have decreased 67% since the Violence Against Women act was passed in 1994 (NCADV 2015), the fact that serious domestic violence still happens is simply enough to incite moral concern. In the present study, we test whether people who perceive that their partner has endangered their physical safety are more disengaged (e.g., avoidant and withdrawn) during discussions with their partner and have lower trust levels regarding physical safety. Additionally, we will explore the concept of *cognitive trickery/bias*: how a person can perceive something about their lives that is in reality not true (e.g., "my partner is very supportive of me in my times of need" when in fact, their partner is not); these individuals might be less likely to behave or feel differently about their partner after experiences of physical violence, so we will examine whether individuals' relationship satisfaction moderates the influence of experiences of physical violence with the partner on their tendency to disengage and their trust in their partner and how it, along with understanding the epistemological limitations of testimony, can have an impact on psychological preconceptions regarding these variables.

**Wyoming Wheels: Increasing the Ergonomic Efficiency of Manual Wheelchairs**

James Francis, Tyler Kissel, Scott Ratliff, Megan Richter
Mentored by Dr. Kevin Kilty
University of Wyoming

Oral and poster presentation

*Mechanical Engineering* *Laramie, WY*

An estimated 3.3 million Americans use manual wheelchairs daily. 30-50% of these wheelchair users will develop arm pain and injury from the constant operation of their wheelchairs due to the ergonomically inefficient structure of a wheelchair. These injuries further destabilize the mobility of users and decrease their overall quality of life. As manual wheelchair use increases with the growing retirement-aged Americans, it furthers a need for ergonomic devices which allow users a better standard of living. Wyoming Wheels works to increase the ergonomic efficiency of a manual wheelchair by applying three major components: ergonomic ratcheting drive-levers; an independent braking system; and a geared transmission. With these mechanisms, manual wheelchair users apply larger muscle groups in their arm, chest and back, delaying the onset of muscle fatigue. Concurrently, Wyoming Wheels' device brings users' hands away from push rims, minimizing contact with moving parts. Wyoming Wheels used Solidworks modelling and 3D printing to provide prototype construction and prove the viability and functionality of the preliminary design. Further validation of the initial prototype occurred with the physical machining and assembly of metal components and a newly designed tire hub. These parts attached to an existing wheelchair frame to test Wyoming Wheels' design and confirm it performs as anticipated.

Assembly testing will ultimately prove the crux of Wyoming Wheels' design. However, as UW policy makes it prohibitive to find experimental subjects, the Wyoming Wheels' team will perform as the pilot testers for system assessment. Metrics measured will include the following: quarter-mile time; maximum possible climb angle/s; device maneuverability over an eight hour period; assembly weight; and functionality analysis from disability experts.

**Secure Pet Door**

Mardee Urban and Thomas Freeman with Jerry Hamann
Electrical and Computer Engineering
University of Wyoming

Oral and Poster Presentation

*EPSCoR* *Cheyenne, WY*

Pet doors provide a luxury to homeowners to allow their pets outside without the homeowners' presence. However, the pet door typically is a rubber flap to create a barrier between the home and the outside world. The goal of this project was to design a more secure pet door that also decreases the amount of heat that is lost through the opening the pet door creates. To accomplish this goal we have decided to use a RFID controlled locking mechanism that the pet can wear on its collar.

**Humic Acid Extraction from Powder River Basin Coal**

Emily Fretland, Trey Herrera, Meghan Jacobs, Stephen Kristy, Michael McMinime
Dr David Bell
University of Wyoming

Oral Presentation

*Engineering Senior Design* *Laramie, WY*

Extraction of humic acids from Powder River Basin (PRB) coal to develop agricultural supplements as an alternative use for coal was our goal with this Senior Design Project. The result concluded that extraction from coal can be performed. The extraction method takes solid, surface coal and crushes it. Then potassium hydroxide and sulfuric acid are added in separate reaction vessels to precipitate out the humic acid from the other salts. The coal will be taken out and sold as a byproduct, as well the other salts. The generation of the acid is done onsite and much of our steam and water is recycled within our process. The economic benefit of this project comes from the region of location. Wyoming has dry arid soil and a surplus of surface coal. This provides an alternative use for the coal that can't be used, as well as improving the fertility of soil. Our 15-year project life yields a net present value at a discount factor of 10% to be $228 million and an IRR of 29.9%. The biggest risk factor for this project happens to be the market. Coal, acids, bases, and fertilizers all depend on the global economy and market. Other risk factors include environmental permitting and safety mitiation. In conclusion, the plant design has proven to be economical, beneficial, and profitable and humic acid extraction is a promising fertilizer for the future that could benefit the coal, as well as the agricultural, industry.

**Portable Solar Powered Water Sterilization System**

Kyle Struna, Justin Oborny, Diego Fronza, Jaimie Wages, Kevin Kilty, & Jonathan Brant
Department of Mechanical Engineering
University of Wyoming

Oral Presentation

*Mechanical Engineering Senior Design* *Laramie, WY*

With days spent off-grid, acquiring safe water to drink, clean, and cook with becomes a necessity. For the average backpacker, this usually means utilizing a number of methods to protect against waterborne illnesses caused by contaminates, such as heavy metals and pathogens. Nearly all of these methods are either: expensive, energy intensive, time consuming, require chemicals, or some combination. Therefore, it becomes evident that there is a problem that can be resolved through engineering and innovation. The design objective is to enhance the standard 100 milliliter high-density polyethylene bottle with a two-piece lid and case system. The system design integrates solar power to drive mechanical pumping, filtration to remove bacteria and cysts, and UV-C LED sterilization to kill any remaining viruses. Incorporating these components produces a self-contained system that is lightweight, quick, and easy to use. Most importantly, this system provides a proactive and comprehensive solution to acquiring safe drinking water on-the-go. The full system is comprised of a lightweight and compact solar battery, a micro-submersible pump, beverage grade hosing, a .1-micron carbon and/or hollow fiber membrane filter, a 3D printed attachment case, and a 3D printed lid housing both the UV-C LED and USB adapter. An important feature to note is that the UV-C LED and membrane filter can be used independently of one another during failure mode scenarios. When combined, filtration and UV-C offers users the ability to vigorously and completely treat contaminated water. Overall, this combined system puts a personal portable water treatment plant in users' hands.

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Oral Presentation

*Mechanical Engineering Senior Design* *Laramie, WY*

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**The Expression of Peptidylarginine Deiminase Enzymes in Uterine Tumor Cells**

Gard, P., Cherrington, B.
Department of Zoology and Physiology,
University of Wyoming

Peptidylarginine deiminase (PAD) enzymes post-translationally convert positively charged arginine amino acids into neutral citrulline residues. A major target for PAD catalyzed citrullination is arginine residues on histone tails. Citrullination of histones results in changes in chromatin organization and gene expression. There are five PAD isoforms designated PADs 1, 2, 3, 4 and 6. PADs 1-4 have catalytic activity, while PAD 6 is believed to be a structural protein limited to preimplantation embryos. PAD enzymes are highly expressed in multiple female reproductive tissues. For example, the first studies investigating this enzyme family showed strong PAD expression localized to uterine luminal and glandular epithelial cells. More recently, work from our lab demonstrated that PAD2 and 4 are highly expressed in sheep uterine epithelial cells during early pregnancy. Using a cell line derived from sheep uterine cells, we showed that PADs citrullinate histones to regulate expression of genes involved in blastocyst implantation. Based on these findings, we hypothesized that PAD enzymes are expressed in human uterine and cervical epithelial cells. To test this possibility, we first investigated if a human uterine-cervical cell line termed HeLa cells expresses PAD enzymes. HeLa cell lysates were examined by western blot analysis and probed with antibodies specific to each PAD isoform. Our results indicate that the PAD 1-4 isoforms are all expressed in HeLa cells. Since these cells are a well characterized uterine-cervical cancer line, we next hypothesized that PAD enzymes are expressed in uterine tumors. This hypothesis was tested by examining uterine tumors with immunohistochemistry using PAD isoform specific antibodies. Our results demonstrate that PADs 2 and 4 are expressed within the uterine tumors. Since PADs 2 and 4 localize in the nucleus, we next plan to examine if they citrullinate histones in HeLa cells to regulate expression of cancer related genes. Although further investigation is clearly necessary, our findings suggests that PAD catalyzed citrullination may be an important post-translational mechanism in uterine cancer cells.

**DSM-5 Changes Increase ADHD Symptom Endorsement Among College Students**

Anna Garner with Dr. Cynthia Hartung
Psychology
University of Wyoming
Oral presentation

*INBRE* *Afton, WY*

In the most recent iteration of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*), changes were made to the diagnostic criteria for Attention-Deficit/Hyperactivity Disorder (ADHD); among these changes were parenthetical examples of adult behavior that were added for each symptom. This was done to make the criteria developmentally appropriate for adolescents and adults. Prior research has found that the changes significantly increased the number of symptoms parents of adolescents with ADHD endorsed for their children. This study conducted a similar procedure with a community sample of college students and collateral reports from a small group of participants with ADHD and matched controls. This study was conducted at four universities in the Western, Midwestern, and Easter United States; participants were undergraduate students (ages 18-25) who rated themselves on the *DSM-IV* and *DSM-5* checklists, as well as the Weiss Functional

Impairment Rating Scale – Self-Report (WFIRS) and the Depression Anxiety Stress Scale (DASS-21). Parents of some participants in the ADHD group within the sample were contacted with the consent of their child to provide collateral reports, completing the *DSM-IV* and *DSM-5* checklists on their child's behaviors and the WFIRS other-report. The *DSM-IV* and *DSM-5* checklists were counterbalanced in the survey. To test the hypothesis that the changes to the *DSM* criteria would increase symptoms endorsed, a repeated measures ANOVA was conducted. The within-subjects variable was *DSM* edition, and it was found that college students endorsed significantly more symptoms, specifically inattentive symptoms, using the *DSM-5* checklist.

**Teaching an Essential Literacy Strategy to Third Graders**

Olivia Gaudesi with Christi Thompson
Elementary Education
University of Wyoming

Poster Presentation

*Honors Department* *Chino, CA*

Teaching elementary education effectively is an experience that faces many different factors; some obvious, such as behavior and time management. It also includes factors that are sometimes overlooked such as varied student skill levels within one classroom and a one to thirty ratio between the teachers and students. Due to this, teachers must differentiate instruction in a stride towards utilizing the best practices to encourage student growth levels in reading and writing. The intent of this project is to determine if using the "gradual release model" and "teacher modeling" strategies are best practices for teaching how to use reading and writing to summarize non-fiction text. Students were led through a literacy unit of four lessons, and assessed based on their final writing component on day four. The varied growth results from students of different reading and writing levels are analyzed and discussed.

**Geologic Map of lower ocean crust at Pito Deep (S Central Pacific)**

Michelle Gess
Mentors: Drs. Barbara John and Mike Cheadle
Department of Geology and Geophysics
University of Wyoming

Both oral and poster presentation

*NSF and Department Fellowship* *Lakewood, CO*

The formation of ocean crust at mid-ocean ridges is one of the fundamental processes of plate tectonics and Earth evolution. However, our knowledge of how the lower gabbroic ocean crust grows is limited due to inaccessibility. Gabbroic rocks constitute > 75% of the ocean crust generated at fast spreading mid-ocean ridges, but are typically buried beneath ~ 1km of sediment, basalts and dikes which inhibits sampling. During January and February of 2017, a 42- day research cruise explored >35 km along a flow line of *in-situ* fast spread lower crust at Pito Deep (southern Pacific). There, the ridge-perpendicular exposures along the steep scarps (with up to 3 km of vertical section) of the Pito Deep canyon provide an unique opportunity to sample this lower gabbroic crust, and therefore differentiate between models for accretion and growth using petrologic, geochemical, and microstructural data. Over 400 samples were collected by the remotely operated vehicle (ROV) system JASON II using hydraulic arms and high resolution cameras to illuminate the rock exposures, with the majority of the samples being gabbroic. Post-cruise analysis of ROV dive videos (recording sample collection and outcrops along the sea floor) allows construction of the first geologic map of *in situ* lower ocean crust (>10 $km^2$ of seafloor). Geologic features emphasized in the map include magmatic foliations, layering, cross cutting fractures, faults, and associated striae. This structural synthesis allows a new evaluation of the construction of lower ocean crust which was not previously possible.

**CubeSat Functionality and Microgravity Testing Platform: Aerodynamics**

Barbara Giffin with Dr. Kevin Kilty
Mechanical Engineering
University of Wyoming

Oral Presentation

*Mechanical Engineering Senior Design* *Laramie, WY*

This project aims to develop a new process of providing a microgravity environment for CubeSat testing. This is a collaboration among many senior design groups. An aerobody will be dropped from 100,000 ft from a weather balloon with CubeSats, electrical equipment, and reaction wheels inside. This will provide about 20 seconds of microgravity, in a cheaper, more economically feasible way. My team's purpose is to lower drag coefficients on the aerobody in order to improve microgravity, resulting in a higher quality product. In addition, other aerodynamic properties of the aerobody such as location of the center of pressure, restoring moments, and boundary layer effects have been determined in order to assist other teams. In order to determine the optimal aerobody design, the drag on the original design has been compared to drag on various aerobody designs. Testing was performed using the mezzanine wind tunnel, and includes experimentally quantifying drag and observing boundary layer effects through smoke trail testing, as well as analytically determining the center of pressure and restoring moments. Restoring moments of the aerobody will greatly impact the Controls team's design, including how many wheels need to be implemented and the motor size needed. Through these various tests and calculations, improvements will be made to the aerobody design in order to lower drag coefficients on the body, thereby improving the overall quality of the microgravity and the product.

**Assessment of Computer Vision and Image Processing Pipelines for Fiber Quantification in PMC Laminates from Optical Images**

Kyle Gilman and Cameron Wright, Ph.D., P.E.
Department of Electrical and Computer Engineering
University of Wyoming

Oral and Poster Presentation

*Supported by U.S. Air Force Research Laboratory* *Powell, WY*

A novel approach to fiber quantification in polymer matrix composite laminates from bright-field light optical microscopy images is proposed that enables rapid detection of the key 2D fiber metrics. A hybrid technique uses the Scale-Invariant Feature Transform (SIFT) to identify the minor axis of each carbon fiber and the convolution of complex phase-coded Hough filters with the fiber Sobel edges to extract the centroid, major axis, and rotational orientation information. Active contour segmentation is investigated using SIFT keypoints as seeds for the algorithm. Comparisons are made between different segmentation techniques and current state-of-the-art algorithms like the Przybyla-Bricker Hough ellipse method. I present results showing this novel algorithm to have similarly accurate fiber count and metrics as Przybyla-Bricker with significant computational speedup.

**Pension Fund Strategic Positioning**

Evan Giusto (Mentor: Philip Treick)
College of Business, Department of Finance
University of Wyoming

Oral

*Honors Program* *Lakewood, CO*

Pension funds have struggled in recent years to adapt to the low yield climate driven by low interest rates and volatile markets. As a result, they have struggled to maintain funding to meet their accrued pension liabilities. In order to meet the growing demands of their liabilities, pension funds have migrated away from low- risk assets towards riskier assets, which have changed the investment composition and risk profiles of these funds. This paper identifies historical pension fund investment allocations and how those have proportionally changed over time. Despite pursuing different and riskier investment vehicles, pension funds continue to struggle to meet their liabilities. Among these risky assets, the focus of this paper will be on private equity and alternative assets. This paper then analyzes the implications and repercussions of investing in such assets, and what this means for the future of pension funds.

**Charlton 30/31 Basin, Michigan**

Kalu Okonkwo, Yeshet Gobena, and Audi Hartoko with Dr. Douglas Cuthbertson
Petroleum Engineering
University of Wyoming
Oral Presentation

*Petroleum Engineering* *Laramie, WY*

The Charlton 30/31 field, which is situated in the Northern Reef Trend of the Michigan Basin, was established in the stratigraphic unit generally known as the Niagaran Brown. There has been oil and gas production in the reefs of the Michigan Basin since 1925 when production was established in the southern Michigan Basin Silurian Reef Trend. In the northern reef trend, production started in 1969 and peaked in the late 1970s as well as early 1980s. The Northern Reef Trend consists of over 700 producing reefs with a significant production of over 1 million barrels of oil with six wells drilled in the 1970's to produce the field. This project is aimed at developing a static model and producing optimal field development plan for the drilling of additional boreholes for production in the Charlton 30/31 field in Michigan with given 3D seismic survey and six well log data. These data will be analyzed and interpreted using petrel and reservoir static model will be developed after which an optimal field will be developed for producing additional boreholes.

**Microgravity Testing Platform: Data Acquisition and Communication Team**

Jesse Gonzales, Grant Lindblom, Kaitlin Laughlin, Mohamed Zayed with Dr. Steven Barrett
Electrical and Computer Engineering
University of Wyoming with NASA
Oral and Poster Presentation

*CEAS* *Guernsey, WY, Gillette, WY, Westminster, CO, Tripoli, Libya*

Currently, NASA uses several methods to replicate a "microgravity" environment on earth. The two most popular include reduced-gravity aircraft and drop facilities. A reduced-gravity aircraft is a plane that flies in a parabolic path. On the negative sloping arcs of the flight path, the contents of the plane will be in free fall for approximately 20 seconds. Drop facilities are like giant vacuum tubes. The air will be pumped out of the shaft. This provides a low-pressure environment for which to drop test packages, and achieves approximately 2 seconds of free fall. Our goal is simple. We want to provide an additional earth-based method for which to simulate microgravity. We are using a weather balloon to tow a test package to 100,000 feet. Once the package is at 100,000 feet, we will detach the package from the weather balloon and allow it to fall for 20 seconds before deploying a parachute for recovery. At this height, the air resistance is so low that an object in free fall will fall extremely close to the acceleration of gravity. This is the goal of every earth based microgravity project, and one we will meet. The data acquisition and communication team is responsible for building a system for just that. This system allows us to communicate with that package via radio. The system includes instruments to measure GPS location, temperature, acceleration, and pressure. This data transmits to a team on the ground. The communication system also allows us to issue commands to drop the test package and deploy the parachute.

**Point of Care Diagnostics**

Garrett Goostree, Riley Henderson, Katie Nelson, Brandon Wehrle, Kaitlyn Weitzman, and John Oakey
Chemical Engineering
University of Wyoming

Oral

*Senior Design* *Laramie, WY*

*Coagutain* aims to develop a point-of-care (POC) blood diagnostic device, to fit a known market need. The device would be an at-home point of care (POC) device to measure blood thickness via a prothrombin time (PT) test, and convert it to an international normalized ratio (INR). This test was chosen due to the large number of anticoagulant prescriptions circulating the United States, the un-optimized current monitoring system, and the open market availablity. To incentivize this product, an additional N-terminal prohormone of brain natriuretic peptide (NT-proBNP) concentration monitoring test was included. We chose to use a mechanical testing method to conduct the PT/INR test over other methods based on electronic, magnetic, or fluorescent properties due to the associated low costs of production and mechanism simplicity. The chosen technology works by mixing the blood with a sample of tissue factor to initiate clotting. Then, a constantly spinning wheel picks up clotted blood and passes it by a light source. When the light source is interrupted, the test is completed and the INR is calculated. The NT-proBNP test will work based on the intensity of chemiluminescence that the hormone emits when bound between two antibodies, one conjugated to a magnetic bead and one to ruthenium metal, then subjected to a voltage. The intensity of chemiluminescence observed can be converted into an electric signal which directly correlates to the concentration of NT-proBNP in the blood sample.

**Personality and pair bonds: Future research to investigate communication and coordination on a problem-solving task in captive zebra finches**

Rachel Graham with Sarah Benson-Amram
Zoology and Physiology
University of Wyoming

Poster Presentation

*INBRE* *Riverton, WY*

Zebra finches (*Aeniopygia 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. This particular study will investigate whether personality of pair bond members influences the pair's coordination on a novel problem-solving task. We plan to form pair bonds of zebra finches with similar personality types and pair bonds of zebra finches with dissimilar personality types. The paired birds will then be placed into a maze that will require them to pool their knowledge in order to find a food reward. We will also investigate whether communication plays a role in coordinated problem solving and whether personality influences how communicative mates are with each other while they are in the maze. This study is important in bringing in the potential influence of personality on cognition and fitness and why personality may be a critical component of mate choice for species where pair bonded mates exhibit a lot of coordination in parental care and foraging.

**What Qualifies As Crisis Coverage & Why Does It Matter?: Establishing Characteristics of Crisis Reporting Using 2015 Terror Attacks in Paris**

Brooklynn Gray & Dr. Leah LeFebvre
Communication and Journalism
University of Wyoming

Oral Presentation

*Honors* *Laramie, WY*

The Paris attacks serve as a recent and relevant example of the differences between regular news reporting and crisis reporting, based on the circumstances of the crisis in question. Three main aspects serve as dominant features in crisis reporting than in day-by-day reporting. These are timeliness, authority, and the level of the crisis (often the death toll or infrastructure damage). This paper will examine the Paris attacks from November 2015, the circumstances surrounding ISIS at the time, and the way news media reported on the crisis event. By taking these topics into account, one can see that although there are several problems with credibility that news media deals with, when a crisis occurs, the news media are still the first source of information a lot of people, globally, turn to for answers. The purpose of this research is to make reporters and citizens alike, aware of what influences their choice in news media, and determines what they believe as being credible. The best way to look at what makes the news credible is to look at a type of coverage which tends to have the least amount of room for partisan interpretation, a short amount of time for news updates, and an importance factor, often established by the severity of the crisis at hand.
*Keywords:* Paris, Attack, Terrorism, Media, Crisis, Communication, News

**CO2 Based Enhanced Oil Recovery Scenario for the Tensleep Reservoir at Teapot Dome, Natrona County, Wyoming USA.**

Enhanced Oil Recovery Group
Beau Green, Charlie Kloss, Michael Seidlich, Jack Kern and Quinn Morrison
Mentor: Professor Douglas Cuthbertson
Petroleum Engineering
College of Engineering and Applied Science
University of Wyoming

Oral Presentation

*EPSCoR* *Laramie, WY*

The Teapot Dome field is a faulted dome in the Salt Creek anticline on the southwestern margin of the Powder River Basin 35 miles north of Casper Wyoming. The Teapot Dome field is included in the Basin Margin Anticline Play of the Powder River Basin petroleum province (Dennen 2005). The Tensleep stratigraphic layer of the Teapot Dome field is a thin sandstone overlain by a dolomite layer intermixed with shales and limestones. The Tensleep sandstone formation has an average thickness of 320 feet interbedded with marine dolomites. The Tensleep reservoir is further divided into Sand A, Dolomite B, Sand B, Dolomite C1 and Sand C1; Sand A and B are oil producers (Ouenes et al. 2010). This project will analyze the geophysical data available on the Tensleep reservoir to make a static Petrel model. The static model will incorporate field data and well logs taken from 15 well sites. We will also incorporate 3-D seismic into the petrel model for further accuracy of the formation geological attributes. After the static model is completed we will create the dynamic model to path reservoir simulations of varying CO2 injection techniques. After analyzing the dynamic models, we will suggest the best CO2 injection scenario for the reservoir.

**The effect of speech timing on velopharyngeal function**

Megan Griggs with David Jones
Communication Disorders
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Oral Presentation

*Honors* *Maple Valley, WA*

During normal speech, the soft palate elevates to separate the nasal cavity from the oral cavity. This process is referred to as velopharyngeal function, and it allows speakers to direct air and sound out of the mouth. If the soft palate does not function adequately, then air and sound will leak through the velopharyngeal port and out of the nose, and speech will exhibit a nasal quality. It is likely that the timing of speech (such as slow versus fast speaking rates) can affect velopharyngeal function and the opening/closing of the velopharyngeal port, but we do not have a good understanding of how speech timing affects the control of the velopharyngeal port opening/closing. The purpose of this project is to study the effect of three speech timing conditions on velopharyngeal function in individuals with normal speech. The purpose of this study was to assess velopharyngeal function by measuring intranasal pressure, nasal airflow, and intramural pressure signals that were acquired simultaneously during productions of the word "pamper" under three speech timing conditions. Mean velopharyngeal timing and velopharyngeal port measurements across the three timing conditions will be presented.

**Explorations into Monomer-Dimer Tilings of Planar Regions**

Zachary Hall with Dr. Bryan Shader
Department of Mathematics
University of Wyoming

Oral Presentation

*Honors & EPSCoR* *Cheyenne, WY*

The properties of monomer-dimer tilings of planar regions has been a focused area of study in the mathematical community for many years. Applications include areas such as diatomic molecular bonding and ice-formation. As my research has gone forth, discoveries have been made regarding the number of monomer-dimer tilings in specific regions. We also were able to characterize these larger tilings with polynomials that have not been published by others. Using mathematical programming, I have also found the probability distribution of where monomers will land in a completely random tiling of these square regions. Thorough research has also been done on n by n, 2 by n, and 1 by n regions, and tilings of these regions using “bonding” between what begins as a region of only monomers and turns into one that has both monomers and dimers. Patterns have been confirmed regarding how many steps it takes for these regions to converge or “freeze” and how many dimers are expected to exist after converging. This has been confirmed both through simulations and mathematical analysis.

**The Changing Meaning of Terrorism**

Brian Halsey with Dr. David Messenger
History & Political Science
University of Wyoming

Oral Presentation

*History* *Greeley, CO*

While terrorism is both a prevalent issue in the United States and worldwide, the United Nations, an organization binding countries around the world, has still not defined the term. There has been a mild attempt to define boundaries in which certain violent acts fall under this term, yet the understanding of the term is still very broad. The goal of this project is to better define what this phenomenon is and how we can use historical examples to help refine a definition and its implications. The project will foremost establish a basic understanding of the way terrorism is interpreted through orthodox, critical, and radical theories. The Ashgate Research Companion to Political Violence compiles a wide array of works from scholars around the world providing insight into these theories. This piece of work, among others, will be complemented with statistical evidence researched through The Global Terrorism database at the University of Maryland, The Chicago Project on Security and Terrorism, along with the United Nations Action to Counter Terrorism. The theories and evidence will be applied to historical events of the past decade in nations around the world, and a definition, or rather a lack there of, is established.

**Mining the Mouse Microbiome**

Bailey Hamann, Kristopher Parker, and Naomi L. Ward
Molecular Biology Department
The University of Wyoming

Oral/Poster Presentation

*Wyoming NASA Space Grant Consortium* *Laramie, WY*

Recent research has revealed the significant impacts the human microbiome exerts over our health. The majority of human associated microbiota reside within the gastrointestinal (GI) tract and provide a wide variety of benefits to the human body [1]. However, disruptions within the gut microbiome, termed dysbiosis, can lead to disastrous conditions. The Ward lab has been investigating the relationship between dysbiosis in the gut and the development of Hirschsprung's-associated enterocolitis (HAEC), for which the cause is unknown. We primarily use a mouse model of HAEC, the Endothelin Receptor B-null (or Ednrb$^{-/-}$) mouse. Using this mouse model, we have previously shown that compared with wild-type (WT) littermates of the same age, Ednrb$^{-/-}$ (mutant) mice exhibit statistically supported differences in both the content and diversity of their GI microbes [2]. At the genus level, young Ednrb$^{-/-}$ mice showed a striking dominance of *Staphylococcus* corresponding with low abundance of *Lactobacillus*. The reverse was observed in WT-mice. Preliminary analysis has also revealed the genus *Akkermansia* to be found only in WT-mice [unpublished data]. The Ward lab also studies the effects of frequent antibiotic use on GI microbes in mice. This research revealed that *Lactobacillus* was predominantly associated with mice resistant to chemically induced colitis and species of *Akkermansia* were depleted in mice displaying severe symptoms of colitis. *Staphylococcus* was found in both instances [3]. Given the potential importance of these genera in the gut microbiome, future in vitro experiments will require isolated strains of *Lactobacillus*, *Staphylococcus,* and *Akkermansia*. The research presented here describes the isolation and identification of *Staphylococcus* and *Lactobacillus* species collected from the feces of WT and Ednrb$^{-/-}$ mice.

[1](Bäckhed et. al 2005), [2](Ward et. al 2012), [3](Ward et. al 2016)

**A New Era of Genome Modification**

Lizabeth Hampton with Dr. Pamela Langer
Department of Molecular Biology
University of Wyoming

Oral Presentation

*Honors* *Pinedale, WY*

Four decades ago, the advent of technology that could be applied to genetic engineering stimulated the hope that one day we would be able to 'fix' genetic disorders or inhibit cancer growth by replacing defective genes or introducing helpful genes into a person's genome. That hope was followed by frustration with the limitations of the technology until the recent development of a new strategy used in the CRISPR/Cas9 system, which is considered one of the most important developments in the field of genome modification to date. CRISPR technology can be used both for genome modification and post-transcriptional editing through RNA editing. Envisioned applications of the CRISPR system range from basic research on cancer and the study of essential genes to treatment of genetic diseases and cancer. However rather than a panacea for the treatment of intractable medical problems, the technology has presented potential negative consequences. Scientists have called a moratorium on the use of CRISPR technology until it was better understood. Furthermore, policy makers have preemptively banned the use of CRISPR in human systems. In spite of these fears, China has moved forward on studying CRISPR in human embryos anyway, though esteemed journals such as *Nature*, *Science*, and others, will not publish their studies due to ethical concerns. This literature review will describe the mechanics of the CRISPR technology in DNA modification and RNA editing, some of the current research applications and challenges, and finally, potential human applications and the need for regulatory oversight.

**Prisoner Reentry and Parole**

Tia Lynn Hampton with Dr. Eric Wodahl
Criminal Justice
University of Wyoming

Oral Presentation

*Honors* *Pavillion, WY*

Although many prisoners have been released into society without regards to monitoring post release since the beginning of incarceration, prisoner reentry has become more of a concentration in the criminal justice system recently in attempts to reduce the prison population. Recidivism in released prisoners causes them to return to prison thus, adding to the growing prison population. There have been many programs enacted to reduce this occurrence such as parole. Parole programs allow convicted felons to serve the rest of their time under supervision outside the prison. The programs vary in their policies as to how they release inmates differing depending on where the parole board is located. Focusing on rural areas and data collected from the Wyoming parole board, the purpose of this paper is to assess previous research compared to the current policies in place in an attempt to find a relation as to why an individual breaks parole as well as when this occurs.

**Understanding binge eating disorder in intellectually disabled population**

Mariah Hancock with Dr. Kyle De Young
Department of Psychology
UW

Oral Presentation

*Department of Psychology* *Fort Collins, CO*

Intellectual disability (ID) refers to clinically significant adaptive and functional deficits in social, conceptual, and practical situations, with onset of ID occurring within the developmental period and typically requires continued support for daily living. Binge-Eating Disorder (BED) causes distress because of binge-eating episodes, defined as eating a large amount of food in a discrete period of time, accompanied by a lack of control over eating during the episode. Both ID and BED are associated with obesity and decreased quality of life. Individuals with ID show reduced interceptive awareness and demonstrate adverse self-awareness, maladaptive behavior, negative affect, and disinhibition. These psychological constructs are etiological risk factors for BED, which may predispose individuals with ID to developing BED. Existing research consistently identifies individuals with ID who meet criteria for a diagnosis of BED who did not receive this diagnosis from health care professionals. Failing to recognize BED in individuals with ID likely prevents them from receiving appropriate treatment for BED. In addition, issues associated with the assessment of BED in individuals with ID, such as current diagnostic criteria and cognitive functioning, will be discussed. Specifically, diagnostic criteria, like those in the DSM-5, may not capture some eating-related problems in individuals with ID, which may be responsible for under-recognition of problems like BED in this group. For individuals with ID who also have BED, cognitive treatments are unlikely to be appropriate, given ID cognitive function deficits. Finally, challenges posed by existing treatments for BED in individuals with ID will be addressed.

**Music: a key for unlocking Locked-in-Syndrome and improving the quality of life for those with neurodegenerative diseases**

Heidi Hanekamp with Dr. Meg Flanigan Skinner
Zoology and Physiology
University of Wyoming

Oral Presentation

*Honors* *Laramie, WY*

Neurodegenerative diseases involve the gradual loss of neuronal functioning over time; such diseases include amyotrophic lateral sclerosis (ALS), Alzheimer's, Huntington's, and Parkinson's diseases. The cause of these disorders is often idiopathic and treatment options are limited. Progressions of these diseases may lead to Locked-in-Syndrome, where an individual is aware of their environment but unable to communicate due to paralysis. The impact often leads to further comorbidities and an overall lower quality of life. I investigated recent scientific literature on how music has been, and could be, used as form of therapy to benefit those with neurodegenerative disorders. Certain types of music therapy have been shown to significantly help cognitive and physical functioning in those with Parkinson's and Alzheimer's, while also serving as a form of comfort care. Furthermore, a new type of eye tracking technology allows individuals with complete paralysis to compose and deliver a musical performance through accessing brainwaves and eye movements. This technology allows individuals to deepen environmental engagement and potentially improving emotional well-being. Finally, this research illuminates possibilities for music therapy to become a standard means for supporting individuals with neurodegenerative disorders.

**ELLs in and Outside of the Classroom**

Paige Hanewald with Dr. Jenna Shim
Educational Studies
University of Wyoming

Oral Presentation

*Honors* *Casper, WY*

Some people are able to look at language in its entirety, seeing all of its facets—the multiple versions of ourselves expressed in different discourses. Some see it as a tool in communication while, unfortunately, others experience it as a barrier. Wenying Jiang (2000) declares, "Language and culture makes a living organism: language is flesh, and culture is blood. Without culture, language would be dead; without language, culture would have no shape" (328). Here, Jiang (2000) explains that without language, a culture ceases to exist. Language pumps the blood throughout bodies of culture, but interestingly, their interdependency often goes unnoticed. This issue is prevalent for children and adolescents who do not speak English in the United States. Many students with diverse backgrounds and who are English language learners (ELLs) face insurmountable challenges through their schooling and are often mislabeled as unintelligent or disabled. As a future educator with an English-as-a-Second Language endorsement, I aim to advocate for these students and integrate more effective and inclusive teaching strategies for the ELL population. In this portfolio, I will present and reflect my observations from my 45-hour practicum in Natrona County School District, current research on ELLs and examples of effective teaching methods. Overall my portfolio contains 1) reflective journal entries regarding my observations and correlating research topics, 2) lesson plans I have created or adapted and their evaluations, 3) a reflection on professional development and strategies to support colleagues and improve ELL learning, 4) a report on teacher-family relationships and suggested improvements.

**An investigation on non-point source pollution on the Green River in proximity to trona mining activities**

Julia Hanni with Megan Lahti and Craig Thompson
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Western Wyoming Community College

Oral

*INBRE* *Rock Springs, WY*

The Green river originates in the Wind River Mountains and flows south into Utah where it joins with the Colorado river. Today, the Greater Green River Basin holds wealth of natural resources such as coal, oil, and trona (Lageson & Spearing 1991). Extraction activities in proximity to the River can have accumulating effects downstream Colorado river watershed. Trona, a sodium carbonate compound, is used to make soda ash, and the world's largest reserves are found along the Green river. Trona is mined and brought to the surface for refining and export via railroad. The Rock Springs uplift, sandstone beds, provides surface geology with western flank towards the Green river (Lageson & Spearing 1991). This results in all eastern surface runoff flowing into the River. My study examines the non-point source pollution along the east side of the Green river due to trona extraction. I will analyze water quality ($Na^+$, alkalinity, pH, conductivity, $F^-$, $SO_4^{2-}$, and $Cl^-$) from two locations along the Green river; one north of a trona plant (Ciner Wyoming, LLC) and one south (where the I-80 crosses the River). According to the Green river regional Environmental Impact Statement, there should not be any significant impact of trona mining activities on the Green river (U.S. Department of the Interior 1996).

**Overcoming Childhood Trauma: Long-Term Effects of Early Maltreatment**

Kellsey Hansen with Tara Clapp
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University of Wyoming
Oral Presentation

*UW Honors Program* *Casper, WY*

Child maltreatment is a worldwide problem, often overlooked by the general population. Each year in the United States of America, about 3.6 million referrals are made to Child Protective Services, reflecting 6.6 million individual cases of maltreatment. The short- and long-term effects of abuse and neglect have drastic consequences on individual children and society as a whole. In order to combat these outcomes, it is crucial for victims to demonstrate resiliency after the trauma has occurred. The goal of this project was to review relevant literature pertaining to the subject of child maltreatment and resilience. After examining several research studies and cases, six main long-term effects began to emerge. These include poor academic performance, psychological disruptions, physical health problems, substance abuse, violence, and decreased quality of life. Additionally, recent research has found many coping strategies designed to increase resilience, which are further discussed in this literature review. By bringing more attention to the long-term effects of childhood trauma and strategies for resilience, state and local governments may one day be able to implement policies which seek to improve the lives of child maltreatment victims.

**History of Women in Agriculture**

Eilish Hanson with Dr. Chian Jones-Ritten
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University of Wyoming
Oral Presentation

*UW Honors Program* *Dayton, WY*

The number of women as key farming operators rose from 28 percent to nearly 60 percent from 1940 through the mid-1990s. (Blau, Ferber, & Winkler, 2014, p. 27) as men were sent to war during WWII (Adams, 1997, p.5). At the same time, unfortunately, the total number of farms declined by more than half from 1940 to 1980. (Labao & Meyer, 2001, pp. 107-108). In an effort to understand historical trends of women's involvement in agriculture, a research project was performed tracking the participation rate, collegiate enrollment, and employment as faculty of women in agriculture across the United States and in Wyoming.

The goal was to analyze historical trends of women's involvement in agriculture. The first research topic was used to determine the trend in women's participation in agriculture by comparing the number of women as principle operators across the U.S. to Wyoming. The second research topic was used to determine the trend of the rate at which women have received general bachelor, masters, and doctorate degrees across the U.S. and in Wyoming compared to the rate at which women have received agricultural degrees at those levels. The final research topic was used to determine the trend in the number of women faculty members of agricultural programs across the U.S. and in Wyoming compared to the number of women faculty members in general. It was determined that women's participation rate, collegiate enrollment, and faculty status in agriculture across the U.S. and in Wyoming has historically increased.

## Getting Bit with West Nile Virus and Malaria

Becky R. Watkins, Kayla Harakal, Chloe D. Winkler, Taylor Russell and Eric C. Atkinson
Biology Department
Northwest College
Poster Presentation

*INBRE & EPSCoR* *LaMoure, ND*

From an ongoing project, we are observing the protist malaria in avian communities in the Greater Yellowstone Ecosystem, especially the Big Horn Basin. House Sparrows (*Passer domesticus)* and House Finches (*Haemorhous mexicanus)* both inhabit the Big Horn Basin year-round experiencing similar environmental conditions. Natural history between the two species is similar but House Sparrows typically nest in cavities, or woven nest balls, whereas House Finches are open cup nesters. It is hypothesized that subtle differences in natural history can influence occurrence of malaria. Malaria can weaken the bird and in severe cases cause death. The protist comes from the families of species including Haemoproteidae, Plasmodiidae, Garniidae and Leucocytozoidae. These Apicomplexans can be passed to avian species by biting midges, hippoboscid flies, female blood-sucking mosquitoes of the genera *Culex, Aedes, Culiseta,* and *Anopheles,* and blood-sucking simuliid fly. We are taking blood samples from House Sparrows and House Finches caught and released at either Coons Age Farm (Belfrey, MT) or on the campus of Northwest College in Powell, WY. We made blood smears and dyed the sample with Giemsa for one hour. We observed the sample under microscopes to detect any malaria and we are also taking counts of white blood cells: monocytes, heterophils, eosinophils, lymphocytes, and basophils, to test the immune status against malaria and West Nile Virus. Simultaneously, West Nile Virus is tested with RAMP (a specific ELISA).

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

Becky R. Watkins, Chloe D. Winkler, Kayla Harakal and Eric C. Atkinson
Biology Department
Northwest College
Poster Presentation

*INBRE* *LaMoure, ND*

Attempting to replicate a previous experiment, we are testing 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). 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. The union of these leads to the production of diploid resting eggs. Resting eggs are resistant to desiccation and can remain viable for many years as an evolutionarily adaptive trait in ephemeral water bodies. We are testing to see if chemicals (potentially, hormones or endocrine disruptors) produced by brine shrimp have any effect on the mictic cycle of the rotifers. We have three groups of 20 vials each: Just rotifers, rotifers with brine shrimp and rotifers in brine shrimp-conditioned (2 days) water (25 ppt Instant Ocean®). We placed 5 amictic rotifers into each 4 dram shell vials to test to see if they would undergo the mictic cycle. We let the rotifers sit for four days and then viewed the vials to determine if any rotifers have an egg.

**Masculinity in the Ancient Legal System**

Michael Harden with Dr. David Messenger
History Department
University of Wyoming

Oral Presentation

*HIST 4030* *Casper, WY*

Few entities influence daily life in a society as thoroughly as an established code of law. As such, written law offers a relatively complete medium through which to identify and define a concept such as masculinity within a society. This paper examines the role of masculinity in ancient Greek and Roman life through study of written laws and legal processes. Throughout ancient Greece and Rome, laws differed between cities and territories. These laws hold a mostly linear relationship to differing ideas of masculinity within each of these cities or regions. This paper analyzes known laws from ancient Greece and Italy, as well as primary source documents pertaining to the legal process, such as surviving court speeches and representations of legal environments.

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

Hartman, G., O'Sullivan, S., Adderhold, T. with Jacki Klancher
Natural Sciences Central Wyoming College

Poster and Oral Presentation

*INBRE, EPSCoR and NASA* *Lander, WY*

The effects of ongoing climate change provoke glacial recession in Wyoming's high alpine environment, specifically the Dinwoody Cirque. This study investigates the impacts of water quality, seasonal water flow, and snow albedo on the alpine ecosystem and local communities. There are two prior seasons of CWC research data associated with water contamination and snow albedo, but this is the first data set to include flow data. The 2016 analysis for *E.coli* -- a surface bacterial indicator organism--revealed negative presence in all ten surface water samples, identical to the 2015 results. The 2016 water flow measurements were taken below the Dinwoody Cirque and ranged from .81 to 1.63 cubic meters per second (cms). These initial seven points provide comparable data to analyze the rate of future glacial melt**.** Black carbon, a powerful light-absorbing particle, is the strongest contributor in snow albedo reduction. Using field sampling and laboratory analysis methods provided by Dr. Carl Schmitt (National Center for Atmospheric Research), 22 samples were collected from glacial terrain and nearby snowfields. The results for effective black carbon (eBC) amounts for 2016 contrast sharply across years. Samples from 2014 and 2015 revealed an average value of 30ng/g of eBC, whereas the 2016 results indicated an average of 193ng/g. The reason for this increase is still being explored. Additional water quality, flow measurements, and black carbon sampling will be performed to document and assess the hydrological changes associated with glacial recession due to climate change.

**Likelihood of Bystander Intervention as a Function of a Social Norms**

Shelby Hatten, Matt Gray
Psychology Department
University of Wyoming

Oral Presentation

*Honors* *Torrington, WY*

Bystander intervention is the decision of a third party to take action in a perceived, ongoing, or completed sexual assault to assist the victim. The primary goal of bystander intervention is to prevent sexual victimization before it is perpetrated. Research demonstrates how perceptions of community expectations can alter rape myth acceptance (RMA). RMA can be malleable if the community's perception of RMA is higher or lower, at least temporarily. RMA can function as a social norm. This study evaluates the degree to which an individual's perceptions of community support influences willingness to intervene in potential assault situations. It is expected that individuals' perceptions of bystander behavior as normative will increase self-reported willingness to intervene, and perceptions of such behavior as uncommon, will decrease one's intent to intervene. Participants ($N$=81) filled out two surveys assessing willingness to help and efficacy to help in a hypothetical sexual assault situation. Participants were randomly assigned to one of three groups: control group, low community support, or high community support. Trends in bystander efficacy demonstrated that higher levels of perceived community support lead to higher self-reported efficacy. This also held true for lower levels. Readiness to help was divided into three subscales (action, responsibility, and no awareness). The different conditions had no effect on action. Trends indicate feelings of responsibility and need for awareness in the two experimental groups.

**Honors Program Web and Mobile Application**

Meghan Haukaas with Dr. Ruben Gamboa
Computer Science
University of Wyoming

Oral Presentation

*Honors* *Laramie, WY*

The University of Wyoming Honors Program provides its students with access to special coursework, scholarships, and priority class registration. Administrative overhead is generated as a result of providing these services. Currently, students are advised of scholarship opportunities and Honors Program events via email. Priority registration occurs through the use of paper sign-up sheets to collect student information. Students currently do not have a method of saving general information for use with Honors Program-specific scholarship applications. The goal of this project was to provide a comprehensive platform that addressed the administrative needs of Honors Program staff. We chose to use a LAMP stack due to its flexibility. A web interface was created in a self-hosted CentOS 7 virtual environment using the PHP MVC framework Laravel, powered by a MySQL database. The interface allows for administrators of the site to add/edit/delete items such as News Articles, Web Pages, Program Events, and Scholarship Opportunities. The interface allows administrators to send alerts and notifications to the student base. Registration events can be created and posted so that priority registration and event attendance can be tracked and associated with either a student's login information or a one-time code. The application utilizes QR codes as a method of quickly registering a student as having attended an event. We also created a side-by-side Android mobile application to allow students to quickly and easily access the data from the web interface via our web API and allow for the administrators to update students via push notifications.

**Russian Soldiers' Perceptions and their Impact on War Crimes in Chechnya**

James Hedeen with Dr. Tanis Lovercheck-Saunders
History
University of Wyoming

Poster Presentation

*McNair Scholars Program* *Laramie, WY*

The Second Chechen War, fought between Chechen separatists and the Russian Federation from 2000-2009, was infamous for the brutality with which it was conducted. Incidences of extra-legal executions, torture, rape, and the use of force against civilians were common among Russian forces. Chechen forces made extensive use of terrorism as well during the conflict, bombing civilian buildings in Russia and taking hostages, most notably during the Beslan School siege in 2004, where several hundred civilians were killed. This cycle of reprisals against non-combatants hardened the perceptions of both sides, contributing to the length and intensity of the conflict. The scale of the brutality in Chechnya far outstripped other contemporary conflicts, including the United States' own wars in Iraq and Afghanistan. The objective of this project is to research what role the selection, training, military culture, and perceptions of Russian soldiers had in the prevalence of war crimes in Chechnya. To do so, this project will analyze primary documents sourced from Russia, as well as existing scholarship on Russia's military forces, to determine if war crimes are a systemic issue or an issue dependent upon individual actions. Important indicators of systemic culpability include dehumanization of the enemy as part of soldier preparation, prevalence of derogatory language toward Chechens in soldiers' correspondence, commonality of reaction (desire for revenge) following Chechen terrorist attacks, and individual accounts, if any, of soldiers engaging in acts defined as war crimes by the Geneva Convention of 1949 (Article 50).

**Bringing Reading Back to the Classroom**

Brie Hein with Dr. Todd Reynolds
Secondary Education/English
University of Wyoming

Oral Presentation

*Honors Program Senior Project* *Laramie, WY*

I believe that when students are actively engaged in the reading of the novel they are far more likely pursue personal analysis of the novel as opposed to simply following the teacher's lead. Kylene Beers comments on it in her work, *When Kids Can't Read, What Teachers Can Do,* when she declares the importance of having the students be introduced to the novel beyond being provided with historical information of the author and context of the text. The more students interact and engage with a text the more thoroughly the students will invest in and receive from their learning. This shows that having students be introduced to and interacting with the main conflicts of the novel before they even begin reading it will lead to a more invested reader. The more students invest in the text the more they will undoubtedly come away from the novel with. An investment in the text leads not only to further enjoyment of the text but also increased analysis and application to one's personal life.

**Even birds speak different dialects: How different are they?**

Lewis W. Hein with Dr. Hayley C. Lanier
Zoology and Physiology
University of Wyoming at Casper

Oral presentation

*INBRE* *Casper, WY*

Birdsong is known to be variable geographically in many species, and we have anecdotally observed this effect in Wyoming populations of the House Wren (*Troglodytes aedon*). This variation may be due to gradual divergence in song dialects between geographically distinct breeding populations, genetic variation among populations, or habitat-driven differentiation based on sound transmission properties of the environment. In this project, we collected 944 wren calls from three different locations around Wyoming, tested the similarity of various acoustic environments and modeled call similarity against distance and acoustic environment type. These comparisons were made using time-frequency analysis, clustering, and summary statistics. The geographic distribution of these song dialects is shown to be quite diverse, with some locations showing great consistency and others showing as much internal dialect variability as exists between locations. We found that between locations dialects can be distinguished by differences in rate of singing, minimum pitch attained, and the proportion of the song spent in pauses between phrases. These findings may help answer important questions about population diversity, boundaries for mating, and migration patterns.

**Microgravity Testing Platform – Controls Team**

Nick Hein with Dr. Kevin Kilty
Mechanical Engineering
University of Wyoming

Oral Presentation

*Honors Program Senior Project* *Laramie, WY*

The NASA Microgravity Project consists of Mechanical Engineering Senior Design projects that aim to develop a new process for testing CubeSats in a microgravity environment below $10^{-3}$G. To accomplish this, five senior design teams are working on various aspects of a small drop package, released from a weather balloon, to test CubeSats by simulating microgravity conditions in freefall. The monocoque will fall from 100,000 feet during which the testing platform will experience about 20 seconds of quality microgravity.
The goal of the Controls Team is to develop a proof of concept control system that corrects for any perturbations during the fall; this prolongs the period of acceptable microgravity. Implementing a reaction wheel system within the drop package achieves this goal. The system consists of a flywheel driven by a DC motor that applies a corrective torque to the monocoque. An inertial sensor determines the absolute orientation of the package using a 3-axis accelerometer, gyroscope, and magnetometer. An Arduino Uno running a Proportional Integral Derivative control loop outputs appropriate commands to the motor. This control system allows for responsive attitude control of the monocoque during freefall and maintains the microgravity environment throughout the CubeSat test.

**Improved Nitrogen Containing Graphitic Material (NCGM) Membrane Fabrication for the Production of Effective Large-Area Membranes**

Erik Trey Herrera with Dr. Katie (Dongmei) Li
Chemical Engineering
University of Wyoming

Poster Presentation

*EPSCoR* *Cheyenne, WY*

Recent advancements in synthetic chemistry have brought about the possibility of creating custom nanopore materials. Graphene systems are highly ordered 2-dimensional crystals with a distinct pore size in their structure. With the introduction of nitrogen into the graphene structure, the nanopores can now be lined with nitrogen atoms that are more chemically reactive with another species. These nitrogen containing graphitic materials (NCGM) are unlike normal graphene material in that, through chemical modifications, the pore size can be changed to fit a specific function. The goal of this project was to determine an appropriate method to fabricate large-area membranes from a synthesized NCGM. Multiple fabrication techniques were attempted on various membrane supports. The fabricated membranes were analyzed for in-plane proton conductivity using a Scribner Associates Inc. 850e fuel cell system and a BT-112 membrane conductivity cell, also from Scribner Associates Inc. The through-plane proton conductivity was later measured using a custom-built U-tube set-up. These measurements were done in liquid solution with quaternary ammonium cations of varying sizes. The membranes were further analyzed using Scanning Electron Microscopy (SEM). Research is ongoing on both NCGM synthesis and membrane fabrication/analysis techniques.

**Archiving Wyoming Dinosaur Trackways with Photogrammetry and 3-D Modeling**

Terra Hess with Melissa Connely
Casper College

Poster Presentation

*EPSCoR* *Cheyenne, WY*

A variety of Theropod, Sauropod, and Pterosaur tracksites are scattered throughout the state of Wyoming. These trace fossils tell the story of the dinosaurs ancient past, including stride length, locomotion, habitat, and other morphological characteristics. Unfortunately, collecting large specimens for protection and study is problematic and mold casting can cause significant damage. The recent affordability of photogrammetry and 3-D modeling offers a unique way to preserve, document, and recreate important trackway's if theft, vandalism or natural weathering occurs. In this study a series of close range photographs and Global Positioning System coordinates were taken at multiple locations in Wyoming. The Pterosaur track locations were documented in the Windy Hill Sandstone around Alcova Lake, Wyoming and a Sauropod and Theropod trackway assemblage in the Morrison Formation from Como Bluff, Wyoming. Photogrammetric techniques and 3-D visual modeling were performed and digitally archived for present and future generations to study.

**Hybridization Patterns Between *Oncorhynchus clarkii* and *Oncorhynchus mykiss* in Northeastern Wyoming**

Karly Higgins with Catherine Wagner and Elizabeth Mandeville
Botany Department
University of Wyoming

Poster

*McNair, Federal Work Study* *Lindsay, CA*

Cutthroat trout (*Oncorhynchus clarkii*) are an important species of conservation concern in the western US. A primary threat to cutthroat trout is hybridization with introduced rainbow trout (*Oncorhynchus mykiss*). The pervasive introduction of rainbow trout to river systems in the western USA as sport fishes, and their hybridization with cutthroat trout subspecies throughout much their introduced range in the west, has imperiled many cutthroat trout subspecies. Included among these is Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*), where only 28% of remaining populations are thought to be unaltered by hybridization from rainbow trout. To better understand the pattern and extent of hybridization between Yellowstone cutthroat trout and rainbow trout in the North Fork Shoshone in northeastern Wyoming, we gathered genetic samples from more than 1200 individuals during outmigration from tributaries back to the main stem river in September 2016. We extracted DNA from these samples, and used genomic library preparation methods to prepare these samples for sequencing which will allow us to quantify the extent and pattern of hybridization across tributaries. In addition to the genetic samples, a photo and length and mass measurements were collected to understand phenotypic trends among sampled fish. Interestingly, in some tributaries we find bimodal length distributions, which may indicate differences in spawning time between individuals of mostly rainbow or mostly cutthroat trout ancestry.

**Improved Efficiency of a PCBM/P3HT Organic Solar Cell through the Addition of CuO Nano-Wires**

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

Oral Presentation

*Wyoming Space Grant Consortium* *Laramie, WY*

With today's growing energy demand it is imperative that we increase the usage of clean and renewable energy sources. Solar cells have the potential to provide us with the majority of our energy. While there are many types of solar cells, organic cells offer a low fabrication cost with a high efficiency. PCBM/P3HT is a commonly used material for the active layer in a solar cell. The reported active layer absorption coefficient is typically in the order of $10^4$ $cm^{-1}$ which would imply an active layer thickness of around 1000 nm. However, the best achieved power conversion efficiency of this type of OSC was reported to be ~10 %, with an optimum thickness reported to be around 100 nm or less. This decrease of the PCE in a thick active layer is due to the resulting longer path for charge collection. The path of charge collection can be reduced by extending the electrode into the active layer. For my project I have explored the use of CuO nanowires as a low cost method of extending the electrode. I will discuss a PSCBM\P3HT solar cell design that makes use of CuO nanowires to improve cell efficiency.

**The Legend of Cyborg Zelda: Linking Bodies, Linking Worlds**

Elizabeth Hobbs with Caroline McCracken-Flesher
English
University of Wyoming

Oral Presentation

*Honors Program* *Kraków, Poland*

Are you a cyborg? Am I a cyborg? Has our technology turned us into cyborgs, anti-cyborgs, or pro-humans? This paper analyzes the role of Donna Haraway's notion of the "cyborg myth" in Nintendo's *The Legend of Zelda: Twilight Princess*. It investigates the main characters and storyline as a message about cyborgs, probes the medium of video games as they create or discourage becoming a cyborg, and determines the player's role in the question of what and who is human. Whether or not we as the players have become post-human remains yet to be seen as we look at the creatures of Hyrule and the powers of the Triforce.

**Water and Lithium Recovery from Rock Springs Uplift Brines**

Mhamed Samet, Josef Robeson, Mathew Hollmann, Alexander Moss, Brandon Wilde
Faculty Mentor: Dr. David Bell
Department of Chemical Engineering
University of Wyoming

Oral Presentation

*Process Design Project* *Laramie, WY*

The efficient and productive treatment of brines produced during carbon capture and sequestration (CCS) is vital to the sustainability aspect of carbon capture. The Rock Springs Uplift saline formations contain brines with significant amounts of dissolved salts (sodium chloride, lithium carbonate, etc.). This project aims to design a safe and economically feasible brine treatment process for water recovery, and analyze the profitability of the recovery of lithium and other salts. Lithium carbonate is a major battery component with an increasing demand and price worldwide and road salt (sodium chloride) is a commodity valuable in the state of Wyoming and the United States. The water recovered from the brine will be recycled back to the power plant to be used for cooling.

**Upper Dinwoody Projectile Points: Killing Tools From the Pleistocene to the Little Ice Age**

Nico Holt
Natural and Applied Sciences
Central Wyoming College & University of Wyoming

Poster

*EPSCoR, INBRE, NASA* *Lander, WY*

Central Wyoming College archaeology students have discovered a series of prehistoric sites along most of the trail leading to Gannett Peak and the Dinwoody Glacier. These sites provide evidence that people have lived and foraged for food at elevations up to 12,500 feet above sea level in the Wind River Mountains. The oldest identified so far was part of the Goshen Culture, over 11,000 years ago and only recently arrived from Berengia at the end of the Pleistocene Ice Age. That site was identified by the type of spear point recovered there. Other projectile points are used to date sites through the entire span of human presence in North America perhaps to the middle 1800s at the end of the Little Ice Age. This poster describes and discusses the various types of weapons that human hunters have used to obtain food and defend themselves in the high alpine of northwest Wyoming.

**Addressing Water Pollution: A review of Zero Liquid Discharge Policy in Tirupur, India**

Savannah Hook[1], Ishan Patel[2] with Dr. Ramesh Sivanpillai[3]
1. Department of English, 2. Department of Chemical Engineering, 3. Department of Botany and Wyoming GIS Center
University of Wyoming
Oral Presentation

*Haub School of Environment and Natural Resources* *Green River, WY*

*Ahmedabad, Gujarat, India*

Effluents from Indian textile industries, such as bleaching and dyeing units, are discharged directly into the rivers and other surface water bodies. This adversely impacts the water quality, aquatic species, agriculture, and human health. In Tamil Nadu, a state in southern India, farmers in Tirupur District, a textile manufacturing hub, protested the deteriorating water quality and its impact on their livelihood. In 2011, the Tamil Nadu Pollution Control Board implemented a Zero Liquid Discharge (ZLD) regulation, which required the textile industries in this state to remove almost all pollutants from the effluent stream. However, there was no commercially viable technology to achieve the stringent standards. This forced many units to either close their operations or move to other states where ZLD was not implemented. Our research focuses on how the lack of a uniform national policy affects this major water pollution problem, and the alternate solutions such as Minimal Liquid Discharge that are developed to minimize pollution levels in the effluent stream.

**Biomass Utilization of Carbon**

Kathryn Hopfensperger and Dr. David Bell
Chemical Engineering
University of Wyoming
Oral Presentation

*Honors*

The goal of this project was to address the environmental implications of an algae biomass system that sequesters carbon dioxide to produce economically valuable products (Oakey, 2016). The Algalrithm, a theoretical company driven by reducing $CO_2$ emissions, chose a final product based upon the results of economic analyses that considered potential carbon capture and utilization incomes, as well as the value of diverse products under various commodity pricing constraints. Many algae-based bio-products were considered before narrowing in on a specific product that would encompass the volume of typical utility-scale electricity producing plants, a wide range of future carbon costs, and the scalability of the proposed carbon utilization process. Due to the economic viability of algal-based products in prominent industries, a full analysis has led to the selection of bio-surfactants, a widely applied, high-value product. The Algalrithm's company will produce lipids that they will sell to a surfactant producing plant and a major algae cake by-product will be produced and sold as a soil amendment. As the Algalrithm moves forward based upon conclusive research and evaluations of both the economics and the unit operations, it will establish a company that is both marketable and environmentally-friendly.

**Politics: Perception versus Reality**

Josh Hopkin with Dr. Kristen Landreville
Communication
University of Wyoming

Oral Presentation

*McNair* *Greybull, WY*

The purpose of this research is to investigate how online content headlines portray major presidential candidates' positions with regards to framing and bias across a series of articles from various types of news sources for a total of nine sources. Demographic research based on political ideology was used as rationale for each news source. The 2016 United States presidential election is a year where nontraditional, anti-establishment candidates are winning over voters more than anticipated and to further evaluate this third party candidates will be in included in analysis. While in each new election year for the US presidency the internet has been used increasingly by political campaigns and as a primary source of political information for voters.

**Synaptic Plasticity During Learning**

Dustin Horn with Dr. Kara Pratt
Zoology and Physiology
University of Wyoming

Oral Presentation

*Honors* *Glenrock, WY*

Neurons communicate at junctions called synapses, and changes (plasticity) of these synapses underlie the ability of humans to learn. Synapses are dynamic structures that can change their chemical activity within seconds. Some of these short-term changes involve the cytoskeleton (specifically actin filaments) within the dendritic spine to change only its shape. Modulation of cyclic AMP and protein kinase C pathways are also important in this process. There are also long-term changes in synapses: early and late long-term potentiation (LTP). Early LTP involves activation of calcium calmodulin dependent kinase II (CaMKII) and insertion of preexisting glutamate receptors into the cellular membrane. Late LTP requires protein synthesis. BDNF, ARC, and PSD-95 are examples of proteins required for late LTP. PSD-95 is part of the post synaptic density. The post synaptic density is correlated with the size and shape of the dendritic spine, and it organizes cellular machinery required for synaptic function. BDNF is a neurotrophin linked to the MAPK pathway. Many of the proteins required for late LTP are translated locally in the dendrites. How the neuron traffics the appropriate mRNA and cellular machinery to the correct location within dendrites is still unknown. Previous researchers hypothesized a "synaptic tag" guides molecules to their correct location, and CaMKII and actin remodeling are important for creating this tag. I have designed an experiment to uncover the molecular identity the tag. If successful, the experiment will increase our understanding of synaptic plasticity and proper neuronal function.

**Extending storage time for Rainbow Trout (*Oncorhynchus mykiss*) milt: the effect of temperature**

Alex Elizabeth Howell, and Dr. Scott Newbold
Department of Life Sciences, Biology Program
Sheridan College

Poster

*Department of Life Sciences* *Etna, WY*

Fish hatcheries collect and store milt (sperm) as part of their standard breeding protocol, and longer-term storage is desirable for various reasons such as poor performance in males or spawning issues when the timing of egg production by females is mismatched with the timing of milt production. A previous study in 2016 found that rainbow trout (*Oncorhynchus mykiss*) milt can be stored and remain viable for up to seven days. However, we still don't know if rainbow trout milt can be stored for longer periods of time or how temperature might affect storage time. The purpose of this current study is to: (1) observe how many days stored rainbow trout milt will remain viable based on motility and fertilization rate, and (2) investigate the effect of temperature on milt storage. I hypothesize that trout milt stored at 1.7˚C will remain viable longer and have a higher fertilization rate than milt stored at 4.2˚C. In addition, I hypothesize that despite motility, milt stored for longer periods (> 15 days) can still fertilize eggs. Individual milt samples from 15 male trout will each be divided into two groups and stored at the two temperatures for a paired design. During the course of the 21-day experiment, motility will be checked every 5 days and fertilization rate will be assessed on days 10 and 21. This study will assist the Story Fish Hatchery captive-breeding program by enhancing their understanding of longer-term storage potential for rainbow trout milt.

**Nature Aesthetics and American Nationalism:**
**Curating Cultural Identity Through Rhetoric and Design of National Park Landscapes**

Ellen Hughes and Dr. David Messenger
Department of History
University of Wyoming

Oral Presentation

*Honors* *Elizabeth, CO*

In 2016, "America's Best Idea", the United States National Park System, celebrated a century of national heritage in natural resource stewardship. As the NPS progresses into its next century, reflection on the semiotics of national park tourism offers a critical perspective on meanings of American Nationalism and identity with management implications for a twenty first century audience. This research acknowledges the originating confluences of artistic and literary romanticism, commercialization of natural resources through tourism, and political annexation of public land during the Reconstruction Era in the establishment of an institutional model that advanced the "monumentalism" of nature. This research analyses the varied political ecology of nature through the lens of historic design and rhetoric concerning cultural landscapes, the people within them, and periods of national crises using national park case studies. This research will offer clarifying perspectives on how nature itself became a national monument in these places.

**How Telling is Author Voice? Further Associations Between Personality and Writing**

Jasper Hunt with Dr. Robin Barry
Psychology
University of Wyoming

Poster and Oral Presentation

*Department of Psychology* *Laramie, WY*

Just as everyone has a unique personality, so too does everyone have a unique style of writing. The differences in writing styles are so pervasive that individuals' writing styles persist across writings on different topics, and writing styles are distinguishable in samples from several different domains (e.g. academic publications, diary entries, and school assignments; Pennebaker & King, 1999). Indeed, the consistency of writing styles is on par with individuals' responses to questionnaires (Pennebaker & King, 1999). Existing research into differences in style focuses largely on formal writing samples, such as letters (Broehl & McGee, 1981), published books (Foster, 1996), and the aforementioned academic publications, diary entries, and school assignments (Pennebaker & King, 1999). Yet these analyses do not capture the breadth of people's writing. Individuals often write informally, as when they make personal notes. The present study aims to address this issue through a novel application of linguistic analysis, thereby supporting the ecological validity of studies examining associations between writing styles and personality characteristics. In this study, 86 cohabiting couples completed self-report questionnaires that assessed multiple personality characteristics. Each couple-member then wrote for 10 minutes about a time when they felt emotionally vulnerable, with many writing in list formats. Afterward, couples had conversations about their vulnerabilities and completed further questionnaires. Writing samples were later digitized and analyzed using Linguistic Inquiry and Word Count (LIWC; Pennebaker, Francis, & Booth, 2001) software. Finally, correlational analyses were used to examine the associations between writing tendencies and their personality characteristics.

**Searching environmental sources for novel antibiotic-producing bacteria**

Joel Hunt, Dr. Elise Kimble, Dr. Uko Udodong
Biology and Chemistry
Northwest College

Poster

*INBRE* *Cody, WY*

Growing resistance of pathogenic bacteria to antibiotics has health, economic, and societal costs, yet most antibiotics in use today are synthetic derivatives of core classes of antibiotics created during the heyday of antibiotic development in the 1940s to 1960s. Because of the abundance of current antibiotics originally derived from soil-based bacteria (*Actinomyces*, *Streptomyces*, and *Micromonospora*, for example), we have decided to focus our search for novel sources antibiotic-producing bacteria on similar environmental sources, specifically marsh water/mud and two different compost piles. The marsh water and mud yielded several isolated bacterial colonies that had inhibitory effects against our three pathogens of interest, *S. aureus*, *E. coli*, and *P. aeruginosa*. One of the inhibitory colonies, identified by BLAST search as *S. plymuthica*, produced a pink inhibitory secondary metabolite we were able to isolate and purify using organic chemistry techniques. We hypothesize the compound is a type of prodigiosin due to its color and the fact that a different *Serratia* species, *S. marcescens* is well-known to produce prodigiosin. Further characterization of the isolate is ongoing. The two compost piles, one pig compost and the other residential compost, produced numerous inhibitory bacterial colonies, including several that inhibited *P. aeruginosa*. In addition, many of the compost-based bacterial colonies grew weakly at 37°C

and strongly at 60°C, indicating they may be thermophiles, a group that is understudied in antibiotic research. Identification of these inhibitory bacteria is ongoing using genomic DNA extraction, PCR amplification of the 16S ribosomal gene, DNA sequencing, and BLAST database searches.

**A genetic module for programmable asymmetric cell division in bacteria**

Rebecca Iacovetto, Nikolai Mushnikov, Dr. Grant Bowman
Molecular Biology Department
University of Wyoming

Poster

*INBRE* *Laramie, WY*

Asymmetric cell division is a fundamental cell biological mechanism that many organisms use to achieve greater complexity. Following an asymmetric cell division, the daughter cells inherit differences that lead to distinct patterns of gene expression and different cell fates. In the bacterium *Caulobacter crescentus*, asymmetric cell division results in an immobile cell and a swarmer cell that produce a stalk and flagellum respectively. In another example, the differentiated cell layers of microbial biofilms are created by different intracellular concentrations of the secondary messenger molecule c-di-GMP, which regulates patterns of gene expression in the biofilm. The goal of this project was to combine elements of these two regulatory systems to create a programmable genetic module that establishes asymmetric cell division in E.coli, which normally divide symmetrically. Our results show that asymmetric cell division can be coordinated with differential control of gene expression with a surprisingly small set of regulatory components.

**The Partnership and Efforts of Domestic Counterterrorism**

Jonet Jennings
Dr. Jean Garrison
Department of Political Science
University of Wyoming

Poster

*McNair Scholars Program* *Denver, CO*

Terrorism is a communicative strategic act carried out with the intention of influencing one or more audiences' behavior. The symbolic form of violence uses fear and intimidation. Terrorism became a major challenge for the United States foreign policy, particularly after the terrorist attacks on September 11$^{th}$, 2001. It is an intermestic problem. 9/11 simultaneously thrust terrorism into the realm of high policy for the United States' foreign policy agenda while stirring domestic fears and concerns around acts of terror in a way that was unprecedented. The domestic perception of the rising terrorism threat spurred the creation of many institutions across national, state, and municipal levels that aid in countering terrorism, building awareness and implementing prevention programs at community levels working closely with local law enforcement. The Counterterrorism Education Learning Lab (CELL) is one such organization. CELL is a foundation that "is dedicated to preventing terrorism through education, empowerment and engagement" (CELL 2012). The institution provides training, a public speaker series, and a one-of-a-kind interactive terrorism exhibit. My project is an evaluative case study of the specific efforts of CELL as they pertain to the development of domestic perspectives on international terrorism policy, looking specifically at how organizations define terrorism and the ways in which they prevent it. The study will ultimately evaluate and measure how effective these organizations are and what implications they pose for American foreign policy.

**Utilizing Plant Pigment-related Transcription Factor Genes for the Development of New Petunia Cultivars With Enhanced Ornamental Value**

H.L. Jernigan[1], Sadanand Dhekney[1]
[1]University of Wyoming, Sheridan Research and Extension Center

Oral

*EPSCoR* *Cheyenne, WY*

Petunias are one of the most popular annual flower crops because they have beautiful blooms from spring to frost, and come in a plethora of varieties. Gene engineering is an expanding field for both research and commercial purposes to add desired traits of interest in existing commercial crop cultivars. Anthocyanin biosynthesis has been extensively used for the genetic manipulation of flower color. This flavonoid can be traced to several genes derived from different plants. The goal of this study was to insert a differently derived transcription factors and evaluate their efficiency to produce novel phenotypes for ornamental purposes. Petunia leaves were excised from seedlings growing in tissue culture and wounded using tweezers. The leaves were then suspended in a solution of A. tumefaciens carrying a regulatory gene (LC, MybA1, or Ruby) that overexpresses the production of anthocyanin pigments. After following predetermined protocol for transformation and post transformation red pigmentation was observed in cells of petunia leaf discs co-cultivated with the desired gene. Within two weeks transgenic red shoots interspersed with non-transformed green color shoots emerged. Transgenic shoots were transferred to rooting medium and then acclimated. Plants with red foliage and petals were observed. Subsequent studies include regenerating transgenic plant lines and examining co-suppression due to overexpression of pigment genes.

**The role of a grapevine-derived acetolactate synthase gene as a selectable marker for precision breeding of *Vitis.***

H.L. Jernigan[1], Sadanand Dhekney[1]
[1]University of Wyoming, Sheridan Research and Extension Center,

Poster

*INBRE* *Cheyenne, WY*

Precision breeding (PB) is a newly-enabled approach to plant genetic improvement that transfers only specific desirable traits among sexually-compatible relatives via the mitotic cell division pathway to avoid the genetic disruption imposed by meiosis. PB builds upon decades of both fundamental and applied research aimed at bypassing the disruption of sexual reproduction (meiosis) by allowing gene insertion to be accomplished via the significantly more stable and predictable mitotic cell division pathway. Recent advances in the development of cell culture protocols for efficient plant regeneration combined with crop genome sequencing have opened new avenues for the movement of specific functional traits among sexually compatible crop cultivars. A grapevine derived MybA1 transcription factor was recently studied and characterized for its use as a reporter gene in plant transformation. We are currently studying the grape-derived tolerant acetolactate synthase gene, *VvALS2f*, that might potentially confer herbicide resistance and can be used as a marker gene for selection of modified events in cell culture. In the current study, the effect of different herbicides including Monument and Image, on inhibition of tobacco shoot cultures and grape embryogenic cultures will be studied to determine the optimum levels of herbicide that can be used for selection at the cell culture level. These studies will enable the use of the acetolactate synthase gene for the recovery of modified events in cell culture and regeneration of whole plants with traits of interest.

**On the Art of Teaching Medicine – Galen as Physician, Philosopher, and Professor**

Ariane Joskow with Dr. Laura DeLozier
Classical Studies
University of Wyoming
Oral Presentation

*Classics Department* *Cody, WY*

Galen of Pergamum was a physician working in the emperor Marcus Aurelius's court in Rome from 166 AD and continued working under Aurelius's successors until his death in approximately 200 AD. His work regarding anatomy and physiology was prolific and well ahead of its time; his medical treatises were still regularly taught and followed up until the eighteenth century. Galen's teachings sparked a return to the Hippocratic medical philosophies, though these were substantially altered and expanded upon within Galen's career. In addition to his expansive research into the anatomy and physiology of living organisms, he wrote often about the philosophy and ethics of medicine and surgery, and wrote several teaching treatises, likely for his friends, colleagues, and students. These teaching treatises are a starting point to begin to understand the intersection of medical science and philosophy. It can be asserted, indeed, that Galen's teaching sparked the transition between medicine as an art and philosophy and medicine as a science.

**With Wyoming in Mind: Wyoming Writes Its Own Narrative**

Tyler Julian with Dr. Erin Abraham
College of Arts and Sciences
University of Wyoming
Oral Presentation

*Honors Program* *Sheridan, WY*

This two-part project examines modern writing in Wyoming, from fictional narratives to poetry, as a framework for my own original poetry. By analyzing the primary source accounts left by writers, their own work, and peer reviewed investigations of their words, it seeks to determine what about Wyoming lends itself to a prominent, though often overlooked, literary tradition. The inherent paradox of creativity in the least-populated state suggests the cathartic and necessary nature of establishing a Wyoming narrative from within the state itself. Reinforcing this need for expression is the landscape, isolated and expansive, and the population, separate, even altern, from the rest of the United States. Such paradox, tied inextricably to these factors, have certainly influenced the collection of poems included in this project, which focus on my own experiences in relation to time and place, heroes, storms and weather, and religion.

**Remotely Automated Observations of Transiting Exoplanets**

Aman Kar with Dr. Hannah Jang-Condell
Department of Physics and Astronomy
University of Wyoming

Oral Presentation

*EPSCoR* *Kolkata, India*

The goal of this research is to perform remotely operated automated observations of transiting exoplanet candidates cataloged by the KELT (Kilodegree Extremely Little Telescope) Collaboration. We have been using University of Wyoming's Red Buttes Observatory which has a 0.6-meter telescope. We have been using a software program designed in Python to help conduct observations with no human interaction. The program only requires the details of the event to be entered and it automatically conducts the nightly observations including the startup and shutdown procedures of the observatory. Being a part of the KELT collaboration, we have been granted access to an extensive database of potential exoplanet candidates. We are also able to compare our data with previous observations by other members of the collaboration and help expand the search for exoplanets.

**Manifest Liberia: The American Colonization Society and the Formation of Liberia**

Katherine Kasckow and Dr. Mary Keller
African American & Diaspora Studies
University of Wyoming

Oral Presentation

The country of Liberia did not exist until 1821 when a boat arrived from New York, carrying members of a Christian organization called the American Colonization Society and Black families who sought solace from a society that continued to discriminate against black communities them due to their skin color even though they were no longer under the chains of slavery. They were to start a new society, a Black Republic, on the lands that their ancestors were taken from years before. These families wanted to bring western culture, such as Democracy and Christianity, of the United States to their new country but this leads to important questions, such as what about the cultural groups that already existed in the region? How do the two parties interact and how does that shape how the country is formed? How did the interaction with prior European traders shape the region into what it was in the nineteenth century? With the development of the Liberian state, a new social and political identity of Americo-Liberians is established within the region. The Americo-Liberians established themselves on the top of the political and social hierarchy, allowing them to push the platform of Christianity and Western Culture within the country in a region populated by various cultural groups such as the coastal Vai and the Grebo in the Hinterland who have been existing in region for decades.

**Dry Reforming of Methane into Syngas and Direct Conversion into Acetic Acid and other Subsequent Products**

Sean Kasprisin
Chemical Engineering
University of Wyoming
*Honors* *Lino Lakes, MN*

Synthesis Gas, or syngas (Hydrogen and Carbon Monoxide) can be used in multiple chemical processes. Utilizing Steam reforming (SRM) of methane (CH4) has been the accepted method to create syngas and utilized industrially. SRM results in the formation of Carbon Dioxide, CO2 (a greenhouse gas) has to be dealt with to minimize the environmental impact. Dry-reforming of methane (DRM) uses CO2 as a feed, instead of a by-product with a better stoichiometric conversion to syngas. Acetic acid, CH3OOH, (the desired product) is very common in chemical processes, with a variety of uses. The accepted method for CH3OOH synthesis uses a Methanol (CH3OH) intermediate. This requires multiple reactors and a gas-liquid shift reaction. Directly converting from syngas to CH3OOH (and other products) allowing the favorable stoichiometric amounts of syngas from DRM to be utilized without involving an additional reactor for the process. The goal of the process was to determine if it was possible to directly convert CH4 and CO2 into syngas through the DRM process and then directly convert it to CH3OOH and other subsequent products for sale. The project focused on what were the necessary items to create this process and would it be economically feasible. Due to the limited amount of literature information on these processes the project's end state was to determine what necessary steps in the research and development phases were needed to create a catalyst with certain properties to make the process technically possible, and economically viable.

**Spatial and Temporal Patterns in Age Structure of Golden Eagles (*Aquila chrysaetos)* Wintering in Eastern North America**

Macy Kenney[1,2], James Belthoff[2], Todd Katzner[3], and Matthew Carling[1]
[1]Department of Zoology and Physiology, Laramie, WY, [2]Department of Biology, Boise State University, [3]Geological Survey, Forest and Rangeland Ecosystem Science Center, Boise, ID
University of Wyoming
Oral Presentation
*Department of Zoology and Physiology* *Cody, WY*

Behavior of wild animals varies seasonally, especially for migratory species that may spend sequential seasons in very different habitats. However, in the case of migratory birds, our understanding of behavior tends to derive from studies on breeding grounds. We tested the hypothesis that golden eagles (*Aquila chrysaetos*) in eastern North America show age-specific wintering behavior by evaluating spatial and temporal patterns in age structure on wintering grounds. We used motion-sensitive trail cameras set at scavenging bait sites over multiple years to collect images of golden eagles in the Appalachians during winters 2013 and 2014. All eagles were aged and age ratios estimated for each year with two different techniques. We tested our estimates of age ratios against a stable age distribution and used the aging technique that produced the most plausible age ratios in subsequent analysis. Age ratios of eagles were not the same at each site (i.e., they varied spatially within a given year) but spatial patterns in age ratios were not consistent across years (i.e., they varied temporally). Site-specific variation in age ratios across years suggests that eagles do not show age specific wintering behavior but instead show inter-annual fidelity to wintering sites. Such patterns are inconsistent with previously described age-specific wintering behavior for eagles but consistent with telemetry data from eagles that also show site fidelity by wintering birds.

**Persnickety Parents: How Parental Care Behavior affects Songbird Nest Success**

Macy Kenney[1], Lindsey Sanders[1,2], and Anna Chalfoun[1,2,3]
[1]Department of Zoology and Physiology, [2]Wyoming Cooperative Fish and Wildlife Research Unit, [3]US Geological Survey
University of Wyoming

Oral Presentation

*EPSCoR* *Cody, WY*

Incubation attentiveness and rhythms can have important fitness consequences for songbirds through influencing their number and quality of successful young. Songbirds are highly susceptible to nest failure due to predation given their use of sessile reproductive sites, and have been shown to alter their nesting behavior in response to perceived predation risk. One sagebrush-obligate songbird, the Brewer's sparrow (*Spizella breweri*), has been shown to adjust their parental care behavior following failed nesting attempts. We therefore expected that sage thrasher (*Oreoscoptes montanus*) nest survival also may be affected by parental care behaviors. Specifically, we predicted that birds with successful broods would take fewer trips to the nest and have longer bout lengths, reducing the likelihood that their nest would be discovered by predators. We analyzed parental care videos from sage thrasher nests during incubation to assess differences in parental behaviors between successful and unsuccessful nesting attempts. We assessed average on- and off-bout lengths, total nest attentiveness, and average number of trips taken to the nest per hour. Videos were recorded from May-August 2015 and 2016 at sites in the Upper Green River Basin, WY as part of a larger study of sagebrush-obligate songbird nest success. Preliminary results suggest that sage thrashers that successfully fledge young tend to have longer on-bout and shorter off-bout length, higher total nest attentiveness, and have fewer visits per hour to the nest. Identifying whether and how sagebrush-obligate songbirds mitigate predation risk via behavioral plasticity will facilitate better understanding of how birds respond to ongoing human disturbance, such as energy development, which alters habitat and predator communities.

**Moms Go Wild: Facebook, Female Empowerment, and the Outdoors**

Meghan Kent with Dr. Lauren Hayes
Anthropology
University of Wyoming

Oral Presentation

*Anthropology* *Laramie, WY*

Aided by social media communities and contests, there has been a reemergence in the popularity of mothers engaging with their children in outdoor adventure activities such as hiking. While the effect of participation in outdoor activities on children is well documented, effects on mothers and their social groups is less explored. Through ethnographic fieldwork conducted using methods of participant-observation surveys, and interviews, this paper aims to understand how hiking groups and interaction with these groups on social media platforms such as Facebook shape the identity and self-perceived empowerment of mothers involved with the Little Laramie Hikers.

**GeoChemical Sourcing of LaPrele Mammoth Kill Ochre**

Meghan Kent with Dr. Todd Surovell
Anthropology
University of Wyoming

Oral Presentation

*Honors* *Laramie, WY*

Red ochre pigment, or the mineral hematite, is commonly recovered from Early Paleoindian sites in the American west. Although it is clear that early peoples in the New World were transporting pigments from place to place, the inability to date to determine ochre provenance has limited our understanding of the natural sources of ochre that were in use, as well as the distances over which ochre was transported. This work is a pilot study in sourcing of ochre from the La Prele Mammoth site, a 12,900 year old human occupation in Converse County, Wyoming. Excavations at this mammoth kill site have revealed a large area of hematite-stained sediments, and over 1,500 individual nodules of ochre were mapped and collected. As a first attempt to determine the provenance of the ochre from this site, I collected comparative geologic hematite samples from two well-known iron deposits in Wyoming, the Powars II site at the Sunrise Iron Mine near Hartville and the historic Rawlins red paint mine. I characterized each source chemically and mineralogically using ICP-OES and powder XRD, respectively. I found that the two sources can be differentiated and that the excavated ochre was found to most closely match that of the Powars II site, which occurs approximately 85 km down the valley of the Platte to the southeast. This study suggests different sources of red ochre are geochemically distinguishable and that provenance studies of ocher may become commonplace in Wyoming archaeology.

**Synthesis and Characterization of an Atomically-Precise Iron Oxide Cluster**

Jonathan Kephart, Prof. Elliott Hulley
Department of Chemistry University of Wyoming

Oral and Poster Presentation

*EPSCoR* *Brookings, SD*

Magic number clusters exhibit structural and photophysical properties that differ significantly from those of their bulk counterparts. Through our research we discovered the first magic number iron oxide cluster: $Fe_9O_6(Np)_6(TMEDA)_3$. After its initial discovery, we developed a synthetic method toward the $Fe_9O_6$ cluster and we have been investigating a variety of its properties. The cluster was characterized using X-ray diffraction crystallography, UV-visible spectrophotometry, nuclear magnetic resonance spectroscopy, and magnetic susceptibility studies. In this presentation we will present these results, the potential applications of this material, and the future directions of the $Fe_9O_6$ project.

## *Eimeria* in Mediterranean geckos and ornate box turtles

Catherine Kerr and Dagmara Motriuk-Smith
Biology
University of Wyoming at Casper
Poster Presentation

*INBRE* *Casper, WY*

Oocysts from two different hosts, *Hemidactylus turcicus* (Mediterranean geckos) and *Terrapene ornata* (Ornate box turtles) were collected and analyzed. Samples were originally collected in Texas, Florida, Arkansas, and Mississippi and analyzed in Casper, Wyoming. Oocysts from the *H. turcicus* were identified as *Acroeimeria lineri (Eimeria lineri)* and *Choleoeimeria turcicus (Eimeria turcicus)*. In five of the samples from *H. turcicus*, *A. lineri* was present. Overall, ninety-seven oocysts were documented and measured. These oocysts had an average size of 23.95 x 18.00 µm with an average shape index of 1.3. The sporocysts of this species measured 7.63 x 6.72 µm with an average shape index of 1.1. Sixty-six *C. turcicus* oocysts were photographed and measured. These oocysts had an average size 34.50 x 17.55 µm and an average shape index of 2.0. Sporocysts in these oocysts were 9.40 x 8.07 with a shape index of 1.2. DNA was extracted from these oocysts, but so far the results are inconclusive. A new species of *Eimeria* was described and documented from the *T. ornata* samples. Seventy oocysts were measured and had an average size of 20.6 × 13.8 µm, the shape index was 1.5. Sporocysts were ellipsoidal, 9.8 × 6.1 µm with a shape index of 1.6. Polar granules were visible in almost every oocyst, some oocysts contained as many as 2 or 3. DNA was extracted from these samples and two unique rDNA 18S sequences were obtained. Construction of phylogenetic trees that define evolutionary relationships will be attempted in the future.

## Martian Ice Extraction Drilling Unit

David Mohler, Dakota McCormack, & Taylour Keyser with Dr. Steven Barrett
Electrical and Computer Engineering
University of Wyoming
Oral and Poster Presentation

*NASA* *Evanston, WY*

The purpose of this project is to increase the feasibility of human life on Mars. Since water is an essential element of human life, it must be accessible if any colonization on the planet is to occur. NASA's solution to this problem is to utilize the current resources on Mars since sending water from Earth into space proves to be too costly and impractical of a solution. According to recent data, a vast amount of subterranean ice is estimated to be located beneath the surface of Mars. By using a drilling system that is able to penetrate through Martian overburden and into these underlying ice pockets, our system will be able to collect the ice, and melt it down into potable liquid water. In order for any future colonization to occur on Mars, a device that is capable of performing the tasks as described above is paramount. On Mars, there is no easy access to potable water, and currently the only known existing water on Mars is located beneath the surface of the planet's poles. The successful design, construction, and implementation of this technology will allow astronauts and space-colonists alike to use the existing resources on Mars for their hydration needs. This promises an efficient and economic method of obtaining water and extending the duration of Martian exploration.

**Growing Plants with the Power of Robotany**

Jacob Kirkland, Nathaniel Kuhn, and Kevin Shelton with Dr. Ruben Gamboa
Computer Science
University of Wyoming

Oral Presentation

*Computer Science Department* *Cheyenne, Casper, and Green River, WY*

The goal of this project was to create a digital system to monitor the growth of a plant and regulate the environmental variables to optimize growing conditions. An Arduino system was used to read light, temperature, humidity, and soil moisture data, and to control a light source and a water source. A camera attached to the Arduino took pictures of the plant, which the server program analyzed to determine the health of the plant. It considered factors such as height of the plant, color, number of leaves, and size of leaves. The data was sent via Wi-Fi connection to a desktop restful server program, which stored and analyzed the data using C.A.R.T. decision trees. Each plant received its own decision tree that decided when to adjust watering and lighting schedule information and send it back to the Arduino. An Android application pulled plant growth, health and sensor data from the server to display to the user. In addition, the application allowed the user to manually alter server variables and to score training data for the decision trees. Using these components, we successfully created a comprehensive and semi-autonomous system capable of plant health and growing environment management.

**Accessioning the Garth Denman Percival Family Avian Skin Collection and Possible Changes in Nine Species of Birds**

Adam Klessens and Eric C. Atkinson
Biology Department
Northwest College

Poster

*Research Problems in Biology* *Cody, WY*

Over the course of two semesters at Northwest College in Powell, Wyoming, I have been measuring the avian specimens within the Garth Denman Percival Family Collection and documenting them. The collection consists of 347 birds of approximately 152 different species from 39 families. The vast majority of the collection is over one hundred years old, the oldest being a Red-Winged Blackbird caught 20 June 1908. Each specimen is measured via standard ornithological procedures (i.e., wing chord, tail length, bill metrics, and tarsus length; each measurement was taken to 0.01mm.) and photographed from three angles. These digital data will be uploaded for access by researchers and educators. Some studies indicate that wing chord length may be evolving in response to human-caused environmental changes, hence, out of this collection, I selected nine species to test to see if there are any morphological differences between historically taken specimens and those accessioned more recently. The nine birds tested are the Lark Sparrow (Chondestes grammacus), Yellow Warbler (Setophaga petechia), Chestnut Collared Longspur (Calcarius ornatus), Loggerhead Shrike (Lanius ludovicianus), Yellowbellied Sapsucker (Sphyrapicus varius), Willet (Tringa semipalmata), Red Winged Black Bird (Agelaius phoeniceus), Common Grackle (Quiscalus quiscuan), and American Redstart (Setophaga ruticilla).

**Religion and The Romans of the Second Century C.E.**

Callie Klinghagen with Dr. Laura De Lozier
Classics
University of Wyoming

Oral Presentation

*Animal Science* *Worland, WY*

The Romans claimed to be the most scrupulous of peoples when it came to beliefs. Their idea of *Religioso* is one that is much different from religion today, however, it served them to much of the same extent. Religion to Romans was of the utmost importance as it insured their safety, livelihood, and success of endeavors (Elsner, 2015). The habituality of their beliefs and their occasional contracts with their deities contributed greatly to tradition as well as the ideals of a Roman Citizen. The goal of this research was to determine the effect that religion had on the Roman people and government during the second century C.E. Using Apuleius' *Metamorphoses*, themes such as divine intervention, the evils of man and the world, free will, and curiosity all contribute to the effects Religion had on the early Roman Empire.

**Flash Gas Management Analysis**

Josh Knight
Faculty Mentor: Doug Cuthbertson
University of Wyoming

Oral Presentation

*Honors* *Bakersfield, CA*

The petroleum industry is always evolving and improving, both in profitability and environmental responsibility. Jonah Energy in Pinedale, Wyoming is a on the cutting edge of that innovation. As a senior design team, they have asked us to specifically investigate the economic viability of different flash gas management solutions. The first option is to install a Vapor Recovery Unit (VRU). This unit routes the flash gas through a scrubber for dehydration, through a compressor for pressurization and then into the sales line. This is both economically and environmentally more beneficial than flaring the gas. However, certain flash gas rates are required to cover the initial and maintenance cost of the VRU. The second option is to install a Power Generating Combustor (PGC). This combustor is cutting edge technology and will route the flash gas into a combustor to create power, this power can then be used on site at the production facilities, lowering cost and emissions. However, certain flash gas rates are required to produce a sufficient amount of power. Through our Flash Gas Management Analysis our overall project objective is to reduce emissions and increase capital efficiency through the installation of VRUs or PGCs and associated electric powered equipment. As a team we have analyzed at what rates of condensate production the volume of flash gas is sufficient to efficiently operate each of these technologies.

**Algebra, Calculus, and The ACT**

Alex Krysl, Professor Linda Hutchison
College of Education
University of Wyoming

Oral Presentation

*Honors Program* *Cheyenne, WY*

It is a common saying that "the hardest part of calculus is the algebra". Unfortunately, I found that many students lack the necessary, prerequisite algebra skills and knowledge in order to utilize completely the novel calculus concepts learned. For calculus to be effective, algebraic manipulation presents itself as an essential precondition. As an example, students apply exponent rules throughout the whole differentiation and integration process—like the power rule. For students who lacked a solid background or basis in algebraic concepts like exponent rules, factoring, rewriting equations, and graphing functions, I observed their learning taking place in the calculus classroom as laborious and arduous. There is another catch here: in high school, many of the students taking this first-year calculus course are juniors preparing to take the ACT. However, the ACT omits calculus from its tests. Teachers are required to prepare their students for the mathematics portion of the ACT, all the while progressing and teaching calculus. So, the question becomes: How do teachers prepare students to take the ACT while continuing to propel them forward in their knowledge and application of calculus? Through my student teaching experience, I found that through applying a method called "Just-In-Time Review", combined with specific ACT preparation, students improved their algebraic knowledge while enhancing their learning of calculus and preparing for the ACT. I will propose some methods or ideas that will help teachers be successful in regards to both the ACT and their calculus—mathematics—course.

**Energy Sustainability for Arcosanti, AZ**

Robert LaFaso, Michael Love, Faris Sakka; Mentors: Dr. Kevin Kilty, Dr. Jian Cai
Department of Mechanical Engineering
University of Wyoming College of Engineering and Applied Science

Oral Presentation

*Mechanical Engineering Senior Design* *Laramie, WY*

Arcosanti is a community of approximately 100 people located 70 miles north of Phoenix, AZ. It was founded by Italian-born architect Paolo Soleri based on the concept of "arcology", or "architecture and ecology". The community emphasizes four key values: Ecological Accountability, Limited Footprint, Resourcefulness, and Experiential Learning. This project examines methods by which the community can enhance its sustainability and limit its ecological impact. Specifically, the study investigates the feasibility of wind and/or solar powered pumps to supply the community's water demand. The final solution proposes a variable frequency drive solar powered pumping system capable of meeting demand for more than 300 days annually.

**Serologic Assessment of Antigenic Type-V and other Outer Membrane Proteins from *Brucella* Species as Differential Diagnostic Targets for Brucellosis**

Samantha Lambert with Dr. Gerard Andrews
Microbiology
University of Wyoming
Oral Presentation

*Honors* *Cody, WY*

The Type V autosecreting proteins of Gram-negative bacterial pathogens have been shown to be important surface-expressed molecules that facilitate colonization and in vivo survival. In particular, *Brucella* species have been shown to carry genes with the potential to express several Type V and Type V-like secreted proteins that are antigenic, possess putative virulence function, and may very well contribute to persistence of the microorganism in susceptible hosts (cattle, pigs, bison, and cervids [elk and deer]). Additionally, some of these proteins may be differentially surface-expressed and thus potentially represent species-specific markers. Experiments were conducted to assess feasibility of selected recombinant outer membrane proteins to be used to distinguish between *B. abortus, B. melitensis,* and *B. suis* infection in various host species. A total of four *Brucella* genes were previously cloned in *E. coli* and their recombinant products expressed and purified by established molecular procedures. Methods for determining sero-reactivity of these potential diagnostic targets consisted of SDS-PAGE, electroblotting, and immunolabelling with anti-sera from goats, cattle, bison, and elk infected with either of the three pathogenic *Brucella spp.* Quantitative analysis of protein gels and Western blots was conducted by digital imaging. Results reinforce the practicality of one or a number of these bacterial envelope proteins for use in a rapid serologic-based field assay for Brucellosis in wild and domestic animal hosts. Furthermore, these antigens may have utility in a test that can differentiate infection by pathogenic *Brucella* species specific to a target host.

**Reverse Genetic Screen in *Toxoplasma gondii***

Haley LeFaivre, Stephen L. Denton, and Jason P. Gigley
Department of Molecular Biology
University of Wyoming
Oral and Poster Presentation

*INBRE* *Rock Springs, WY*

*Toxoplasma gondii* is a eukaryotic parasite that can infect a wide array of hosts multiple times and cannot be eradicated. Effects can lead to blindness, brain inflammation, and fatality in immunocompromised patients by developing toxoplasmosis. By understanding the nature of *Toxoplasma gondii* infection, future research could lead to treatments or complete removal from the host. The parasite invades a host cell by specialized organelles secreting proteins called rhoptries, micronemes, and dense granules that facilitate active invasion. Mechanisms of parasitic lifestyle such as replication, immune invasion, and nutrient acquisition within the host cell are not fully characterized. To understand genes involved with these aspects of fitness, a reverse genetic screen was employed. A double stranded break was introduced at targeted sites of the genome using CRISPR-CAS9, which causes mutations as the parasite attempts to repair the induced double stranded break. To select for these mutants, we hijack the repair mechanisms to insert a resistance cassette in place of our targeted gene, resulting in a null mutation. We asses contribution of fitness of the selected gene by monitoring growth, replication, motility, and invasion. After analysis of genes involved with parasite fitness, these gene candidates will lead to future research into the mechanisms they are involved with.

**Spiral Petroglyphs and the Solstice: Archaeoastronomy in the Wind and Bighorn River Basins**

Sara Bales & Bailey Lewis, Prof. Todd Guenther
Natural and Applied Sciences
Central Wyoming College

Oral

*EPSCoR, INBRE, NASA* *Lander, WY*

The Central Wyoming Field School discovered a spiral petroglyph, reminiscent of those common in the desert southwest, on a large boulder in the foothills of the Absaroka Mountains. Sighting from the spiral, over the point of an adjacent boulder, leads to a series of cairns on high points extending at least four miles to the southeast. The fact that similar petroglyphs in Chaco Canyon, New Mexico are associated with a variety of astronomical events caused field school students to wonder whether this is a calendric site. Other researchers have documented that a similar petroglyph near Thermopolis marks the Summer Solstice. This paper discusses the results of student research on four possible calendric petroglyph sites near Lander, Meeteetse, and Hyattville, Wyoming.

**Sagebrush, Climate Change, and Groundwater Recharge in Wyoming**

Lukas Lindquist with Dr. William Lauenroth and Dr. Kyle Palmquist
Botany Department
University of Wyoming

Poster Presentation

*WRSP* *Fort Collins, CO*

Water is arguably the most limiting and important natural resource in drylands where high evaporative demand and seasonal precipitation events are common (Robbins and Fergusson 2014). Groundwater is the critical resource making it possible for people, their crops, and their livestock to persist through the dry periods indicative of dryland ecosystems (Scanlon et al. 2006). Overexploitation of groundwater resources and the externalities associated with depleted aquifers makes understanding the ecohydrology of drylands an essential issue. We focus on the water balance and climatic drivers of big sagebrush ecosystems, an important dryland type in Wyoming covering a large spatial extent. The goal of this project is to understand how groundwater recharge (GWR) will change in magnitude and seasonality in multiple sites across WY in the future. We used a combination of field work and simulation modeling to explore key climatic and ecohydrological drivers of GWR. We simulated water balance using SOILWAT2, a process-based soil water balance model and future climate data to estimate change in GWR through 2100. We found that mean annual temperature and precipitation explained 70% of the variation in change in GWR. High elevation, wet sites (>2200 m) had larger increases in GWR in the future compared to low elevation, dry sites. The among-site variability in GWR was also higher for sites >2200m, which indicates that mean annual precipitation and perhaps snowpack are important explanatory variables for GWR. This research indicates that GWR for high elevation sites increases in magnitude from present and occurs earlier in the year.

**Methane Cracking**

Tyler Webber, Caleb Weddle, Matthew Paintner, Andrew Lipe with Dr. John Myers
Chemical Engineering
University of Wyoming

Oral Presentation

*Chemical Engineering* *Allentown, PA*

The purpose of our design project is to produce a high purity hydrogen product that emits a low concentration of carbon dioxide emissions. The objective will be to replace the current industrial standard of steam reforming which doesn't produce a marketable byproduct as well as producing high amount of carbon dioxide emissions. Throughout the semester, we have researched different processes to crack methane which included the Hazer process, plasma pyrolysis, nickel based catalysis, and direct contact pyrolysis of natural gas using a molten metal. For this project, we decided to design a process based off direct contact pyrolysis due to its ability to produce product with a high conversion as well as not needing significant amounts of water for the reaction along with producing significantly less carbon dioxide emissions. With this process, we learned that it emits nearly half as much of the CO2 as steam reforming. [27]. The molten metal catalyst for this process adds residence time to the reaction and increasing the conversion of reactants to products. We found tin to be the most common in past laboratory trials due to tin's high boiling point, relatively low melting point, and high density. These properties seem ideal for this process since tin acts as a natural separator for our product and byproduct.

**Branding and Visual Promotion in Laramie, WY**

Lauren Looney with Jennifer Harmon
Department of Family and Consumer Science
University of Wyoming

Oral Presentation

*Honors Program* *Loomis, CA*

Branding and visual promotion are two key components for a business that can strengthen their stance in the marketplace. This paper looks specifically into branding and visual promotion, and how that relates to the visual merchandiser, in Laramie, Wyoming. It will also discuss how small businesses become successful based on Laramie business owners' perspective and the unique view on visual merchandising in a small college town. This research started with businesses in downtown Laramie and, after choosing a few businesses, the researcher designed three display windows downtown. After designing and implementing these windows, the owners or managers of each store were interviewed about their roles in visual merchandising, their outlook on owning or running a small business, and how effective they perceived the windows to be.

**African and European Cultural Exchange and Development within the Southern United States and Brazil, a Comparative Case Study**

Jonathan Loper with Dr. David Messenger
History
University of Wyoming
Oral Presentation

*History* *Cheyenne, WY*

This work will examine the differential as well as similar ways in which African and European cultural traditions interacted with, and influenced, one another to affect social realities in the Americas during the eighteenth and nineteenth centuries. This will be achieved primarily through a focus upon the cultural traditions of music and religion. This will be achieved through means of a comparative case study of the Southern United States (Virginia, and South Carolina) and Brazil. In both Brazil and the United States, European traditions definitely affected the lives of people of African descent, but African traditions likewise also played a major role in shaping both 'black' and 'white' culture. Likewise African and European traditions often merged together to create new cultural and social realities. There are also important differences also between USA and Brazil which will be explained as resulting from a different set of historical circumstances as well as cultural discrepancies. Using reputable secondary sources combined with primary source documents such as traveler accounts, an analysis of how African and European cultures co-mingled will lead to a better understanding of how cultural exchange unfolded.

**Vehicle Occupancy Detection System**

Hannah Miller, Kelsey Lunberg, and Justin Wert
Advisor: Dr. Jerry Hamann
Electrical Engineering
University of Wyoming

*Honors* *Gillette, WY*

Personal vehicles often become traps for unattended occupants throughout the year. Sadly, this can lead to severe health complications or even death if exposed for too long. Although these complications arise primarily in hot climates, it has been demonstrated that they can happen in any environment. Prolonged exposure to an unfamiliar and often dangerous setting without competent human intervention can be detrimental to health. This problem predominantly impacts pets and young children. In an effort to reduce these preventable health complications and possible deaths, we have developed a vehicle occupancy detection system. The goal of developing this occupancy detection system was to first determine if an unattended child or pet resided in the vehicle. If detection occurred, the real-time climate was then sampled. If the climate conditions were deemed hazardous or detrimental to health in any way, an alert would then be sent to a parent or guardian via a text message. Main system components include passive infrared detection sensors, temperature and humidity sensors, Bluetooth modules for communication between subsystems, and an SMS module for cellular alert communication. This system process aligns with efforts in reducing as many preventable health complications and deaths due to prolonged exposure to dangerous environments as possible.

**The Effect of Two Learning Conditions on a Dancer's Technical Accuracy and Confidence in a Simulated Performance Setting**

Avery Lux with Margaret Wilson
Theatre and Dance
University of Wyoming

Oral Presentation

*Honors* *Rapid City, SD*

In dance classes, mirrors are used to help students see if they are using proper alignment and technique. Mirrors are used in the classroom, but are not used in performances. Performances usually take place on a stage, with stage lighting. The purpose of this study is to see if there is a notable impact on the technical accuracy and confidence of the dancer when learning dance with the mirror versus learning dance without the mirror. For this study, participants learned sequences with and without the mirror, and executed the sequences in a simulated performance setting. A faculty panel assessed the performance of the dancers using a survey. Following their performance, the dancers evaluated themselves using an initial survey, generally rating their performance in each testing condition (with the mirror, and without the mirror). After completing both testing conditions, participants filled out a final survey rating their performance in both rounds, and comparing the two. This study will add to the research being done in the dance science community. It aims to assess whether the mirror plays a significant role in aiding or hindering the dancer's accuracy and confidence in a performance setting. Final data is still being reviewed, and will be presented at undergraduate research day.

**Synthesis and Properties of Transition Metal Carbides from Structured Carbon Precursors**

Kenneth Madsen, Dr. Brian Leonard
Chemistry
University of Wyoming

Oral

*Wyoming Research Scholars Program* *Cheyenne, WY*

As the world's energy demands continue to increase the search for efficient and renewable means of generating power must grow to meet them. A significant portion of this research aims to develop improved electro catalysts, which could serve as a replacement for traditional precious metal catalysts in hydrogen fuel cells. One class of materials under investigation is transition metal carbides. These materials show high catalytic activity and are vastly less expensive than precious metal catalysts such as platinum and ruthenium. Regardless of which catalyst is being used good control over the composition and structure of the material is necessary to produce high activity. Carbide materials are typically synthesized by a high temperature solid-state reaction, making control over the morphology of the product very difficult. This investigation seeks to develop techniques to control the morphology of metal carbides by structural variation of the carbon precursor. Through a salt flux mediated high temperature synthetic route we have demonstrated that the variation of the morphology of starting materials does affect the morphology of the product. Moreover, we observe that at sufficiently low temperatures (<1000˚C) we can maintain the morphology of the starting material throughout the reaction. We have demonstrated this with a variety of structures including carbon buckypaper, graphene nano-platelets, and carbon microspheres.

**Reactions of Nitric Oxide with β-Hydroxylimino Esters**

Elayna Mahone and Dr. Navamoney Arulsamy
Department of Chemistry
University of Wyoming

Oral Presentation

*Faculty Grant-In Aid, Honors* *Monument, CO*

Nitric oxide (NO) and its one electron reduction product nitroxyl (HNO) are known to act as vasodilators in mammals, including humans, and are considered a possible cure to cardiovascular diseases. However, their instability and high reactivity with atmospheric oxygen preclude the direct use of them as drugs. Recent work has shown that NO donor molecules can be used as pro-drugs to deliver NO to the appropriate bio-sites. Therefore, there is considerable research interest in the synthesis and studies of donors capable of releasing either of the molecules under physiological conditions. As part of our research effort towards the synthesis of new NO- and HNO-donors, we have synthesized new nitroxy derivatives from the reaction of two β-hydroxylimino esters namely, methyl 3-hydroxyliminobutanoate and methyl 3-hydroxyliminopentanoate, with potassium hydroxide and NO. The isolated products are characterized as potassium 3-methyl- and 3-ethylisoxazolone-4-diazeniumdiolate. The new diazeniumdiolates are first examples of diazeniumdiolate-substituted isoxazolone. Under modified conditions, the reactions yield the potassium salts of 5-acetyl- and 5-propionylsydnonate-N-oxides.

**Prolonged Exercise and Its Effects on Type 1 Diabetes Mellitus**

Laurel Markert with Dr. Amy Krist
Department of Zoology & Physiology
University of Wyoming, Laramie

Oral Presentation

*Honors Program* *Cody, WY*

Type 1 diabetes mellitus is presumably caused by immunological or viral cumulative destruction of pancreatic β cells, leading to a complete inability to produce endogenous insulin. Exercise can cause different reactions in relation to blood glucose concentration, depending on duration and intensity. High intensity aerobic workouts can cause blood glucose to drop. Anaerobic exercise can cause blood glucose to rise. This can cause problems for a diabetic patient in terms of diabetes management during exercise, as patients often over-compensate for an expected glucose drop by eating carbohydrates and taking a reduced bolus amount of insulin (or no insulin at all) in anticipation of a sharp blood glucose drop. After about ten seconds of anaerobic exercise, energy production moves from creatine phosphate break-down to anaerobic glycolysis, although glycolysis only generates energy for about 180 seconds. An endurance event, such as long-distance backpacking, primarily utilizes aerobic respiration. There is a low rate of aerobic ATP generation, but energy can be sustained for far longer than glycolysis or the phosphagen system. Due to this inefficiency, backpackers may have nutritional deficits of nearly 3,000 calories/day. Caloric deficit should not affect blood glucose levels if insulin ratios are adjusted accordingly. Typically, diabetics with greater fitness require less insulin and do not suffer large blood glucose decreases when compared to less fit peers, although insulin dosages are commonly decreased down to levels as low as 30% of the patient's normal rates. As the body adjusts to the demands of backpacking, blood glucose and insulin requirements normalize.

**TRPV1 Activation Counters Vascular Dysfunction by Increasing PPARs, SiRT-1, PGC-1α and UCP-1 Expression in the Thoracic Aorta**

Kaylan Schilling[2], Laurel Markret[1], Joy Watkins[2], Kelvin Kinyatta[2], with Steve McAllister[2], Padmamalini Baskaran[1], and Baskaran Thyagarajan[1].
School of Pharmacy[1]
Division of Health Science and Public Safety[2]
University of Wyoming[1] and Central Wyoming College[2]

Oral and Poster Presentation

*INBRE* *Riverton, Cody, WY*

Obesity foreshadows metabolic diseases. The imbalance between energy intake and expenditure leads to increased visceral fat accumulation, causing obesity. Vascular dysfunction associated obesity causes hypertension and progressively leads to cardiovascular diseases. Recent research suggests that activating TRPV1 is a good strategy to counter obesity and metabolic complications. In this work, we evaluated a hypothesis that activation of transient receptor potential vanilloid subfamily 1 (TRPV1) expressed in the thoracic aorta vasculature suppresses development of hypertension and vascular damage by enhancing expression of metabolically important peroxisome proliferator activated receptors (PPARs), sirtuin-1 (SiRT-1; central cellular metabolic sensor), PPARγ coactivator 1α (PGC-1α) and uncoupling protein 1 (UCP-1). Data show high fat diet (HFD; 60% calories from fat) feeding caused obesity and hypertension and suppressed the expression of PPARs, SiRT-1, PGC-1α and mitochondrial UCP-1. Capsaicin (a TRPV1 agonist) supplementation reversed this. Capsaicin increased the expression of SiRT-1, PPARγ, PGC-1α and UCP-1 in the thoracic aorta of wild type mice but not $TRPV1^{-/-}$ mice. Further, capsaicin enhanced expression of PKCε, which in turn enhanced the phosphorylation of PPARα. Also, capsaicin significantly decreased elevated systolic and diastolic blood pressure (measured by non-invasive tail cuff method) in wild type but not in $TRPV1^{-/-}$ mice. Data show that HFD significantly suppressed expression of TRPV1 in the thoracic aorta and capsaicin countered this. Our data collectively suggest that activation of TRPV1 tightly couples to a SiRT-1-PPARs and PGC-1-dependent signaling mechanism to upregulate mitochondrial UCP-1 to protect vascular damage.

**Personality and Problem Solving in Zebra Finches**

Jessica L. Marsh, Lisa Barrett, and Dr. Sarah R. Benson-Amram
Department of Zoology and Physiology
University of Wyoming

Oral Presentation

*INBRE & EPSCoR* *Laramie, WY*

Zebra finches (*Taeniopygia guttata*) are often used in studies of social learning, personality, and communication. However, few studies have addressed the potential influence of an individual's personality on their cognitive abilities, or how personality combinations can affect the success of pair-bonded mates. Our research aims to investigate these questions. We began by assessing personality in zebra finches. To evaluate an individual's personality, we measured five different behavioral traits. These traits include: dominance, neophobia, aggressiveness, fearfulness, and obstinacy. Personality traits were tested individually and across multiple trials. Next, individuals were given a series of three problem-solving tasks with a food reward. This was used to measure an individual's problem-solving ability. We then asked whether an individual's personality predicted its performance on the problem-solving tasks. Future work will aim to address whether pairs of mates with similar personalities perform better than pairs of mates with dissimilar personalities on two coordinated skill-pooling maze tasks.

**Molecular identification of rhizosphere fungi isolated from a selenium rich ecosystem**

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

*Department of Natural Science, INBRE* *Cheyenne; Laramie; Riverton, WY*

This is an ongoing study of fungal samples collected from the rhizosphere of selenium (Se) hyperaccumulator and non-accumulator plants in the north central Wind River Basin west of Lysite, WY. Development of a consistent and reliable procedure to identify these chemically diverse species proved to be challenging. Presently each sample has been assessed for Se tolerance, total phenolics, antioxidant capacity and antibiotic production. However, these isolates still require taxonomic classification. Identifying these fungi will provide insight into their phylogenetic and ecological roles in Se tolerance, host plant and fungal interactions, and impacts of environmental Se on fungal communities. To identify fungal taxa, DNA was isolated using the E.Z.N.A. SP Fungal DNA Mini Kit. Each DNA sample was amplified using standard PCR for the internal transcribed spacer region (ITS), commonly used to identify fungi. Amplified DNA was visualized and extracted using 1% agarose gels and prepared for sequencing using Quantum Prep PCR Kleen Spin Columns. The purified DNA was sequenced in both forward and reverse directions and concatenated sequences were compared to available sequence data of other fungi using BLASTN in Geneious. Using this information, we identified a sub-set of the unknown taxa minimally to genus and report preliminary results.

**Effect of High Salt Diets on Reproductive Organs of the Rat**

David Mayer, Dr. Donal Skinner
Physiology
University of Wyoming

Oral

*INBRE* *Casper, WY*

Infertility rates among women all over the world are on the rise. What factors might cause this? Many differences in peoples' physiology are due to diet. With the promotion of westernized cuisine people are consuming more salt. The negative effects of a high salt diet are understood to be harmful, but could they be responsible for the increase in infertility? Recent research has determined a high salt diet can postpone puberty in a rat significantly. Taking a closer look at the how female rats' sexual organs are affected by a high salt diet might help us determine what is going on in humans. By looking at specific features in the ovaries of rats that have been fed different percentage salt diets, we might be able to broaden our understanding of morphological changes caused by a high salt diet. Sprague-Dawly rats (Rattus) act as a great model of human physiology. Female rats' completion of puberty is determined by vaginal opening. In recent research, the number of days that had passed before vaginal opening occurred was recorded in rats being fed different concentrations of salt in their food. The rats being fed higher concentrations of salt showed a delay in puberty. By taking a closer look at these rats' ovaries, a difference could be detected. This discovery could yield a better understanding of the consequences of a high salt diet. It is important to find causes of infertility in women, and modeling using a rat is a great place to start.

**Quantifying Analyst Bias in Mapping Flooded Areas from Landsat Images**

Caleb McCarragher[1] with Dr. Ramesh Sivanpillai[2, 3]
1. Department of Geology, 2. Department of Botany,
3. Wyoming Geographic Information Science Center
University of Wyoming

Oral

*WyomingView* *North Andover, MA*

Satellite images are classified by image analysts following disasters such as flooding, landslides, and wildfires. Results of the image classification process will be impacted by analyst bias which is unavoidable. If the results of the classification vary too much due to analyst bias, the derived map products might not be useful for post-disaster management. The goal of this study was to quantify the amount of bias introduced by the analysts while classifying the flooded areas in six Landsat images. In this study, six analysts classified a set of four post-flood Landsat images. Each analyst had the flexibility to select the number of clusters along with related parameters while assigning the pixels in each image. Finally there were required to group the pixels in each image and assign them to water (flooded areas) or non-water classes. Variations in the area of flooded areas identified by the six analysts for each image was computed to quantify the extent of analyst bias along with sources of variation in each image.

**The Mustangs' Coming of Age: A History of Western Wyoming's Two-Year College**

Savannah McCauley, Dr. Jessica Clark
History Department
Western Wyoming Community College

Oral

*Sweet Memories: Historical Research Group* *Green River, WY*

Appalled that only 20 percent of the 1957 Rock Springs High School graduates planned to attend college, Wyoming Legislator Elmer Halseth wrote a passionate editorial to the residents of Sweetwater County. In the June 12th edition of the *Rock Springs Daily Rocket*, he argued that the lack of a local college prevented many Sweetwater County students from advancing in social or economic status. Halseth insisted that depriving the region's youth of this opportunity was fundamentally unjust, and that it was not only the county residents' right, but their moral responsibility to create a place of higher education within the region. This 1957 article started an initiative to charter a regional college in Western Wyoming, and within two years Sweetwater County was home to Western Wyoming Junior College. By 1965, this school transitioned into Western Wyoming Community College and began providing educational opportunities not only to graduating seniors, but also concurrent or dual-credit high-school students and adult non-traditional students. It soon expanded its reach to a larger audience by building a new campus, and adding outreach centers throughout the southwest region of the state. During this growth, Western's employees endeavored to emphasize change and adaptability, while still adhering to their mission of providing quality education at an affordable cost. After six decades, the school has changed its location, mascot, and name, yet still maintained its identity as the community's institution of higher education and center of cultural enrichment.

**Cokeville's Real Miracle: Reconciling Traumatic Memory**

Savannah McCauley, Dr. Jessica Clark
History Department
Western Wyoming Community College

Poster

*Sweet Memories: Historical Research Group* *Green River, WY*

As the explosion filled the classroom with smoke, third-grade student Jamie Buckley King curled up in a corner awaiting death. Suddenly, someone threw her out of the burning schoolhouse and an ambulance rushed her to a hospital. Her physical injuries consisted of a severe burn on her arm, yet her emotional injuries were much more extensive. Plagued with trust issues for nearly two decades, Jamie was unable to move past this traumatic event, until a friend pointed out that by not moving on, Jamie had died in that school in 1986. This honesty allowed Jamie to reconcile her avoidance of the traumatic memories, inspiring her to turn to religion and begin healing. One of several survivors of the Cokeville Elementary School Bombing, Jamie King, as the others, has coped with the emotional scars of this traumatic memory. According to the *Lewiston Daily Sun*, this experience emotionally scarred most of the children in the small, rural, Wyoming community. They never forgot the events of that fateful day, and the media's constant interviews only made the situation ever present. As the news outlets celebrated that no lives were lost, survivors had to cope with living with constant fear and mistrust. Many of them managed to overcome this trauma by turning to The Church of Jesus Christ of Latter Day Saints and coming together as a community. Through therapy, acceptance of the media's intrusion, and church support, survivors of the Cokeville Elementary School bombing slowly managed to reconcile their traumatic memories.

**Portable Audio Equalizer**

Sean McColley
Advisor: Dr. Eva Pikal
Electrical Engineering
University of Wyoming

Oral and poster presentations

*Senior Design* *Cheyenne, WY*

Music is an integral part of most people's life, and as consumers of music we like to have control over how we enjoy this product. Music in essence however is a complex periodic pressure wave with an arrangement of frequencies. These frequencies can be sectionalized into different envelopes to which using complex circuitry, and then modulated which can alter the user's experience of the music. Therefore the purpose of the project is to design a prototype for a portable audio equalizer with a digital control mechanism that will sectionalize different frequency bands for modulation. Also, as a basis of principle this design will incorporate a digital control scheme for a completely analog filter set. Through preliminary testing of the device I have come to a conclusion of the feasibility of such a device so long as it follows a set of guidelines, making it suitable for consumer consumption.

**Nasal Antisepsis: Povidone-Iodine vs Alcohol Based Solutions**

Mackenzie McCoy with Kimberly Raska-Miller
Nursing
University of Wyoming

Oral Presentation

*Honors* *Casper, WY*

Surgical site infections (SSIs) are unforeseen complications of surgeries as a result of antibiotic-resistant bacteria. Often these SSIs are caused by bacteria that are naturally found on a person's body, specifically their own personal flora found in the nares. A method of eliminating this colonization is critical in decreasing rates of SSIs. Therefore, the purpose of this research was to determine the best solution of nasal antisepsis to use in my nursing capstone preoperative unit in order to eliminate the colonies of nasal bacteria in patients undergoing surgeries involving implants. Two solutions were identified as most commonly used antiseptics: povidone-iodine and alcohol. Currently, povidone-iodine is being used per hospital policy at my capstone facility but for the purpose of bettering infection control, the facility is open to looking at both solutions. Bacterial death percentage, ease of use, length of effectiveness, cost to the facility, and patient compliance were elements considered for this research. The outcome of this research will be to provide the preoperative unit and the facility with the needed information in order to identify and implement the best nasal antiseptic in regards to decreasing the rate of infections following surgeries involving implants.

**The Interdisciplinary Climate Change Expedition (ICCE): An Analysis of Ice Depth on the Dinwoody Glacier Using Ground Penetrating Radar**

Ian McGlynn, Mentor: Jacki Klancher
Applied Natural Resources
Central Wyoming College

Oral and Poster Presentation

*INBRE, EPSCoR, NASA* *Walnutport, PA*

The Wind River Range, located in west-central Wyoming, is home to over 80 mountain glaciers. The meltwater from Wyoming's alpine glaciers is critical during the dry summer months when the snows have melted and precipitation is rare. Previous assessments of glaciers in the Wind River Range indicate an overall trend of recession since 1850, with only localized periods of growth. Due to the relationship between alpine glaciers and water availability, it is critical to monitor the health of these glaciers and analyze their rate of recession. This study seeks to determine changes in ice depth of the Dinwoody glacier (at the base of Gannet Peak) in the Wind River Range. Using Ground Penetrating Radar (GPR) (S&S Noggin 100MHz), the team collected subsurface data along a 1500m transect of the glacier. Results from this transect, collected in August of 2015, were compared to two previous studies conducted in 1991, and 2006. Data correlation with previous studies suggested a continuing trend of recession over the past three decades. Further analysis revealed a miscalculation in the transect route due to datum shift, rendering comparisons invalid. Repeat experiments, conducted in August of 2016, accounted for datum shift and resulted in suitable data for comparison with 2006 studies, as well as the previous year's data. Analysis of data from 2016 suggests an overestimation of ice depth from previous studies, along with an overall trend of recession. These findings may affect current understanding of glacial recession rates in the Wind River Range, and expand knowledge of the applications of portable GPR antennae for remote alpine glacier studies.

**Extracting Water from Martian Sub-Surface (Martian Cowboys)**

Tanner Poalillo, Mark Mckee, and
Lindsay Patrick with Dr. Kevin Kilty
Mechanical Engineering
University of Wyoming

Oral Presentation

*Senior Design* *Laramie, WY*

With the pace at which technology is advancing, there are speculations that NASA will send the first manned mission to Mars by 2050 and the dream of consistent space travel will become closer to a reality. With this amazing achievement on the horizon, the need for extracting water from the Martian sub-surface becomes apparent and in an attempt to understand the difficulties of this task, NASA called for teams to design a prototype of an extraction system. At the beginning of the fall semester, the Martian Cowboys began a seven-month endeavor to develop a functioning prototype that met NASA's requirements. The goal of this project was to develop a low-level prototype that could extract potable water from an ice block. To begin development, many brainstorming sessions took place between the Martian Cowboys and our professors/advisors and potential problems were identified. There are two extremely challenging aspects of this project: one was the mechanical system that needed to be in place to provide movement in two global directions as well as withstand the drilling force and the second difficult task of this project is that the prototype must operate without direct human interaction. Working with our team of electrical engineers, we were able to develop an integrated system that allowed controlled movement from a remote location as well as produced clean water.

**Rare Earths from Phosphoric Acid Sludges**

Ben McMillan, Dr. Bell
Chemical Engineering
University of Wyoming

Oral

*Chemical Engineering* *Haslett, MI*

The initial designs for a rare earth extraction plant as an addition to the existing Simplot phosphoric acid plant in Rock Springs, WY are laid out. Rare earths exist in trace amounts in the ore mined for phosphates, and remain in the processed sludge after the phosphoric acid is produced and clarified. The design calls for an initial drying of the sludge, and then batch acid leaching. The unleached solids are recycled back into the main phosphate plant while the leachate is sent to a solvent extraction unit. Using crossflow extraction, the aqueous rare earths are extracted into an organic solvent and then stripped with pure water. This aqueous solution contains a higher concentration of rare earths and a lower concentration of impurities than the original sludge. The rare earths are then precipitated with oxalic acid, and then calcined to produce a purified rare earth oxide product. The economics of this design will be discussed, and show a very unfavorable outcome. While the capital cost is manageable, the variable costs of the required chemicals are greater than the value of the products.

**Assessing Medical Providers Knowledge of American Diabetes Association (ADA) Clinical Guidelines**

Drew McMillan and faculty member Michelle Hilaire
School of Pharmacy
University of Wyoming
Oral Presentation

*Honors* *Cody, WY*

More than 29 million Americans live with diabetes and type 2 diabetes accounts for about 90% of all diagnosed cases. Diabetes complications include heart disease, stroke, kidney disease, and amputation. Health care providers are expected to stay current with guideline based treatment options to provide optimum care. This project focused on a single medical practice to assess providers' knowledge of the 2016 American Diabetes Association (ADA) Clinical Guidelines. A 10 item survey outlined key issues including blood pressure goals, immunizations, laboratory monitoring, exercise recommendations and A1c goals among others. Twenty eight out of 35 providers (80% response rate) completed the survey including medical residents, attending physicians, and nurse practitioners. The average was 5 questions answered correctly (range 2-7) and individual questions were analyzed (4-100% correct). We examined differences among types of providers to see if time spent in clinic vs time since initial training had any implications on scores. Nurse practitioners had the greatest number of questions correct (6.25) and are typically in clinic 8 half-days per week. First year medical residents averaged 4 questions correct and spend 1-2 half-days in clinic. Based upon survey results, two clinic adjustments were made. First we had a didactic learning experience with providers to go over survey answers and also alert them to the new 2017 ADA Guidelines. Second we created chart phrases in electronic health records that can be pulled into patient charts to make sure providers are following guideline recommendations.

**Fetch!**

George Sciss, Jason Melick
Kevin Kilty
Mechanical Engineering
University of Wyoming
Oral Presentation

*Senior Design* *Laramie, WY*

The goal of this project is to aid elderly or disabled when retrieving items around their home. The project is two parts: building a manipulator with optical recognition capabilities and building a moveable chassis with local GPS. The project focuses on building a type 4P1R manipulator that is lightweight, cheap, and "semi-autonomous". 4P1R means the manipulator has four pin joints operating the primary plane of motion and rotation about a single axis in the plane; and the meaning of "semi-autonomous" is to act independently after receiving an input from the user. Due to thorough FEA modeling, the manipulator is lightweight. This allows use of smaller less expensive motors, when compared with industrial manipulators. The team is also designing servomotor controls based on inexpensive hardware. Servo motor control and optical recognition remain a work in progress. The mechanical design of the manipulator is complete and a prototype is under construction. We produced a manipulator close to optimal weight, considering cost constraints. The algorithm responsible for arm manipulation will operate on a microcomputer running Windows 10 and MATLAB. The microcomputer will communicate with a network of microcontrollers, which controls motion of individual joints. The microcontrollers control servomotors using PID control schemes to achieve desired motion. Timing belts and pulleys physically translate the manipulator.

**Preparation and Characterization of Spider Silk Scaffolds for Wound Healing Applications**

Anthony Menghini with Dr. Patrick Johnson
Chemical Engineering
University of Wyoming
Poster Presentation

*INBRE* *Cheyenne, WY*

Few naturally occurring materials surpass spider silk in possessing such unique characteristics and potentially useful applications. The purpose of this research project is to successfully understand and demonstrate the usefulness of spider silk-like proteins in a biomedical context. Using refined experimental techniques, fiber mats composed of spider silk-like proteins are produced. These fibrous protein mats are then tested for their ability to induce cell migration, growth and proliferation and ultimately tissue regeneration. Significant studies over the past three years have provided crucial advancements in optimal spider silk-like protein production and purification as well as refining techniques in the production of protein fiber mats and mammalian cell cultures. The ability to assist in the healing process of a suture, burn or wound while minimizing the physical appearance of scarring exemplifies the importance of this biomedical study.

**Vaccines: What You Really Need to Know**

Sydney Schneider and Victoria Milano
Mentor: David Bruch
School of Pharmacy
University of Wyoming
Oral presentation

*Honors* *Lone Tree and Brush, CO*

The first vaccine created was for smallpox in the late 1700s. In the two centuries following many vaccines have been developed to prevent life-threatening diseases, and decrease human suffering. However, there are still many misconceptions about them. These misconceptions have led to a decrease in the use of vaccines, leading to the reemergence of diseases that were once nearly eradicated from first world countries. In this paper we will address ten common misconceptions held by the public in the United States, and present a review of the literature to either support or reject these beliefs.

**Electroencephalogram-based Brain-Computer Interface**

Cena Miller with Dr. Suresh Muknahallipatna
Electrical Engineering
University of Wyoming
Poster Presentation

*Senior Design* *Waukesha, WI*

Brain Computer Interfaces (BCIs) are systems that allow people to control devices using brain signals. One goal of BCI research is to provide an additional communication method for the estimated 7 million Americans who are living with motor impairments, ranging from partial paralysis to limb loss (Center for Disease Control, 2007). Electroencephalogram (EEG) recordings can provide a real-time, low resolution image of the electrical activity on the surface of the brain, using non-invasive techniques. The challenge is in accurately classifying these signals, in order to provide an appropriate command signal to the software interface. The goal of this project was to use EEG data to train a neural network to recognize the patterns in brain activity associated with four types of motor imagery. Then, the network was used to classify data gathered in real-time from the Emotiv Epoc+, a commercially-available EEG headset. Output from the interface was used to control the movement of a shape within a graphical user interface, which also provided feedback about the accuracy of the classification method.

**Court Decisions after *Strickland v. Washington:* The Evolution of Ineffective Assistance of Counsel Requirements in Federal and State Courts**

Mackenzie Morrison and Dr. Adrienne Freng
Criminal Justice (Pre-Law)
University of Wyoming
Oral Presentation

*Honors* *Casper, WY*

The landmark case of *Gideon v. Wainwright* (1963) established the right to assistance of counsel for all indigent defendants. However, it did not guarantee a right to *effective* assistance of counsel. An attorney must be more than a warm body standing next to a defendant. *Strickland v. Washington* (1984) established that not only do defendants have a right to assistance of counsel, but they must also have effective assistance. The *Strickland* decision established a two-part requirement in order for a defendant or petitioner to show ineffective assistance. After *Strickland*, the federal government continued to make decisions based off of these requirements, sometimes expanding and sometimes contracting the requirements, however, never steering too far from the *Strickland* test. States such as Wyoming and Colorado have continued to uphold the *Strickland* test. Though, states like New York and Hawaii viewed the requirement as too high, in turn these states lowered the bar for the ineffective assistance of counsel requirement. Few states have changed from *Strickland* indicating that the standards are fair, but the states that have changed, take a hard stance that the 6$^{th}$ Amendment's right to counsel has not been vindicated because the standards to show ineffective assistance are too high, resulting in only extreme cases finding ineffective assistance of counsel.

**Trauma & Social Inhibition:**
**The Association Between Trauma and Interpersonal Behaviors**

Mike Morrow under mentorship of Dr. Joshua Clapp
Psychology
University of Wyoming
Oral Presentation

*McNair Scholar's* *Perris, CA*

Clinical trauma is a pervasive occurrence and tends to impact the behavior of trauma survivors. Past research has examined the relationship between interpersonal problems and trauma; at the same time little research has examined the relationship between trauma type and associated interpersonal problems. This research sought to examine the difference in interpersonal problems displayed by survivors of varying trauma type. We separated our participants in three groups; sexual assault survivors, non-sexual physical assault survivors, and accident/natural disaster survivors. We found that sexual assault survivors tended to have higher rates of social inhibition and nonassertive behaviors than accident and non-sexual physical assault survivors. Gender differences did not significantly influence the interpersonal behavior findings.

**The impact of *T.gondii* infection on NK cell Transcription Factor Usage**

Tiffany Mundhenke, Jason Gigley
Molecular Biology
University of Wyoming
Poster Presentation

*INBRE* *Thornton, CO*

The parasite, *Toxoplasma gondii*, is the third world wide cause of food borne illness and possess an extreme health risk for immunocompromised individuals. Chronic infections of *T. gondii* results in immune exhaustion in which T cells become incapable of controlling the infection resulting in *T. gondii* overcoming the immune response. Natural killer (NK) cells were observed to play a role in contributing to immune exhaustion. To address why NK cells play this role in immune exhaustion, we have described the survival relationship of manipulating the NK cells through a series of survival group by the deletion of NK cells during both acute and chronic infection. Depleting the NK cells during the acute phase of infection resulted in a slight prolonged survival of the mice. The depletion of NK cells during the chronic phase of infection, however, had a much longer survival rate compared to mice that had their NK cells. Transcription factors are also of interest in how the NK cells are responding to acute and chronic infection. Transaction factors that were of interest were BLIMP, EOMES and T-Bet in which have been previously demonstrated to change during acute infection. The use of flow cytometry allowed for quantifying the transcription factors that were present in a naïve model. We directly targeted NK cells from the spleen for our baseline knowledge of transcription factors. Our naïve mice displayed high levels of EOMES and T-Bet while the BLIMP was extremely low.

**Self-punishment is not an Effective Strategy for Eliciting Forgiveness following a Guilt Transgression.**

Fernando Munoz Gomez Andrade. Mentor: Elizabeth Louise Ferguson
Psychology Department
University of Wyoming
Poster

*Mexico City, Mexico*

Following some transgression, guilt often motivates to engage in reparative behaviors designed to elicit forgiveness from victims. Common behaviors include compensation and apologies. However, when opportunities for compensation are not available, research also suggest that self-punishment may serve a reparative function. To date, however, the effects of self-punishment on forgiveness have not been explored. In the present study, we compared the effects of three different strategies on forgiveness: self-punishment, compensation, and apology. After allegedly committing a mistake that could negatively affect participants, experimenters engaged in one of three strategies: self-punishment, compensation or apology. Results indicated that participants who were compensated for the researcher's mistake reported significantly greater levels of forgiveness compared to the apology ($p$ = .006) and self-punishment ($p$ = .005) conditions. There was no significant difference between the apology and self-punishment conditions ($p$ = .95). The results from this study suggest that self-punishment is not an effective strategy for eliciting forgiveness following a guilt transgression.

**Nazi Archives and the Americans: From Legal Evidence to NARA Record Group**

Katelyn Myers with Dr. David Messenger
History
University of Wyoming
Oral Presentation

*Honors* *Minatare, NE*

Archives, as institutions, hold the documents that are the basis for every country's history. The documents held within are the framework and foundation of governments and organizations and when thought of as spoils of war, can help the invading country better run their new territories. In the case of Nazi Germany, thousands of documents recording everything from the inner workings of the Reich Security Main Office to the laws governing Jews and the subsequent concentration camps fell into the hands of the Allies as Germany surrendered. These documents helped build the framework of the Nuremburg War Trials and gave tremendous information and aid to everyone from the U.S. military, to intelligence organizations, to historians writing accounts of World War II. The documents that were in American control ended up in Washington D.C., at the National Archives and Record Administration (NARA) where their return back to Germany in the 1990s would become a controversial issue in archival history. The goal of this project is to follow the provenance and uses of the Nazi archives from their capture during World War II through their subsequent uses and their establishment as a NARA Record Group. While following the history, certain case studies are used to demonstrate the significant uses of German material as well as examining American conceptions of their archival structure, such as the creation of the Berlin Document Center, to assist in their use in the Nuremburg Trials and other postwar policies.

**Hydrogel-based Janus Structures for Asymmetrical Aster Nucleation**

Katie Nelson and John Oakey
Chemical Engineering
University of Wyoming

Oral

*Wyoming NASA Space Grant* *Louisville, CO*

Microtubule networks control the spatial and temporal dynamics of a host of cellular processes including motility and division. These networks are nucleated at centrosomes anchored to the nuclear membrane. The distribution and density of centrosomes are therefore hypothesized to influence cellular function. This talk describes the production of immobilized and mobile hydrogel structures to serve as sites for the nucleation of microtubule asters. The surfaces of these structures have been asymmetrically decorated with beads which serve as surrogates for artificial centrosomes through a combination of microfabrication technologies. To create mobile-phase Janus particles, aspiration-driven microfluidic devices were used to precisely meter and spatially locate fluids and beads within droplets, which were crosslinked to form hydrogel microspheres. Oxygen inhibition of the free radical polymerization reaction was exploited to expose fluorescent beads upon a single hemisphere of the particle surface. We hypothesize that in future work these droplets may be used to organize microtubule asters at the droplet surfaces. This experimental platform holds broad utility for fundamental studies that will elucidate mechanisms by which microtubule asters regulate cell motility, cell organization, and cell division.

**Phenotyping Diversity of Crop Species to Inform Model Predictions**

Christopher Nieters with Dr. Carmela Rosaria Guadagno
Botany
University of Wyoming

Poster Presentation

*Botany Department* *Cheyenne, WY*

Changes in global climate patterns and water regimes have always had profound impacts on worldwide crop production. An ever-growing population paired with increasing temperatures and unpredictable periods of severe drought call for accurate modeling of future crop yield. Fine collection of plant morphology and physiological traits are needed to inform mathematical models to reliably estimate yields of crops grown in sub-optimal conditions. We chose *Brassica rapa* to develop our model as it is a globally cultivated crop with several functionally diverse cultivars. Specifically, we use 7 different accessions from oilseed (R500 and Yellow Sarson), leafy type (Pac choi and Chinese cabbage), a vegetable turnip, and two Wisconsin Fast Plants (Imb211 and Fast Plant self-compatible) which have shorter life cycles. We assessed these accessions for anatomical and physiological traits such as gas exchange, chlorophyll content, and chlorophyll *a* fluorescence. Bi-weekly, we harvested above and below-ground biomass to compare the varieties in terms of carbon allocation throughout their life cycle. Preliminary results show that root morphology may be a crucial trait to explain variation in water use and carbon allocation across varieties, which can be used to better inform future models to predict mature crop yield.

**The Evolutionary History of Lake Tanganyika's Nile Perch Species**

Brittany Nordberg, Dr. Catherine Wagner
Department of Zoology and Physiology & Department of Botany
University of Wyoming

Poster Presentation

*Wyoming Research Scholars Program* *Cody, WY*

Lake Tanganyika is volumetrically the second largest lake in the world, and at 9-12 million years in age, it hosts a long history of evolution that has produced remarkable animal communities consisting largely of endemic species. Among these endemics are six fish species that comprise the lake's pelagic (i.e. open water) fish community. Four of these six species are endemic species of the genus *Lates* ("Nile Perch"), and two of the four species have undergone serious population declines in recent years, rendering them listed as "threatened" by the IUCN. All four species are dominantly piscivorous (i.e. fish-eating), and as key predatory species they exhibit strong ecological influences on the lake ecosystem. Remarkably, all four of these species have evolved within this single lake. Previous studies have examined the morphology, habitat, feeding behaviors, growth, and reproductive strategies amongst Nile perch in Lake Tanganyika. The purpose of this project is to explore the evolutionary history of the four endemic *Lates* species. Here, we present preliminary results using mitochondrial DNA sequences to study the order of species divergence and their relative divergence times using phylogenetic methods. This project is significant because very little research has previously examined the genetics of Lake Tanganyika *Lates* species to infer their evolutionary history. The results will provide an important foundation for future work in conservation genetics of these species.

**Wirelessly Controlled Audio Visualizer**

Hayden Oeser
Advisor: Dr. Kubichek
Electrical Engineering
University of Wyoming

Oral and Poster Presentation

*Senior Design* *Elizabeth, CO*

Music has been around for ages, and has been to the enjoyment of many civilizations throughout time. More recently, innovation has created modern visualizers that have lights illuminating colorful and patterned responses to audio, depending on the frequency and amplitude of the signal. This trend has become common on personal computers, at music concerts, and DJ's who want light and music props. The goal of this project is to create a wirelessly controlled LED visualizer that will allow multiple audio inputs, and in response illuminate a square of LEDs directly corresponding to the audio signal. The user will be able to switch the audio input signal, what response the LEDs will give to an audio signal, and adjust the brightness of the LEDs. The project will be lightweight and portable to allow easy travel, and will run mostly on batteries. The visualizer project has a learning aspect as well, where there will be an available USB port on the boards allowing the user to view the loaded program code, and also to modify or add to it. This allows the owner to visually see how programing works, and presents a learning opportunity with quick and fun results.

**Assessment of Cardiac Function in Mice Chronically Exposed to Volatile Organic Compounds**

Jessica O'Neal, Hanna Ahuja, and Gabriel Rodrigues with Bud Chew Ph.D.
Department of Biology
Western Wyoming Community College
Oral Presentation

*INBRE* *Rock Springs, WY*

Atmospheric air pollutants, including Volatile Organic Compounds such as acrolein and polyvinyl chloride (VOC), have been linked to increased cardiovascular and metabolic dysfunction. This is of particular interest in Wyoming, where industrial mining may increase exposure to VOC. This project is part of a recently begun two-year collaboration with Dr. Jun Ren (UW Pharmacy School), to examine the relationship between VOC exposure and cardio-metabolic syndrome. We hypothesize that chronic (6-12 week) exposure to aerosolized VOC will result in cardiac dysfunction in mice. Mice will be exposed to VOC in Dr. Ren's lab, transported to our lab, and subjected to pressure-volume loop analysis of cardiac function (PV). PV is the most comprehensive technique to measure cardiac function, including beat-by-beat determination of: cardiac output, heart rate, stroke volume, preload, afterload, and a load-independent measure of contractility. A PV transducer is inserted into the left ventricle (LV) via the carotid artery, and baseline loops are generated in real time. Inferior vena cava occlusions are performed to assess contractility over a range of end-diastolic volumes. Finally, two calibrations are necessary: 1) hypertonic saline calibration, to subtract parallel conductance (conductance due to cardiac muscle rather than ventricular volume), and 2) cuvette calibration, to convert conductance to volume. PV experiments for this project will begin in Fall 2017.

**Magneto-Optical Properties of Iron Oxide Nanoparticles for Use in Medical Imaging**

Kathleen Oolman with Dr. William Rice
Physics and Astronomy
University of Wyoming
Oral and Poster Presentation

*Honors Program* *Laramie, WY*

Due to their non-toxic and magnetic nature, magnetite iron oxide ($Fe_3O_4$) nanoparticles have potential uses in biomedical applications such as for MRI contrast agents. In this work, the physical properties of rare-earth element doped (Tb and Eu) and undoped iron oxide nanoparticles were optically investigated. Absorption and photoluminescence (PL) from doped and undoped iron oxide nanoparticles in solution showed a well-defined excitonic absorption and weak PL. When the nanoparticles were drop cast into thin films, the absorption spectra remained unchanged while the PL disappeared, suggesting the thin film created non-radiative relaxation pathways. The magnetic properties of the excitons were examined using magnetic circular dichroism (MCD), which is a measure of the difference in absorption under left and right circularly polarized light. Temperature- and field-dependent MCD was used to determine the effect of Tb and Eu dopants on the $Fe_3O_4$ excitons. To further characterize optical properties of $Fe_3O_4$ nanoparticles and other materials, a spectrofluorometer was reconstructed for absorption and PL measurements. This consisted of wiring and controlling three motors to adjust the slit width and rotate a double monochromator using a microcontroller interface. The double monochromator was then calibrated and made available for optical measurements using a white light source.

**Developing an assay for Polar Organizing Protein Z (PopZ) mutant screening**

Allison Hass, Laura Paige, and Derek Vigil with Dr. Dagmara Motriuk-Smith,
Joshua Holmes, and Dr. Grant Bowman
University of Wyoming at Casper and Molecular Biology

Poster Presentation

*INBRE* *Custer, SD and Casper, WY*

The long-standing model that protein structure is critical to function has been expanded to include intrinsically disordered proteins (IDPs). IDPs are present in all kingdoms of life, and they facilitate diverse biological functions. IDPs lack stable structures and exist as conformational ensembles, making the study of IDP structure-function relationships particularly challenging. In this project, our approach is to perform IDP structure-function analyses in a relatively efficient manner, by leveraging the inherent experimental advantages of a bacterial system. The focus of our studies is a bacterial IDP called PopZ, which is responsible for creating signaling networks at the cell poles in *Alphaproteobacteria*. In our experiments, we employ recombinant *E. coli* strains that co-express genetic variants of PopZ together with a known binding partner protein. Both proteins are tagged with a fluorescent protein for the purpose of subcellular localization by fluorescence microscopy. In our experiments, liquid cultures were inoculated, diluted, and recombinant protein expression was induced with IPTG and arabinose. As expected, wildtype PopZ exhibited polar localization, and the GFP-tagged binding partners, ChpT and ParB, co-localized with the polar PopZ foci. When a mutant form of PopZ was investigated in this experiment, it localized to cell poles but the binding partners failed to co-localize, indicating a defect in protein-protein interaction. These pilot experiments, together with related controls, verified the effectiveness and accuracy of the assay. They also provided information for creating detailed protocols for future PopZ mutant screening, which will be carried out in the summer of 2017 at UW-Casper.

**Geographic Variation in Bumblebee Flight Morphology Suggests Aerodynamic Limitations on Upslope Range Shifts**

Zach Parsons with Michael Dillon
Zoology and Physiology
University of Wyoming

Poster Presentation

*EPSCoR* *East Wenatchee, WA*

Geographic ranges of diverse species have shifted poleward and up mountain slopes in response to warming climate. Upslope shifts facilitate tracking of climatic niches over short geographic distances. However, flying organisms moving upslope encounter a novel challenge – reduced air density limiting force production of wings. Whether flying insects may overcome this limitation to upslope shifts through changing flight morphology is largely unknown. Recent studies reveal climate-driven northward and upslope range shifts for dozens of bumblebee (genus *Bombus*) species, which thrive in diverse habitats from sea level to over 5000 m elevation. We measured geographic variation in flight morphology of two Western North American bumblebees (*Bombus vosnesenskii* and *Bombus bifarius*) collected across multiple years and seasons from 36 to 48 °N latitude and from sea level to over 2900 m in elevation. We measured body mass of field-caught foragers before and after emptying the crop, and wing area by analyzing images of clipped wings of over 1500 individual bees. The alpine specialist, *B. bifarius* was smaller overall, with field mass increasing significantly with latitude and altitude. The larger species, *B. vosnesenskii*, showed no change in body size with latitude or altitude. Wing loading (body mass relative to wing area) changed little with

latitude but decreased strongly with altitude, particularly for *B. bifarius*, a species more common in alpine areas. Relatively high wing loading and limited changes in wing loading with altitude for *B. vosnesnskii* may limit the ability of this species to move upslope to track climate change.

**Comparing Galaxy Sizes**

Ryan Parziale with Daniel Dale
Department of Astronomy and Astrophysics
University of Wyoming
Oral Presentation

*WRSP and Wyoming Space Grant Consortium* *Littleton, CO*

Thanks to the expanding Universe, galaxies observed at different distances from us are observed at different cosmological epochs. Thus, observing galaxies at a variety of distances allows us to study galaxies at a variety of evolutionary stages. Comparing galaxy sizes at different cosmological epochs can reveal clues to galaxy evolution. We compare here the infrared sizes of galaxies observed at two different epochs, 1.4 billion and 13.8 billion years after the Big Bang, utilizing data from the Atacama Large Millimeter/submillimeter Array and the Herschel Space Observatory.

**Fabrication and Mechanical Characterization of Thiol-ene Polymers and Thiol-acrylate Liquid Crystal Elastomers**

Viren Patel with Dr. Carl Frick
Mechanical Engineering
University of Wyoming
Poster Presentation

*INBRE* *Laramie, WY*

This study's purpose was to synthesize and program thiol-acrylate and thiol-ene based polymeric materials. A Michael addition of dithiol and tetrathiol monomers with a diacrylate mesogen is the single crosslinking mechanism to form a polydomain. A room-temperature-nematic exhibiting local mesogenic alignment, termed polydomain. A strained polydomain with up to 45 mol% excess acrylate composition, allows photocrosslinking reaction forming monodomain elastomers. These polydomain and monodomain stages largely depend on the effects of increment in crosslink density, showing independent mechanical properties. To study mechanical behavior of polydomain and monodomain samples, dynamic mechanical analysis (DMA) was used to investigate linear viscoelastic region, glass transition temperature, isotropic transition temperature and thermal actuation properties. The amount of acrylate associated in LCEs changed mechanical properties of both polydomain and monodomain elastomers. Polydomain samples exhibited reduced transition temperatures, storage modulus, and high strain-to-failure with increased acrylate as a result of reduced crosslink density. Whereas, monodomain have higher transition temperatures, storage modulus, and reducing strain-to-failure with increased acrylate due to increased crosslink density. A tetrathiol monomer with triene is sole crosslinking mechanism to form radical thiol-ene network polymer. The evolution of mechanical properties is analyzed as a function of UV exposure, where ultraviolet light initiates radical reaction. Thiol-ene polymers were successfully prepared through photochemical reaction with up to 80 mol% excess thiol (relative to acrylate) to form glassy polymer networks with chemically function surfaces. DMA was used to investigate the viscoelastic region and glass transition temperature. Increased thiol concentration resulted in reduced glass transition temperature.

**Attitudes Towards Autism in Healthcare and in Society**

Madeline Peters with Dr. Michelle Jarman
Wyoming Institute for Disabilities
University of Wyoming

Oral Presentation

*Honors* *Hays, KS*

Autism did not appear as its own diagnosis in the Diagnostic and Statistical Manual (DSM) until the third edition in 1980 (Davis, pg 461). In 2014, the Center for Disease Control and Prevention (CDC) reported that autism diagnosis rates were 1 in 110 and stated the high prevalence as "an urgent public health concern" (McGuire, pg 55). This declaration lead to autism being described as an epidemic, which then lead to a widespread sense of fear (McGuire, pg 56). Disability studies scholars take a different approach when looking at autism and disabilities in general. The two main views of disabilities discussed by disability studies scholars are the medical and the social model. The medical model views disability as something that needs to be fixed or cured and as a person-centered problem. The social model views disability as something that is socially constructed (Davis, pg 462). In today's health care, most health professionals view disabilities through the individual model. This takes the medical model to a new level and labels a disability as a tragedy. Disability studies scholars find this to be a nonproductive method of approaching disabilities (Durell). Because of this, a lot of medical students report discomfort when working with disabilities (Symons). Specifically, the field of occupational therapy (OT) is based on a client-centered practice philosophy. It has been argued that embracing disability studies and the viewpoints of disabled people could truly benefit the client-centered practice approach that is utilized by OTs (McCormack, page 2).

**Effectiveness of Project ECHO Case Recommendations.**

Clarissa Petres[1, 2]; Mary Jo Cooley Hidecker, PhD, MS, MA, CCC-A/SLP[1, 2];
Canyon Hardesty, MS, CHES[2]
[1]Division of Communication Disorders, University of Wyoming
[2]Wyoming Institute for Disabilities, University of Wyoming

Poster Presentation

*ASPIRE* *Rapid City, SD*

Many health care professionals and educators in rural Wyoming have few resources for assistive technology. UW ECHO networks are weekly professional development sessions, run via web-based technology, which include a mini lecture and case presentation. A panel of experts provides assistive technology recommendations. This study evaluates effectiveness of these recommendations. Professionals complete a case presentation form listing the area(s) of concern, which includes concerns about communication, reading, motor aspects of writing, composition of written material, mathematics, and organization. Once a case has been presented, recommendations are sent to the professional and posted on the ECHO website. Upon receiving recommendations, a follow-up form asks the professional whether they were implemented. Eleven cases received 58 (range of 3-10 per case) recommendations during 2015-2016 ECHO in Assistive Technology sessions. Five follow-up forms were returned with only 3 of the 5 cases continuing contact. Out of 15 recommendations, four were considered but not implemented, and six were implemented. Possible reasons for lack of follow-up responses could include loss of student contact, relocation of professionals, and the number and appropriateness of recommendations. This study suggests additional steps and procedures may be needed to measure the effectiveness of the ECHO recommendations.

**Forms of Muliebrity**

Naomi Peterson Margaret Haydon
Arts and Sciences
University of Wyoming

Oral

*Honors* *Quincy, IL*

Crafts are often undervalued in the broader 'art world' and are not bestowed the same respect as fine art. Traditional as well as contemporary craft pieces are as significant as many pieces in museums, and, though women were not seen as equal to male artists throughout much of art history, they were just as essential in sculpting the art world that we know today. If everyone were to appreciate craft, including the craft of different cultures, we would gain an understanding of ourselves as a species rather than be defined by divisions in cultures. Through combining various art history concepts and ideas as well as imagery into functional forms, I argue for the importance of craft, the handmade, and art history. I used different forms of ceramic techniques to create a handmade tea set but by carving out a William Morris floral pattern from the Arts and Crafts movement, I negate the functionality of the set. I reference craft and art history through the functional objects, the material of clay, and the pattern. I finished the set with a celadon glaze, which has a long history through Asian crafts and functional vessels as well. Art has played a vital role in the progress of history, and though craft is sometimes seen as frivolous and insignificant in the face of future advancement, looking back at how it has helped us shape our world today can help us grow in any number of fields including education. Allowing arts and crafts to disappear would have countless negative consequences on not only the present, but future generations to come.

**Dry Reforming of Methane into Syngas and Direct Conversion into Acetic Acid**

Tim Poppert with Dr. Joseph Holles
Chemical Engineering
University of Wyoming

Oral Presentation

*Honors* *Powell, WY*

Synthesis gas, or syngas (a combination of hydrogen and carbon monoxide), is utilized in many chemical processes. Steam reformation of methane, SRM, is the primarily accepted method to create syngas industrially. However, this method results in emissions of carbon dioxide, which have an undesired impact on the environment. Dry-reformation of methane, DRM, uses carbon dioxide as a feed, instead of a by-product and creates larger amount of syngas stoichiometrically than steam reformation. Acetic acid (the desired product) is also a common, versatile, industrial chemical. The accepted method for acetic acid production from syngas utilizes a methanol intermediate, requires multiple reactors, and requires a gas-liquid shift reaction. Directly converting from methane to syngas to acetic acid takes advantage of the syngas ratio to eliminate the need for a gas-liquid shift reaction, which reduces the necessary number of reactors. The goal of the project was to design a physically possible DRM process which would also produce a desired by-product for sale (acetic acid in this case). The project focused on the necessary physical conditions and equipment, as well as the economic feasibility of the process. Due to limited scientific literature on this type of process, the project's end goal was to determine what steps in research and development are needed to create a catalyst with the properties that would make the process technically possible, and economically viable.

**Lignin to Adipic Acid**

Kristina Quick with Dr. Karen Wawrousek
Chemical Engineering
University of Wyoming

Oral Presentation

*Honors* *Loveland, CO*

Lignin, a heterogeneous mixture made up of aromatic polymers, is a major co-product produced from second generation cellulosic ethanol plants. Currently lignin is being burned as a low energy fuel; however, since the number of second generation cellulosic ethanol plants in the U.S. is expected to increase over the next several years, a more profitable alternative for lignin is desired. The National Renewable Energy Lab (NREL) has been working towards developing a process that converts lignin to adipic acid, a significant dicarboxylic acid that is used to produce nylon-6,6. This process utilizes bacteria for a biological conversion of lignin, which is much more environmentally friendly than the current petrochemical methods of producing chemically derived adipic acid. The goal of this project was to analyze the lab data released by NREL and determine the feasibility of bringing this process to industry. This was accomplished by designing an industrial scale process based off of the current availability of lignin. A cost and profitability analysis was performed for this design and safety and environmental concerns were also researched and addressed. All of these aspects were taken into consideration to determine if this process would be worth bringing to industry and if it would pose a threat to the current petrochemical process for the production of adipic acid.

**Effect of Neonatal Iron Supplementation on Microglial Activation in Huntington's Disea**se **Mice**

Marley Realing, Dr. Jonathan Fox
Veterinary Sciences and Neuroscience Program
University of Wyoming

Oral Presentation

*INBRE* *Casper, WY*

Huntington's Disease (HD) is a neurodegenerative disorder that results from the atrophy of portions of the brain that control movement, cognition, and personality. Currently there is no therapeutic cure for HD. One change to the brain environment in HD affected individuals is neuroinflammation, this could drive HD progression, but the mechanism is not well understood. Microglial cells, the immune cells of the brain could be a main component of this neuroinflammation and can be activated by oxidative stress. The research team led by Dr. Fox has previously found that supplementation of neonatal mice with iron, worsens the effects of HD and promotes oxidative stress in brain. The aim of this project was to understand if neonatal iron supplementation in HD mice promotes microglial activation. Findings will be relevant to understanding human HD. The initial goal of the research was to validate the microglial cell staining and analysis methods in our own laboratory. We would then utilize these techniques to assess the effect of neonatal iron supplementation in HD and wild-type mice.

**Microfluidic Devices for Cell Growth and Imaging**

Traci Reusser & John Oakey
Chemical Engineering
University of Wyoming

Poster Presentation

*INBRE* *Laramie, WY*

The science and art of microscopy has developed to the point at which we can now image cells and their organelles on microscopic length scales. For many organisms, however, their three dimensional structure complicates the use of modern microscopy tools. The use of microfluidic growth chambers, however, has made it possible to confine organisms within a single plane for high-resolution imaging. Microfluidic devices have been fabricated for the growth and imaging of different organisms using high-resolution microscopes and confocal microscopy. The key aspect of these devices is that they are all designed to confine growth to a single plane. Accordingly, device depth was matched to the thickness of a single cell. We are able to study the growth dynamics of species such as moss, which have never been captured because of its three dimensional morphology. Fungus such as Ashbya can also be imaged to study cytoplasmic streaming and other processes. Microfluidic devices were also used as an in vitro mimic of fungus morphology to image cytoplasmic streaming of proteins and mRNA in a controlled environment. Finally, desiccation-tolerant green algae found in desert crusts were grown in microfluidic devices to gather data to develop and expand models of algal growth. We are studying characteristics of this algal strain to assess how it reacts to various environmental conditions. With microfluidic devices it appears possible to replicate key characteristics of soil in order to explore growth kinetics within and adhesion to these surrogate porous-media.

**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

*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 body's immune response. What is unclear is whether the amount of carotenoids present, seen in the surface area of carotenoid-based plumage coloration, correlate with the intensity of parasitic infection. I am actively testing how the amount of carotenoid-based plumage coloration corresponds with the level of infection with avian malaria (*Plasmodium spp.* and *Haemoproteus spp.*) in Red-breasted sapsuckers (*Sphyrapicus ruber*). The findings of my study will help to emphasize the importance of nutritional status on population health and sexual selection.

**Teleoperated Robot Control with Augmented Reality**

Brad Riotto with Dr. Suresh Muknahallipatna
Electrical and Computer Engineering
University of Wyoming

Oral and Poster

*UW Engineering* *Jackson, WY*

The University of Wyoming currently owns Jaguar 4x4 Wheel robots from Dr. Robot. The Jaguar has a high durability design with integrated camera, audio and optional manipulator arm. These features make it ideal for reconnaissance in the rugged terrain experienced by emergency response and military personnel. However, the robot is currently controlled through a game controller with robot data including video sent to a laptop. This inhibits the user's hands while also requiring the presence of a laptop to view vital information from the robot. This is less than ideal for the people likely to use this robot, as they require full use of their hands and carrying a computer is not always possible. The HoloLens is a wireless augmented reality device that generates 2-D and 3-D holograms on a transparent head mounted display (HMD). It utilizes on-board cameras and microphones to offer gesture and voice interaction with applications in a variety of lighting and sound conditions. It is a fully self-contained computer with a modified Windows 10 operating system. This project integrated the Microsoft HoloLens with the Jaguar 4x4 Wheel robot. It involved developing a HoloLens application to implement both voice and gesture control as well as a heads-up display with video and sensor information from the robot. This reduces encumbrance by eliminating the need for a game controller and laptop. Doing so helps accomplish the goal of providing safe and effective use to those most likely to use the Jaguar 4x4 Wheel robot.

**The Dinwoody Bison Jump: Communal Hunting At 11,000 Feet in the Wind River Mountains**

Morgan Robins, Prof. Todd Guenther
Natural and Applied Sciences
Central Wyoming College & University of Wyoming

Oral

*EPSCoR, INBRE, NASA* *Lander, WY*

The Dinwoody Bison Jump (48FR7682) is located at 11,000 ft. overlooking Dinwoody Canyon in the Wind River Mountains. This is extraordinarily high compared to the fewer than 30 other documented bison jumps and pounds recorded in SHPO files. Thirty years ago, the conventional wisdom was that prehistoric Native Americans (excluding a few sheep eater Indians) avoided the high country. Research since that time has documented extensive use of Wyoming's alpine regions by hunter gatherers. The Dinwoody Jump suggests another previously unrecognized adaptation at elevation-that of communal bison hunting. A 600 acre series of campsites dating between Folsom and Early Contact is adjacent to the jump. This paper presents the results of the Central Wyoming College Field School 2016 field work and lab analysis of the paleoecology and cultural resources of the Dinwoody site complex.

**Rate Predictive Process Control**

Sedona Rockwood with Dr. David M. Bagley
Chemical Engineering
University of Wyoming

Oral Presentation

*Undergraduate Research* *Colorado Springs, CO*

Model predictive control has been used in chemical engineering processes since the 1980s. The chemical process industry still uses model predictive control; however, it is expensive, time-consuming to install and calibrate, computationally demanding, and must be retuned when process conditions change. The chemical process industry has long been looking for a simple, robust, inexpensive replacement for model predictive control. Allan Kern, a 1981 University of Wyoming alumnus, has recently patented a new process control system that may eliminate the problems of model predictive controllers. Mr. Kern developed the rate predictive controller (RPC) to address the challenges with model predictive control. Instead of using highly empirical models, RPC simply adjusts the controller output based on the rate of change of the controlled variable. The goal of this project was to evaluate the theoretical performance of RPC. Excel, MATLAB, and Simulink were used to simulate RPC. Experiments were run in these simulation environments to test the performance of RPC under different conditions. Additionally, the effects of changing key RPC parameters, such as process response time and controller band size, were examined. These experiments yielded varying results. While theoretically instability could be achieved, by following Mr. Kern's guidelines RPC was found to be operationally stable. The simulation experiments were also able to answer questions customers of Mr. Kern have had about RPC, such as the effect of disturbances and higher order transfer functions.

**PopZ organization impacts Protein Distribution and Functionality in *Agrobacterium***

Anne Salisbury with Dr. Grant Bowman
Department of Molecular Biology
University of Wyoming

Oral Presentation

*INBRE Summer Fellowship* *Rock Springs, WY*

In polarized bacteria, cell poles acquire complex, multiprotein assemblies, which are built upon scaffold-like organizing proteins. Polar Organization Protein Z (PopZ) is one such organizing protein that accumulates at the cell poles in rod-shaped bacteria. *Agrobacterium fabrum* is one species of *Alphaproteobacterium* that requires PopZ for proper growth and development. In the absence of PopZ, the growth rate of *Agrobacterium* is diminished, the cell divides incorrectly, and the cell body is unable to develop normally due to the disruption of the organization of proteins and chromosomal DNA in the cytoplasm. Following the fusion of GFP to target proteins utilizing molecular techniques, I used fluorescent microscopy to identify the spatial distribution of PopZ relative to the location of each. Proximity to PopZ implied a relationship between the function of PopZ and that of the protein. I used this technique to locate the positions of flagellar basal bodies in *Agrobacterium* and characterized flagellar activity and localization in the absence of PopZ. My results show that flagellar basal bodies are produced at cell poles during assembly of PopZ polar scaffolds and that, as the cell elongates by creating new cell wall at the pole, the basal bodies are held back at their original sites, creating a radial belt that becomes separated from the growing pole. Although PopZ is critical for normal cell growth in *Agrobacterium*, it is not required for flagellar synthesis at cell poles. This suggests that flagellar basal bodies respond to spatial cues that lie upstream of PopZ polar assembly activity.

**Controlling the Controls**

Arianna Schabauer with Dr. Donal Skinner
Physiology and Kinesiology
University of Wyoming

Oral Presentation

*Honors Program* *Rapid City, SD*

Research provides the basis for scientific discovery and advancements in all areas of science. The process of discovery involves countless repetitions of the identical experiment in order to make a claim about the topic in question. In order to properly conduct an experiment that is similar or the same to one already executed, all of the variables must be perfectly controlled. In experiments discussed in this presentation, living conditions involving rats are the variables to control. Some of the variables include lighting, exercise, water intake, and diet. A current problem facing research is the way diets are being reported in research papers. Matched diets are diets that are the exact same with exception to the nutrient being tested, and should be used within all research labs conducting experiments, however, diets which are very different in many nutrients beyond the variable are being compared. This matching of diets should also be used across separate research labs doing the same or similar experiments. The problem here is the nutrients in these diets are not being reported correctly in many papers, therefore the experiments cannot and should not be compared to one another in order to make a scientific claim. Conclusions are being drawn that may have nothing to do with the research question. The effects of changing many of the main ingredients of these diets will be discussed in depth, in order to show that this is a real issue, and needs to be addressed by the scientific community.

**Turán Numbers of Vertex-disjoint Cliques in r-Partite Graphs**

Anna Schenfisch, Bryan Shader
Mathematics
University of Wyoming

Oral

*Honors Program* *Casper, WY*

In a broad sense, graph theory has always been present in civilization. Graph theory is the math of connections – at a party, who knows each other? How many handshakes will each person have to give before shaking hands with everyone? What is the best way to drive from city to city? Extremal graph theory is a branch that deals with counting items (called vertices) and connections between two items (called edges) and determining the maximum/minimum number of characteristics needed to satisfy a certain property. The specific topic of this talk is Turán numbers, a topic of extremal graph theory that attempts to determine the maximum number of edges a graph may have without a specified pattern emerging. For two graphs, $G$ and $H$, the Turán number is denoted $ex(G,H)$, and is the maximum number of edges in a subraph of $G$ that contains no copy of $H$. We were able to find and prove the previously unknown Turán number for a certain pattern in a certain graph. To be precise, we found the Turán number of $k$ copies of vertex-disjoint cliques in $r$-partite graphs (part sizes $n_1, \dots n_r$). That is,

$$ex\left(K_{n_1,n_2,\dots n_r}, kK_r\right) = \sum_{1\le i<j\le r} n_i n_j - n_1 n_2 + n_2(k-1)$$

This talk will describe the motivation and history of extremal graph theory, discuss definitions and concepts related to the research that was done, explain the main concept behind the proof, and finally discuss possible future research.

**Photometry and Light Emission from Nearby Galaxies**

Kaylee Schimpf with Dr. Daniel Dale
Astrophysics
University of Wyoming

Poster

*INBRE* *Laramie, WY*

The overall objective of this research was to improve galaxy photometry for nearby galaxies that are known for having low chemical abundances. Refining the analysis of space-based infrared imaging was a critical aspect to this research. Infrared radiation of galaxies primarily traces emission from dust grains in the interstellar medium, the voids between stars. Contaminants, such as foreground stars in the Milky Way or background galaxies, were identified and removed to clarify the galaxy being examined. Significant contaminants like these occasionally make it difficult to extract accurate photometry, and therefore the removal of such impurities can be paramount. The focus was on nearby galaxies that were within 50 million light years, and dwarf galaxies were of particular interest. High-resolution optical Hubble Space Telescope imaging was used to identify the contaminating features. The future objective is to improve our understanding of how much stellar light gets absorbed by interstellar dust grains.

**Dual-Electrospray Mass Spectroscopy for Peptide Analysis**

Tyler Schriber and Dr. Franco Basile
Chemistry Department
University of Wyoming

Oral Presentation

*Honors* *Worland, WY*

The research that I have performed since the Spring 2016 semester is based on a study done by Cotham et al. in 2015, where front-end sprayers are used to mix solutions before they enter a mass spectrometer. One of these solutions contains a peptide, which is positively charged, and the other solution contains the reagent 4-formyl-1,3-benzenedisulfonic acid (FBDSA), which is negatively charged. The charges lead to a reaction in microseconds, with spray droplets, before it enters the instrument. Once inside the mass spectrometer a technique called collision induced dissociation (CID) is implemented in order to completely combine the reactant molecules into a single compound called a Shiff base. We plan to attempt this technique on larger peptides, in order to obtain their amino acid sequence, which we prepare through our own microwave digestion techniques. If this technique works with these larger peptides, it will allow for the analysis of peptides at a much more efficient rate. This has applications in many different biological and biochemical fields. Our work could enhance the capabilities of mass spectrometry in daily protein analysis and identification.

**Good Neighbors at Convenience: The Good Neighbor Policy in Panama and the Dominican Republic 1933-1945**

Andrew Schuster with Dr. David Messenger
History
University of Wyoming

Oral Presentation

*EPSCoR* *Laramie, WY*

The Good Neighbor Policy, roughly occurring for the duration of President Franklin Roosevelt's tenure through the beginning of the cold war (1933-1945), is an important landmark in the History of US- Latin American relations. Most historians consider the policy to represent a break, on the United States' part, from a policy of interventionism in the Latin America to one more tied to the idea of partnership. This policy however, like nearly all governmental policies, was created to protect US economic interests rather than solely to purport "Good neighborliness". In fact as I will argue, for most Latin Americans Good Neighborliness changed little in their lives as compared to American Hyper-interventionism earlier in the century or even during the cold war. This was primarily due to the reactionary actions of US-Supported dictators in the region. These dictators were nearly identical to those put in power by the US consistently in the intervention eras both before and after the term of the Good Neighbor Policy. In addition, Good-Neighborliness was not easily applied to the US's continued ownership and operation of the Panama Canal, arguably an ongoing intervention in and of itself, as well as the complex interactions that resulted. This study will emphasize relations in the countries of the Dominican Republic and Panama assessing how the Good Neighbor Policy worked on the ground.

***Parallel Optimization to Obtain a High-Quality Depth Map from an Uncalibrated Small Motion Clip (PDfUSMC)***

Vivaswat Shastry, Dr. Suresh Muknahallipatna
Electrical and Computer Engineering
University of Wyoming

Oral and Poster

*Senior Design* *Bangalore, India*

A high-quality depth map which contains the distance information obtained from a small motion clip i.e. video feed is crucial in the operation of a self-driving car. This can be done through conventional means by sequentially running it on a single core machine. But by using the Jetson TK1 board with its on-board K20 GPU and CUDA programming capabilities, we can parallelize this process of obtaining the depth map. This whole setup is portable and occupies only 5 sq. inches of the car's interior. Due to the GPU's faster computing speeds, we can obtain the depth map quicker which will result in better decision making from the car's processor. This process plays a pivotal role in the operation of a self-driving car.

**Implications and Effectiveness of Half-time Pay for Salaried Employee Overtime**

Dillon Shellenberger with Jaron Harvey
College of Business
University of Wyoming

Oral Presentation

*Honors* *Casper, WY*

Half-time pay is an option for salaried employees to receive as an overtime benefit. Based on a fluctuating work-week schedule, employees with varying hours can be compensated for additional hours worked over 40, through the use of half-time pay. If an employee works less than 40 hours in a week, he/she will still receive the full salary compensation; however, any hours over 40 will receive a wage at half-time of normal pay. My research included examining current policies and analyzing the potentially positive and negative effects of half-time pay for salaried employee overtime. Factors such as retention, fairness, and equity were considered when evaluating the potential effectiveness of half-time pay. By taking into account different management techniques for motivating employees in the workplace and considering the pros and cons of using half-time pay as an overtime pay method, I make a recommendation of how and when half-time pay should be used. Executed in the right conditions, using half-time pay for a salaried employee's overtime can be an effective tool for increasing both employee motivation and moral.

**Relative Competitive Ability of Bulbous Bluegrass (*Poa bulbosa*) and Cheatgrass (*Bromus tectorum*) with Perennial Grasses**

Jordan Skovgard, Beth Fowers, Brian Mealor
Plant Sciences
University of Wyoming

Oral

*Sheridan Research and Extension Center* *Buffalo, WY*

Invasive grasses often negatively impact desirable vegetation. While the interactions and impacts of some species have been widely studied, land managers know little about other invasive species. This research compares the relative competitive abilities of bulbous bluegrass, a largely unstudied invasive grass and cheatgrass – arguably one of the most impactful invasive species in North America. We compared growth of these two grasses using a replacement series design in a greenhouse setting. Light and water were readily available, and plants where grown in a clay-loam field soil with five replicates. Focal species (cheatgrass and bulbous bluegrass) were grown alone, with one another, and with five perennial grasses at focal plant:competitor ratios of 8:0, 6:2, 4:4, 2:6, and 0:8. Twelve weeks after planting, we collected above ground biomass, dried it at 60°C for 72 hours, and weighed it to the nearest mg. Cheatgrass biomass exceeded expected values in mixtures, and bulbous bluegrass competitive response was neutral. As a group, perennial grasses were suppressed more by cheatgrass than by bulbous bluegrass. Idaho fescue was suppressed equally by both bluegrass and cheatgrass. Western wheatgrass was clearly suppressed by cheatgrass, but not by bluegrass. Cheatgrass was smaller with Idaho fescue than with western wheatgrass. Competitive response of bottlebrush squirreltail was superior to other native grasses and was most similar to the non-native crested wheatgrass. Cheatgrass suppressed bulbous bluegrass in direct interaction, and was a stronger competitor in this study. More research is needed to understand the potential impacts of bulbous bluegrass in Wyoming's rangelands.

**The State of Coal in Wyoming**

Sidney Smith with Dr. Nancy Small
Political Science
University of Wyoming

Oral Presentation

*Honors* *Sheridan, WY*

Coal has been part of Wyoming's economy since the late 1800s and continues to have a major influence on the state. Since mining began, trends of rising and falling prices for coal have created economic instability. Currently, Wyoming's coal industry is experiencing a downturn, leading to lay-offs and financial hardship for the state and municipalities. The Wyoming legislature has attempted to invigorate the industry through several pieces of legislation. Some of these include increasing the purview of the Wyoming Infrastructure Authority, funding the Integrated Technology Center in Gillette, and preventing new taxation on the industry. Governor Matt Mead has prioritized diversifying not only the coal industry but also the state economy as a whole. Nationally the Trump Administration is attempting to revive the industry through the removal of regulations imposed by multiple agencies. While these measures are helping in some ways to make coal viable as an energy source again, the reality is that the coal industry globally is struggling. Government can only do so much to promote industry. Rather than market coal as an energy source, one company in Wyoming is proposing to refine and provide it as a feedstock for manufacturing carbon-based products. Ramaco Carbon, a Sheridan-based company, is in the initial stages of creating a large-scale research, development and manufacturing site with several tenants engaged in carbon-based manufacturing. Their efforts could change the future of coal in Wyoming.

**Neither Red nor White: Indian Boarding Schools and the Wind River Tribes**

Kaitlynn Snell with Dr. Jessica Clark
Department of History
Western Wyoming Community College

Poster Presentation

*Sweet Memories: Historical Research Group* *Rock Springs, WY*

Five-year-old Val Norman roused from his military issued bed and snuck out of the boy's barracks at Trout Creek Boarding School, located more than a mile southeast of Fort Washakie. Headed toward Wind River Reservation, he reached his parents' house later that night. Despite his efforts to slip away unnoticed, Norman recalls, the Indian police arrived at his house early the next morning to collect him. Upon his return, Norman insists a disciplinarian punished him by having him kneel on a broom stick for hours. Norman's cries for help fell on deaf ears, as other students feared the consequences of defiance. He shares this narrative in his 1991 oral history for the Warm Valley Historical Project. Native American children experienced situations similar to Norman under American Indian policies of the mid- to late-1800s. Schools, such as Carlisle Indian Industrial School in Pennsylvania and Trout Creek in Wyoming, took children off reservations to isolate from their cultures and integrate into white communities. After these experiences, Wind River children faced discrimination within both white and tribal communities. Elders refused to teach boarding school children their cultural traditions due to assimilation attempts, while mainstream society often rejected them due to racial prejudice. This discrimination created a division in the children's self-perception as they struggled to find acceptance in either community. Upon completion, release, or escape from Indian boarding schools, Wind River Shoshone and Arapahoe existed in a state of complex identity, as they struggled to integrate into the tribal and mainstream communities.

**Analysis of FTIR spectra of carbon materials: subbituminous coal, graphene oxide, graphene nanoplatelets, and carbon nanotubes**

Cassidy Solti with Dr. Rob Milne
Natural Science Division
Sheridan College
Poster Presentation

*INBRE* *Sheridan, WY*

Subbituminous coal is a major factor of Wyoming's economy. However, cleaner sources of energy, such as solar energy, wind energy, and hydroelectric energy, are highly competitive towards natural gas, oil—and most importantly—coal. Coal is mostly carbon which begs the question, "What carbon materials can be extracted or produced from coal, both efficiently and economically?" to develop new markets for this resource. Discovering a second major purpose for subbituminous coal, aside from its energy uses, would boost Wyoming's economy. A goal of this research was to establish Fourier transform infrared spectroscopy, or FTIR spectra, of known carbon materials to compare to samples of coal following experimental treatment. The known carbon materials that were tested included carbon nanotubes, graphene nanoplatelet aggregates, and graphene oxide. The subbituminous coal FTIR spectra were then analyzed and compared to spectra obtained from the known carbon materials. Throughout this research, the relationship between mass and thickness of the salt plates was also analyzed. Details of the FTIR spectra comparisons, as well as the observed salt plate relationship, will be reported.

**Analog Guitar Amplifier**

Alex Soveroski, mentored by Professor Eva Ferre-Pikal
Electrical Engineering
University of Wyoming
Oral and Poster Presentation

*Department of Electrical and Computer Engineering* *Cheyenne, WY*

Over the decades since they were invented, transistors have become more and more ubiquitous in everyday life – they're in our computers, our cars, and even our pockets (in the form of smart phones). But before transistors came into vogue, vacuum tubes were the main electronic device used in all types of "cutting edge" technology, from radios to televisions to early computers. While vacuum tubes and transistors behave on similar principles, they are considerably different in terms of their actual operation, and because of their smaller size and better reliability, transistors eventually won the test of time. Still, even though the market has shrunk considerably, vacuum tubes are still used by a few people, namely guitarists looking for a distinctive tone from an amplifier that you arguably can't get from a transistor. Over the past year, I have been using my knowledge of modern electronics, combined with research into vacuum tubes, to design and build a guitar amplifier using only vacuum tubes and no transistors. The design includes all of the features of a standard guitar amp – a preamplifier, tone controls, an effects send and return, and a power amplification stage. The amplifier is intended to be connected to an external speaker, and should be familiar to anybody who has spent some time playing electric guitar.

**Nitrogenated Covalent Organic Frameworks**

Veronica Spaulding working with Dr. John Hoberg
Chemistry
University of Wyoming
Oral Presentation

*Supported by McNair, WRSP, and Hoberg Organic Lab* *North Fork, CA*

Graphene is a ground-breaking material with over twenty thousand patents involving its applications and modifications. It is the strongest, yet thinnest material known with semi-conducting properties. Extensive research has been performed on graphene to improve characteristics such as its conductivity, formation of holes and chemically manipulating its structure. Specifically, graphene is a two-dimensional, single atomic layer of graphite; which is an allotrope of carbon that is made up of tightly bonded carbon atoms organized into a hexagonal lattice. What makes graphene so special is its sp2 hybridization and nanoscopic atomic thickness (of 0.345nm). An alternative to graphene involves condensation reactions between amine containing compounds and carbonyl groups, which form a graphene-like nitrogenated derivative. These materials have ordered holes with high crystallinity. The organic synthesis of these compounds are well established and have been characterized as Covalent Organic Frameworks (COFs). This amine/carbonyl condensation reaction can produce extremely high control of the lattice structures desired in the final 2-D material; this material can then be fabricated into membranes for applications in separations, batteries and more. The goal of my work on these nitrogenated materials is to chemically synthesize holey 2D materials with two distinctly different holes in the lattice. The two holes will be capable of chemical manipulation, which would potentially be superior to graphene. This gives rise to a variety of applications of the material, and its derivatives; which we hope to improve upon using these nitrogenated frameworks.

**The Blue French Horn: Intertwining Origin Stories in *How I Met Your Mother***

Sydney Stein with Dr. Leah LeFebvre
Communication and Journalism
University of Wyoming
Oral presentation

*Honors* *Breckenridge, CO*

This study investigates the intertwining origin stories in the television show, *How I Met Your Mother*. The TV show follows the main character, Ted Mosby, as he tells his future children about his search for their mother with the help of his best friends – a commonly asked relationship question. While minimal research regarding origin stories exists, this popularized show enables a wider audience and room for investigation. Therefore, this study bases its conceptualization from Sternberg (1986), who proposed love be portrayed in triangles encompassing intimacy, passion and decision/commitment. Through application of intersecting love stories in *How I Met Your Mother*, origin story research will be expanded to include fictional familial and romantic love. Ted, the narrator, tells the story of how he met the mother to his future children to reaffirm his love for the Mother, while subtly using it to position himself close to another main character, Robin. The narrative analysis demonstrates key components of non-fictional love in a fictional analysis and allows the audience to explore the antenarrative in which Ted re-lives his husband-wife origin story and explores how he ignited a flame for an old love.

*Keywords:* origin stories, *How I Met Your Mother*, love, television

**Use of Porous Liquid-Crystalline Elastomers in Glaucoma Treatment Devices**

Logan Stowe with Dr. Carl Frick
Mechanical Engineering
University of Wyoming

Oral Presentation

*INBRE* *Cheyenne, WY*

Glaucoma is a group of eye diseases that cause pathological changes in the retina and optic nerve with corresponding visual field loss and blindness if left untreated. The National Eye Institute concluded in 2014 that an estimated 2.7 million people in the United States are affected by this chronic illness. While there are several short-term remedies available to afflicted individuals, predictable long-term treatments for glaucoma remain elusive, especially at advanced stages. One proposed treatment plan includes surgical implantation of a glaucoma treatment device; however, current devices are prone to complications resulting in subsequent surgeries. The proposed research explores the use of a porous liquid-crystalline elastomer (LCE) as a potential glaucoma treatment device. A transcorneal LCE filter can be designed to mitigate the risk of complication by providing a non-surgical technique to remove and replace a compromised filter, enabled by shape switching LCE properties. Similar microporous filters are commonly applied in research, pharmaceutical, and industrial settings to sterilize fluids by removal of bacteria. Additionally, the unique shape-switching abilities of LCEs combined with microporous filtration capabilities are expected to extend to applications far beyond this single device. It is the goal of this project to determine a suitable technique to create microporous LCEs suitable for use in a glaucoma treatment device. Preliminary test results are encouraging that a prototype could be developed for testing as a potential glaucoma treatment device.

**Oxygen Photolysis in Solid Molecular Hydrogen: Details Associated with the Production of Water**

Aaron Strom and Professor David T. Anderson
Department of Chemistry
University of Wyoming

Oral Presentation

*UW NASA Space Grant Consortium* *Rock Springs, WY*

A common misconception is that outer space is too harsh of an environment to support the production of molecules. In fact, in the vast regions of space between solar systems, known as the interstellar medium, there are cold, dense clouds with dust grains coated in ice, and these dust grains serve as small reaction vessels for a variety of molecules. However, the chemistry that occurs at these low temperatures (as low as 10 K) is very different from the more traditional chemistry that occurs at elevated temperatures. In order to better understand this low temperature chemistry we simulate these reaction conditions in the laboratory. Specifically, we grow crystals of molecular hydrogen ($H_2$) at temperatures between 2 to 4 K that contain small concentrations of oxygen molecules ($O_2$). We then expose these $H_2$ ices to UV radiation which dissociates the $O_2$ molecules into oxygen atoms. Oxygen atoms are highly reactive species and they react with the $H_2$ host allowing us to detect the production of water ($H_2O$) molecules. In this study we specifically examine how the $H_2$ ice rearranges around the nascent $H_2O$ molecule which is important for a detailed understanding of this chemistry. We have performed a number of kinetic studies aimed at understanding the time dependence of the relaxation of the $H_2$ ice around the newly generated $H_2O$ molecule. These measurements allow us to develop and test chemical mechanisms for the types of cold chemistry that occur within the interstellar medium.

**Probing a Quantum Solid with Deuterated Acetylene**

Aaron Strom and Professor David T. Anderson
Department of Chemistry
University of Wyoming

Poster Presentation

*Wyoming Research Scholars Program* *Rock Springs, WY*

The condensed phase is often thought of as a rigid, bulk composition of particles with severely restricted degrees of freedom – perhaps limited only to vibrational modes. In 1930, meditations on molecular rotation within crystals led Linus Pauling to the deduction that this behavior is merely natural, so long as the molecule in consideration possesses the appropriate mass and rotational quantum numbers. Little did he know, dynamical phenomena proliferate through other states of matter, like the quantum solid: a highly ordered array of particles capable of relatively large scale zero point motion about their mean lattice positions. Helium-4 is well known for superfluidity below the Lambda point, but a quantum solid will emerge with pressure and cooling. It turns out that there are only two known quantum solids, the second being solid parahydrogen ($pH_2$); "normal hydrogen" comprises of a 3:1 ortho-/para-$H_2$ ratio as a consequence of nuclear-spin statistics. Homonuclear molecular hydrogen lacks a transition dipole moment, however, the infrared signature of solid $pH_2$ arises due to subtle anisotropic crystal field interactions that distort its spherical symmetry. In situ matrix isolation spectroscopy of a molecular probe such as dideutero-acetylene (DCCD) dispersed in crystalline $pH_2$ via a rapid vapor deposition technique illuminates perturbations influencing the potential energy surfaces of the probe and host of this condensed phase environment. In this work, high-resolution FTIR spectra of DCCD-doped $pH_2$ crystals recorded in the low-temperature regime (1.6–4.3 K) are presented. In particular, the rotational motion of DCCD about a $pH_2$ vacancy will be elucidated.

**Lay Profiles of Mass and Serial Killers**

Kelli Terrell with Dr. Narina Nunez
Psychology
University of Wyoming

Oral Presentation

*Honors* *Pinedale, WY*

There have been 78 mass shootings in the United States since 1978, killing a total of 547 people and injuring an additional 476 individuals; this number is rapidly growing and has drawn widespread media coverage (Bjelopera, 2013). As mass shootings have increased, so has media coverage of the shootings, particularly honing in on the shooter(s) themselves, rather than the victims, creating both contagion and copycat effects (Johnston & Joy, 2016) (Mills, 2016). Each new mass killing sparks conversation and widespread concern centered on the individual's motivation which drives to prevent future shootings (Schildkraut & Elsass, 2016). One assumption by the public and media is that the perpetrator has a mental illness that led to the shooting (Knoll & Annas, 2016). The profile of individuals who are committing mass murders is worthy of researching, as it could provide insights to the question of background, external motives, and prevention (Johnston & Joy, 2016). It was hypothesized society is profiling mass murderers in a specific way contradicting the reality of who the offenders are. Participants were randomly assigned to a mass killing or serial killing condition with a death toll of nine. Participants were asked to profile the killer based on the previously read scenario by first listing assumed profile characteristics then being asked a battery of questions spanning from demographic information to relationship status, education level, and mental health status.

**An Analysis of Swelling Clays when in Contact with Fracking Fluid**

Olivia Terry with Dr. John Kaszuba
Geology and Geophysics
University of Wyoming

Poster Presentation

*McNair Scholars Program* *Tulsa, OK*

Hydraulic fracturing is a common form of oil and gas extraction; this process involves drilling a well down to the reservoir, around 6,000 to 10,000 feet deep. While drilling, water and other solutes are combined to form an aqueous solution which is then pushed using high pressure into the well and fracturing rock, usually shale, so one can extract the oil. However, swelling clays including smectite, can be found in oil and gas reservoirs. These clays swell with the introduction of water into the system. Once this water meets with the clays around the reservoir, the expanded clays make extracting oil much more challenging. Changing the mineralogy of the clays can stop the swelling from taking place and improve the extraction process. My proposed research will address this issue by measuring the effects of fracking fluid paired with varying concentrations of solute (Potassium Chloride ) on the mineralogy of swelling clays. I hypothesize that the mineralogy of the clay will transform the swelling clay into a non-swelling clay. I will use X-Ray Diffraction to quantify the percent change in the clay samples. The goal of this research is to see if there is a correlation between the amount of Potassium Chloride added to the solution with respect to the mineralogical changes in the clay.

**An Exploration of the Past, Present, and Future of Marketing Tea**

Allison Thibault with Dr. Kent Drummond
Marketing
University of Wyoming

Oral Presentation

*Honors Program* *Cheyenne, WY*

The ancient brewed beverage of tea originated in Southeast Asia almost 5000 years ago (Mair & Hoh, 2009). Its presence in both eastern and western communities has not faltered, and, today, the leaf derived drink is found in at least 3,000 varieties (Mair & Hoh, 2009). Tea is served hot or cold, any time of the day, for any occasion. This unique versatility led to tea becoming the second most consumed beverage in the world just behind water establishing a lineage of marketing. Tea is marketed socially, culturally, medicinally, politically, and economically to the citizens of the world, from China to India to England to the United States of America. Its rich history and innumerable roles create a framework for marketing it to anyone and everyone. For example, tea served as an economic commodity on tea leaf plantations in Southeast Asia; a politically charged message in the Boston Tea Party and subsequent modern Tea Party; and an elegant preservation of social status in high tea services. These are just a few of the examples that were analyzed and explored in this demonstration of the importance of tea in the history of the world. However, none of these roles are possible without timeless structured marketing that adapts to new roles and opportunities as they arise in an ever-changing world. The future of tea marketing focuses on accessibility of product combined with preservation of former roles. The small, delicate leaves that compose this simple beverage are packed with intricate marketing examples.

## Petroglyphs in Wyoming: Conservation and Public Outreach

Bailee Thomas and Dr. Dana L. Pertermann
Anthropology
Western Wyoming Community College
Oral and Poster Presentation

*Anthropology Department* *McKinnon, WY*

Rock art is an irreplaceable historical source that faces serious threats to preservation due to human activity and natural weathering processes. There are different measures that can be taken to help persevere rock art or to slow down the weathering of the rocks. One solution, is to remove the rock art from its environment, this of course can be problematic due to its size, the location of the artifact, and it loses its historical context once removed. Another way to help preserve these artifacts is to educate. Many sites have been ruined due to vandalism or unknowingly by individuals who come into contact with rock art. Other ways to conserve these priceless artifacts would be to build some sort of barriers or wall to protect against human contact or animals. This would also help to lessen the effect of weathering to the artifacts as well. Or to make the rock impermeable by applying preservatives such as shellac, or glyptal. Enforcing more laws and regulations to assure the preservation on these historic sites is another step that can be taken to preserve these artifacts. Citizens need to be better educated on the importance of rock art as part of the archaeological record, and its ability to teach us about the different aspects of cultures throughout North American history.

## A comparison of fire and pine beetle (*Dendroctonus ponderosae*) disturbances on seed banks in a forest ecosystem

Katheryn Thomas, Megan Lahti
Biology
Western Wyoming Community College
Oral Presentation

*INBRE* *Cora, WY*

Both pine beetle (*Dendroctonus ponderosae*) outbreaks and fires in effect of climate change have led to rapid and extreme disturbances throughout much of the western United States in the last 2+ decades (Perera et al., 2011). While fire and insects are considered natural disturbances in forest ecosystems, the rapid and profound outbreak of pine beetles is considered unnatural. Seed banks are known to be important reserves for re-establishing forest ecosystems after a disturbance (e.g. Ferrandis et al., 1996). My research investigates the effects of pine beetle and fire disturbances on seed bank diversity and density in a pine forest habitat. I collected 15, 1L soil samples haphazardly from 3 sites in the Bridger-Teton National Forest in September 2016: control, Cliff Creek Fire (July 2016), and pine beetle disturbance (within the previous 20 years). Soil samples were sifted and seeds were separated for identification. While the control site has the greatest seed density ($\bar{x}$= 11.6 seeds/sample; $\sigma$=17.717) as compared to both the pine beetle disturbed habitat ($\bar{x}$ = 5 seeds/sample $\sigma$=7.638) than fire disturbed habitat ($\bar{x}$ = 1.2 seeds/sample; $\sigma$= 2.357), the difference in densities is not significant between sample sites ($F = 1.029$, d.f. = 2, $p = 0.381$). Ongoing analyses are being conducted to investigate differences in seed diversities between each site. This research improves our understanding of the response and recovery from unnatural disturbances in a pine forest and will contribute to our understanding of forest management in light of climate change.

**Understanding the Role of Insulin and GnRH in PCOS**

Rachel L. Tighe with Amy M. Navratil
Zoology and Physiology
University of Wyoming

Poster Presentation

*INBRE* *Crawford, NE*

It is well established that physiological mechanisms controlling energy balance are integrated with those controling reproduction. In humans, insulin resistance is a component of polycystic ovary syndrome (PCOS), a reproductive ovarian disorder characterized by anovulation, polycystic ovaries, high androgen levels, hyperinsulinemia, and predisposition for Type 2 diabetes. It is the most common endocrine disorder among women of fertile age, affecting nearly 10%. Although the etiology of PCOS is unclear, the syndrome is clearly associated with metabolic dysfunction. Hyperinsulinemia and peripheral insulin resistance are central features. It is well documented that altered gonadotropin secretion is associated with the traditional PCOS. Compared with the follicular phase of a normal menstrual cycle, women with PCOS exhibit disproportionately high luteinizing hormone (LH) secretion with relatively constant low follicle stimulating hormone (FSH) secretion from anterior pituitary gonadotropes. Previous data suggests gonadotrope cells undergo rapid and dramatic reorganization of the actin cytoskeleton in response to gonadotropin releasing hormone (GnRH) to facilitate LH release into the periphery. What remains unclear is how GnRH and hyperinsulinemia in PCOS might work together to facilitate changes in cellular morphology and secretion of gonadotropes. Previous data suggests GnRH leads to activation of the actin binding protein cortactin, which is important for actin branching. Interestingly, when there is co-treatment of GnRH and insulin, gonadotropes appear to increase levels of phosphorylated cortactin. Taken together, we suggest combined effect of GnRH and insulin may modulate the actin cytoskeleton in gonadotropes to disproportionately increase circulating concentrations of LH seen in PCOS.

**Variation in Raptor Abundance Between Urban and Rural Habitats**

Haley Tolbert and Dr. Hayley Lanier
Zoology & Physiology
University of Wyoming at Casper

Poster

*Wyoming INBRE* *Casper, WY*

Raptors are iconic apex predators of prairies and grasslands in Wyoming. Due to extensive habitat modification by urbanization, these landscape changes may lead to both threats and advantages, such as human-derived food sources, for raptors. This study explores (1) whether raptor density differs in urban and rural habitats, and (2) if the difference is due to increased food abundance in human-modified habitats. In summer of 2016, distance sampling and roadkill surveys, a proxy for prey density, were used to examine these questions. Raptors in prairie, grassland, and riparian habitats around Casper, WY were studied. Results indicate a lower abundance of raptors in human-dominated environments, with 1.9 per $km^2$ in rural habitats versus 0.7 per $km^2$ in urban areas. An AIC comparison of separate urban and rural models versus a combined model strongly supported modeling the two habitats separately. Significant differences between roadkill in different habitats existed, with a rural of average 1 per km and 0.4 per km in urban zones, suggesting rural prey density may be higher. While raptors and roadkill were positively correlated, this correlation was suggested abundance of both is greater in rural areas. This indicates that even in a state with a small human footprint, urbanization may be negatively affecting important apex predators.

**Black Carbon on the Dinwoody Glacier**

Lane Tomme with Jacki Klancher
Natural Resources and Applied Sciences
Central Wyoming College

Poster

*EPSCoR, CCURI, Wyoming Space Grant* *Riverton, WY*

Global Climate Change has had a measurable impact on the environment on a local and global scale. Glaciers worldwide are receding at an unprecedented levels and the future of water resources are at stake. The intersection of climate induced alpine ice recession, airborne carbon particulate, and subsequent impacts on water resources is the foundation for the Interdisciplinary Climate Change Expeditions (ICCE) Black Carbon Research Project. Black Carbon (BC) is the highest light- absorbing abundant particulate in all of particulate matter (PM) and is created by the incomplete combustion of fossil fuels, biofuels and biomass. In climatology, Black Carbon is known as a "climate forcing" agent and it warms the earth by absorbing sunlight, thereby heating the Earth's atmosphere and reducing the Albedo when the Black Carbon is deposited on snow/ice fields. In South America, this particulate has been documented in tropical glaciers in alpine environments. To date, black Carbon research on North American glaciers is limited. The CWC ICCE Black Carbon team in conjunction with Dr. Carl Schmitt and the American Climber Science Program has been sampling snow on Dinwoody Glacier for the past three seasons. This paper summarizes results of this research and discusses the impacts of black carbon on glacial ice melt.

**Mysterious Symbols in the North: An Analysis of Scotland's Pictish Symbol Stones**

Leah Tray with Nicole Waguespack
Anthropology
University of Wyoming

Oral Presentation

*Honors* *Fort Collins, CO*

During the Roman occupation and conquest of regions that today form England and Scotland, Roman generals and historians wrote of the people they found living in these frozen regions of the world. The Romans referred to these populations as Pictii or the 'painted people', but provided little information about them. Nearly two thousand years after the disappearance of Pictish culture from historic records their symbol inscribed stones endure in the archaeological record, inspiring scholars to investigate and seek meaning in these symbols. The distribution of some common Pictish symbols throughout Scotland may help provide insight into their culture. In this study I investigate several characteristics of Pictish symbols, their distribution, and relationships.

**Synthesis, Characterization, and Aqueous Perchlorate Reactivity with Ruthenium (II) Coordination Complexes**

Kasey Trotter with Dr. Elliott Hulley
Chemistry
University of Wyoming

Poster Presentation

*WRSP* *Fort Collins, CO*

Perchlorate anion ($ClO_4^-$) salts are persistent environmental pollutants that harm humans by bioaccumulating in the thyroid. These salts are found in Western states such as California, Utah, and Nevada as well as on the surface of Mars (as $Ca(ClO_4)_2$, ~0.5 wt%). Although a strong oxidizing agent, the environmental persistence of perchlorate is primarily kinetic. We aim to develop systems to catalyze the decomposition of the $ClO_4^-$ anion into its components, $Cl^-$ and $O_2$ by focusing on the inherent instability of perchlorate in water. We plan to use aqueous ruthenium (II) complexes for the primary purpose of reducing perchlorate. We report the synthesis and characterization of ruthenium (II) complexes and their reactivity with perchlorate.

**Firm Mechanisms for Export Price Determination**

John J. P. Wade with Dr. Alexandre Skiba
Economics
University of Wyoming

Oral Presentation

*Economics Department Conference* *Laramie, WY*

The "shipping the good apples out" effect—free-on-board (FOB) average unit values (AUV) increase with geographical distance—is well established and has profound implications for understanding the composition of trade flows in vertically differentiated products. While the literature also finds within-products FOB AUV increases with the importing nation's GDP per capita and decreases with the importer's market size (GDP), the exact firm-level mechanisms of these adjustments are not precisely known. In this paper, transaction-level data for Chilean exports is used to show that the positive effect of distance on the firms' FOB AUV of exports depends crucially on destination coverage of exports by the exporting firms. Firms that sell multiple products to multiple destinations do not adjust their prices in response to distance. The adjustment occurs primarily due to single product-destination firms that sell more expensive goods to more distant markets. However, all firms raise FOB AUV with the GDP per capita of the destination and decrease for market size. Similar destination catering effects emerge when categorizing firms by low- and high-quality, where the low-quality firms adjust FOB AUV for destination distance and the high-quality do not. These mechanisms suggest a close link exists between quality upgrading and the success of exporting firm's development.

**Do reclaimed areas within natural gas fields augment deer mouse body condition and abundance?**

Brittany Wagler with Anna Chalfoun and Lindsey Sanders
Zoology and Physiology
University of Wyoming
Oral Presentation

*EPSCoR* *Wapiti, WY*

Habitat loss and fragmentation from anthropogenic activities alters habitat availability for wildlife and can result in changes to wildlife behavior, space use, and fitness. Discerning both *how and why* populations change in response to habitat alteration can improve our understanding of community structure and species interactions across trophic levels in disturbed systems. Energy development is a growing source of habitat alteration worldwide. Some small mammals, including deer mice (*Peromyscus maniculatus*), are known to be more prevalent in areas with increased habitat loss from natural gas development, leading to increased predation rates for co-occurring songbirds. *Why* rodents may be more abundant in gas fields, however, remains unclear. We investigated whether mice receive fitness benefits from living near development. We hypothesized deer mouse populations are augmented by food subsidies in reclaimed areas adjacent to well pads. Accordingly, we predicted increased abundance and improved fitness for deer mouse populations adjacent to reclaimed areas compared to populations far-removed from reclaimed areas, and increased abundance with grass cover in reclaimed areas. Although we found no difference in abundance or fitness metrics between mice living near and far from development, we found higher abundance of deer mice near reclaimed areas with higher densities of grasses (an important food resource). Understanding mechanisms underlying small mammal abundance near energy development will facilitate development of targeted management strategies to protect vulnerable species of songbirds breeding near energy development.

**Creation and Characterization of Aligned Single-Wall Carbon Nanotube Films**

Josh Walker, Henry Wladkowski, and William D. Rice
Department of Physics and Astronomy
University of Wyoming
Oral and Poster Presentation

*NASA Space Grant* *Cheyenne, WY*

The one-dimensional nature of individualized single-wall carbon nanotubes (SWCNTs) enables highly anisotropic thermal, optical, and electronic behavior. Commercial applications, like optical polarizers and electrical current delivery, are thus possible from ensembles of aligned SWCNTs. However, the relative absence of easy-to-perform SWCNT alignment techniques, and thus the lack of polarized nanotube films, has hindered scientific and technical investigations of anisotropic phenomena in SWCNT ensembles. Here, we demonstrate macroscopic SWCNT alignment of both semiconductor and metallic nanotubes using slow vacuum filtration, which builds on a recently discovered method for nanotube alignment. Utilizing polyvinylpyrrolidone-coated filter membranes and surfactant-separated SWCNTs, we are able to produce highly polarized nanotube thin films. We measure the degree of the nanotube polarization using both optical microscopy and polarized optical absorption. From the latter, we find that a nematic ordering parameter of over 0.2 can be achieved, which is close to the theoretical maximum of 0.6; polarized Raman spectroscopy confirms these results. Future measurements using temperature-dependent electrical transport will investigate the feasibility of using these aligned nanotubes for very large electrical current-delivery applications.

**11,000 Years of Human Adaptation to Climate Change in Wind River Country**

Jordan Walter, Prof. Todd Guenther
Natural and Applied Sciences
Central Wyoming College

Oral

*EPSCoR, INBRE, NASA* *Lander, WY*

Archaeology students participating in the Central Wyoming College Interdisciplinary Climate Change Expeditions have documented extensive human use of the Dinwoody drainage system in the Wind River Mountains beginning with some of the earliest Paleoindian cultures at the end of the Pleistocene to the present. Cold-adapted cultures sought out the harsh, high alpine environment throughout episodes of continental warming or cooling. Andean cultures make annual pilgrimages to worship glaciers as sacred sources of water. The dense concentration of Dinwoody petroglyphs indicates that Native peoples have regarded the Dinwoody as sacred for thousands of years. Ethnographic research conducted for this project with the Eastern Shoshones confirms this interpretation, and reveals that recent discussions have occurred in which some Tribal officials have considered requesting that the US Forest Service close the area to recreation and archaeological research. Wind River Reservation governments, however, have no plans to adapt to the pressing impacts of climate change or imminent extinction of the glaciers. The National Park Service is assisting Tribes in Louisiana and Alaska with evacuation plans as their communities become uninhabitable. This paper poses questions about the future of the Shoshone and Arapaho Tribes in the Wind River country.

**Call to Arms: White Blood Cells and Malaria in House Sparrows and House Finches**

Becky R. Watkins and Eric C. Atkinson
Biology Department
Northwest College

Poster Presentation

*INBRE & EPSCoR* *LaMoure, ND*

From an ongoing project, we are observing the protist malaria in House Sparrows (*Passer domesticus)* and House Finches (*Haemorhous mexicanus*) inhabiting the Big Horn Basin of the Greater Yellowstone Ecosystem. House Sparrows and House Finches reside year-round in the Big Horn Basin experiencing similar environmental conditions. House Sparrows typically nest in cavities, or woven nest balls, whereas House Finches are open cup nesters. It is hypothesized that subtle differences in natural history can influence occurrence of malaria. Previous work in our lab has shown House Finches demonstrate a significantly greater variability in West Nile Virus (WNV) titers than House Sparrows. As both diseases are transmitted by biting dipterans, is this a pattern also shown by malaria? Malaria can weaken the bird and in severe cases cause death. The protist comes from the families of species including Haemoproteidae, Plasmodiidae, Garniidae and Leucocytozoidae. These Apicomplexans can be passed to avian species by biting midges, hippoboscid flies, female blood-sucking mosquitoes of the genera *Culex, Aedes, Culiseta,* and *Anopheles,* and blood-sucking simuliid fly. We are taking blood samples from House Sparrows and House Finches caught and released at either Coons Age Farm (Belfrey, MT) or on the campus of Northwest College in Powell, WY. We made blood smears and dyed the sample with Giemsa for one hour. We observed the sample under microscopes to detect any malaria and we are also taking counts of white blood cells per field: monocytes, heterophils, eosinophils, lymphocytes, and basophils, to test the immune status against malaria.

**Microbial succession *vs*. plant developmental effects on rhizosphere community structure in *Arabidopsis thaliana***

Monique Weaver with Dr. Cynthia Weinig
Department of Botany
University of Wyoming
Poster Presentation

*NSF, McNair* *Evanston, WY*

Plants grow in association with diverse microbes, potentially including tens of thousands of different taxa. The microbes of the rhizosphere, the area in close physical proximity to the roots, perform many beneficial activities such as promoting plant growth, improving nutrient accessibility, and suppressing diseases. Furthermore, plants can select microbes that perform these beneficial activities via the release of nutrients through the roots, a process referred to as exudation. Prior studies have shown that rhizosphere communities 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 proposed project will compare the rhizosphere microbial composition of two early flowering time genotypes, one wild type genotype, and two late flowering time genotypes. Samples will be collected after one week of growth, and at each of the three flowering times. By sampling at multiple timepoints, it is possible to separate the effects of plant developmental stage from ongoing microbial succession. The microbial communities will either 1) be the same on the day of flowering for each genotype, which would indicate that the assembly is affected by plant developmental stage (and independent of time for microbial succession), or 2) be the same at an individual day, which suggests that assembly is influenced primarily by microbial succession (and independent of whether the plants are at a reproductive or vegetative stage). The results of this study could help researchers understand the complex relationship between plants and their root microbes.

**Methane Cracking**

Tyler Webber with Dr. John Myers
Chemical Engineering
University of Wyoming
Oral Presentation

*Chemical Engineering* *Allentown, PA*

The purpose of our design project is to produce a high purity hydrogen product that emits a low concentration of carbon dioxide emissions. The objective will be to replace the current industrial standard of steam reforming which doesn't produce a marketable byproduct as well as producing high amount of carbon dioxide emissions. Throughout the semester, we have researched different processes to crack methane which included the Hazer process, plasma pyrolysis, nickel based catalysis, and direct contact pyrolysis of natural gas using a molten metal. For this project, we decided to design a process based off direct contact pyrolysis due to its ability to produce product with a high conversion as well as not needing significant amounts of water for the reaction along with producing significantly less carbon dioxide emissions. With this process, we learned that it emits nearly half as much of the CO2 as steam reforming. [27]. The molten metal catalyst for this process adds residence time to the reaction and increasing the conversion of reactants to products. We found tin to be the most common in past laboratory trials due to tin's high boiling point, relatively low melting point, and high density. These properties seem ideal for this process since tin acts as a natural separator for our product and byproduct.

**Rochelle Athletic Center Addition – Structural Analysis**

Morgan Wilder – Derek Swanson
Architectural Engineering
University of Wyoming

Oral Presentation

*Honors* *Laramie, WY*

For architectural engineering, the senior project was to follow the design process for structural engineers while designing a portion of the addition to the Rochelle Athletics Center. It was the responsibility of myself and two other students to provide our interpretation and solution to the structural challenges that the addition posed. My responsibilities on this project included collaborative work in positioning the columns and designing the beam and girder layout. Once a general design was determined, each member of our group was responsible for calculating loads and capacities of members. Throughout the entire project, we had a collaborative effort to design the building, seeing as three minds are better than one. However, I went beyond what was required for the project itself and used a structural analysis program to validate our pencil and paper solution we had come up with.

**Porous Liquid Crystal Elastomer Exploration**

Caleb Wilkins under Dr. Carl Frick Mechanical Engineering Department
University of Wyoming

Poster Presentation

*McNair* *Littleton, CO*

Advanced materials called Liquid Crystal Elastomers (LCEs) have been studied for their ability to retain a fixed shape through temperature change. Using a two-stage thiol-acrylate Michael addition and polymerization (TAMAP) reaction, these materials can be synthesized. Study will be conducted to see how LCE material behaves with differing levels of porosity. Production of porous LCEs will be the focus of research before testing, as the method of creating porous LCEs has not been done before. LCEs have outstanding mechanical properties as a “pure” substance, but with an added level of porosity, this characteristic has potential to enhance the existing material properties or create new properties. Consistency is important when creating multiple porous materials, as the porosity must be similar between samples, therefore the chosen method of synthesis will have to support repeatability. Methods such as high internal phase emulsion, solvent casting/particle leaching, freeze-drying, gas foaming, and electrospinning may be used to create pores of different sizes. Once a consistent method for producing porous LCEs is discovered, testing of thermal stability, dynamic storage moduli, tensile modulus, tensile strength, elongation at break, shape recovery speeds, and shape fixity may be explored. These materials have promising application in a number of real world problems. It is hoped that dampening affects and high relative strengths of the porous LCEs will be discovered.

**How Clinicians Report Discussing Self-Monitoring with Type 2 Diabetes Mellitus Patients**

Christina Wilkinson, PharmD Candidate 2018
Carol Hermansen-Kobulnicky, RPh, PhD, Associate Professor
School of Pharmacy
University of Wyoming

Oral and Poster Presentation

*University of Wyoming School of Pharmacy* *Colorado Springs, CO*

Patient self-monitoring is critical to diabetes self-management. With no detailed approach to discussing self-monitoring by the American Diabetes Association we examined how clinicians report discussing self-monitoring with patients. Semi-structured interviews were conducted and three key questions followed from the research question. Analysis included transcripts and debriefing notes. A constant-comparison approach with category coding and thematic representation was used. How the clinicians discuss self-monitoring relates to their perceptions of: (1) the clinician-patient relationship, (2) needs beyond diabetes, and (3) perceived benefits of self-monitoring. Participants revealed a continuum of relational approaches from "partnership" with the goal to achieve patient independence on one end to benevolent paternalism wherein the clinician "keep[s] people safe", "make[s] slow fixes" and who, in a perfect world would like to "free" patients from insulin and self-monitoring requirements. Different needs of patients were reported to affect self-monitoring efforts and many benefits of self-monitoring were identified. While some clinicians take a partnering approach, others reported this possibility only in "the perfect world" due to patients' struggles and obstacles outside of the clinician's control. It's not clear how the approaches to discussing self-monitoring relate to the clinician-patient relationship, patients' needs or the benefits of self-monitoring. How clinicians talk about self-monitoring within the clinician-patient relationship may influence diabetes outcomes. Future research is needed to address the variety and severity of patients' needs and to include the patient perspective.

**Visual obstruction and biomass heterogeneity related to timing of sampling and exotic/native dominance of vegetation**

Jessica L. Windh, Dr John Derek Scasta
Department of Ecosystem Science and Management
University of Wyoming

Oral Presentation

*EPSCoR* *Reedley, CA*

In the summer of 2016, we conducted a comparative study of how the Robel pole method of measuring visual obstruction is calibrated and applied in different settings. This method has been controversial on Forest Service (FS) grazing allotments, and stakeholder feedback has indicated that more research is needed. Using University of Wyoming – Agricultural Experiment Station rangelands we addressed the question of how the Robel pole method for measuring visual obstruction and biomass should be applied across 1) different timings of sampling relative to grazing and plant phenology on native sagebrush steppe, and 2) plant communities dominated by native or exotic graminoids. For the timing objective, we ran 200-meter transects across three types of grazing exclosures. For the plant community objective, we ran 3 100-meter transects in each of three native and three exotic sites. Monthly visual obstruction readings were taken every ten meters and 0.25 $m^2$ transects were clipped every 50 meters. As the season progressed, the predictive relationship between visual obstruction and biomass improved (June: slope= 1.6, $r^2$= 0.14, July: slope= 5.3, $r^2$= 0.48, and August: slope= 5.8, $r^2$= 0.54). Heterogeneity as measured by visual obstruction sample

variance, and mean visual obstruction, were both greater in exotic plant communities than native plant communities ($p = .01$, $p = 0.03$). Our results indicate that sampling later in the growing season better quantifies visual obstruction and biomass relationships, and that standards should be calibrated relative to specific plant communities and location.

**Annual Metabolism of Spring Creek, Wyoming**

Alison B. Winkler with Dr. Robert Hall and Hilary Madinger
Zoology and Physiology Department
University of Wyoming

Oral Presentation

*EPSCoR* *Cody, WY*

Freshwater ecosystems vary in their photosynthesis and respiration rates resulting in variable metabolism by season. To measure the stream metabolism (gross primary production and ecosystem respiration) we collected dissolved oxygen concentration every ten minutes using a minidot logger. We used diel variation in oxygen concentration to calculate gross primary production and ecosystem respiration. Using statistical modeling, we calculated the metabolism for each day to derive a time series of each. We also calculated average metabolism each month to look at the seasonality of metabolisms. December of 2016 we had a GPP of 0.85 $gO_2m^{-2}d^{-1}$ July of 2017 we calculated a GPP of 7.89 $gO_2m^{-2}d^{-1}$. After deciphering the data we were able to see that the creek has higher GPP in the summer months than during winter.

**Quantitative Rating System for Imagery Acquired with Unmanned Aerial Vehicle**

Elizabeth Wirsching[1] with Dr. Ramesh Sivanpillai[2, 3] and Dr. Greg Brown[2]
1. Department of Ecosystem Science & Management, 2. Department of Botany, 3. Wyoming Geographic Information Science Center
University of Wyoming

Oral Presentation

*Wyoming Research Scholars Program* *Cody, WY*

Unmanned Aerial Vehicles (UAVs) are increasingly used for acquiring aerial images due to their flexibility, low operational cost, and perceived ease of use in comparison to manned aircrafts. However, UAVs can be subjected to relatively higher instability leading to more pitch-roll-yaw and drift problems than manned aircrafts. Hence images acquired from the UAVs could suffer from distortion which will limit their use. Currently, there is a lack of studies that have systematically evaluated how these distortions affect the usefulness and interpretability of the images. This project will focus on quantifying the utility of aerial images acquired in different illumination conditions and camera look angles. A Phantom DJ II aircraft was flown in the UW Williams Conservatory and images of six plants were acquired under three different illumination conditions and three camera look angles. These images were then rated using the modified version of the US Air Force and USDA National Image Interpretability Rating Scales (NIIRS) systems. Results from this study will provide insights about the utility of UAV and the images acquired under different conditions, along with the time and training involved in learning to fly the UAV in a variety of conditions and difficult environments.

**Interactions of the invasive New Zealand Mudsnail (*Potamopyrgus antipodarum*) and native macroinvertebrates in Polecat Creek, WY**

By: Kara Wise Faculty Mentor: Amy Krist
Department of Zoology and Physiology
University of Wyoming

Oral Presentation

*EPSCoR* *Pleasant Hill, OH*

In Polecat Creek, WY, located within the Greater Yellowstone Ecosystem, the invasive New Zealand mudsnail (*Potamopyrgus antipodarum*) was once recorded at densities of over 500,000 individuals/m². In recent years, the biomass of *P. antipodarum* in Polecat Creek has decreased, suggesting a "boom and bust" pattern in population density. The population reached its highest density in 2000-2001, but by 2011, it had decreased by 93%. Native net spinning caddisflies (*Hydropsyche spp.*) have increased significantly in biomass from 2001-2011, suggesting that the native macroinvertebrates may have increased due to release from suppression by *P. antipodarum*. I collected macroinvertebrate core samples in Polecat Creek to measure the density of *P. antipodarum* and native macroinvertebrates. I also conducted a field experiment to assess the possible mechanisms by which *P. antipodarum* may have suppressed *Hydropsyche* caddisfly larvae. I placed *Hydropsyche* larvae on wooden tiles within experimental chambers in Polecat Creek to colonize and build nets, then added boom and bust densities of *P. antipodarum* to the experimental chambers. Preliminary results show no significant difference between the number of *Hydropsyche* nets before the addition of *P. antipodarum* to chambers and after the addition of *P. antipodarum* at boom or bust densities in chambers. These results suggest the invasive *P. antipodarum* do not actively destroy caddisfly nets, but may interfere with feeding by gathering on nets, therefore reducing the amount of food *Hydropsyche* larvae can catch.

**From Source to the Photosynthetic Fringe: The Downstream Geochemistry of Yellowstone National Park's Hydrothermal System**

Samuel Wiswell with Dr. Kenneth Sims
Geology and Geophysics
University of Wyoming

Poster Presentation

*EPSCoR, NASA, Geology Department* *Wilson, WY*

Hydrothermal features provide a unique and extreme environment that can act as a proxy for studying both past earth environments and similar environments of interest that exist throughout the universe today. Yellowstone National Park contains more than half of the world's hydrothermal springs; over 10,000 features in all. As waters flow out of hydrothermal features they cool, evaporate, and interact with the air. This results in significant changes in water chemistry as the outflowing waters move away from their source. Outflow samples were collected that represented Yellowstone's entire geochemical spectrum to further explore the chemical variations in the waters as they moved away from their effluent source. This project analyzed changes in the major and trace element chemistry of the water samples by implementing IC and ICP-OES analytical methods. Results indicate a number of significant trends in major and trace element concentrations. These trends have uncovered information regarding inorganic mineral deposition along with organic uptake of metals in outflow streams. These trends shed new light on the Yellowstone hydrothermal system's unique geobiochemistry along with geobiochemical implications in the greater context of both the Earth and other planetary bodies throughout our universe, including Mars, other rocky planets and moons.

**Smart Mirror**

Shaya Wolf, Kyle Bobak, and Matthew Apple with Dr. Gamboa
Computer Science Department
University of Wyoming

Oral Presentation

*Computer Science Department* *Laramie, WY*

As technology advances, opportunities for advancements in our homes, workplaces, and automobiles race for the attention of consumers. As the internet of things concept grows, we worry both about convenience and style, but also security and protection. The internet opens the door to smart appliances, such as smoke detectors that can alert your phone of a problem at home and thermostats that adjust themselves. To maintain relevant in an advancing world, developers create low cost products that serve a purpose as well as protecting consumers and their information. With that goal in mind, we introduce our smart mirror. Our mirror, built from recycled materials at a fraction of market price (although most smart mirrors aren't available to the general public), allows the user to customize their mirror to display information however they choose. The mirror displays things such as the time, weather, reminders, and alarms in multiple colors and a customizable appearance. The mirror is controlled by the users phone and takes minimal one-time setup. Our mirror would be useless to a hacker, unless such a person wanted to know the time, as our data is stored safely and efficiently. Our project outlines potential for the future and we are proud to present our smart mirror.

**The Study of REDOX Reactions of Biometals in Simulated Body Fluid and Human Plasma**

Renae Wollman with Sherri Adams, MS
Science
Gillette College, NWCCD

Poster Presentation

*INBRE* *Gillette, WY*

The human body utilizes various ions, including Copper, Zinc and Iron, which are usually found attached to proteins, and free ions like Sodium, Potassium, Manganese, and Calcium. These ions are beneficial to the human body in trace amounts, but an increase in metal ions in the body have been recorded to have negative effects. The purpose of this project is to evaluate REDOX reactions between ions in human bodily fluids and metals used in surgical implants. The results of this research could benefit further research into the biocompatibility of metal implants in the human body. Hard Strength Titanium, Resistant Titanium and 316L Stainless Steel were evaluated using an Electrochemical Cell. The data shows that the corrosion resistance of the surgical metals is ranked as follows: 316L Stainless Steel < Hard Strength Titanium < Resistant Titanium. The compositions of the metals evaluated, along with their half-cell potentials, show that these metals should be spontaneously oxidized by copper. However, empirical data and our experimental data shows that these metals undergo a spontaneous reaction with hydroxide ions to form a passive protective oxide film. (Matusiewicz, Henryk, 2014), (T. Hanawa, 2004), (J. Walczak, 1998), (I.Gurrappa, 2003). It was determined that 316L SS and both types of Ti do not undergo spontaneous oxidation reactions with copper under the environment studied.

**Nonsurgical Artificial Insemination in the Ewe**

Jessica Wonderly[1], Kalli Koepke[2], Brenda Alexander[1], Phillip Purdy[3]
[1]Animal Science University of Wyoming
[2]Laramie Research and Extension Center
[3]USDA ARS National Animal Germplasm Program, Fort Collins, CO

Poster Presentation

*Animal Science Department* *Phoenix, AZ*

Artificial insemination (AI) is not readily utilized with sheep because of a lack of knowledge and infrastructure. Therefore, we investigated the effects of timing AI with a synchronized estrous on fertility and the impact of cryopreservation diluents on post-thaw sperm quality. The estrous cycles of 80 ewes were synchronized using progesterone-containing controlled internal drug releasing devices (CIDR) and ovulation was induced with PMSG. Ewes were inseminated nonsurgically 47 to 53 hours following CIDR removal using frozen-thawed semen. The fertility was determined at the time of lambing. In a separate experiment, semen was collected and cryopreserved using 200 mM Tris, 300 mM Tris, or skim milk extenders and analyzed using resazurin dye and computer assisted sperm analysis to assess the metabolism and motility of the sperm, respectively. Sperm frozen in 200 or 300 mM Tris had higher ($P=0.04$) metabolic activity after thawing than sperm preserved in skim milk. Proportions of motile sperm were similar ($P>0.05$) at thaw regardless of the extender, but curvilinear velocity was greater ($P=0.04$) in sperm extended in 200 or 300 mM Tris at 15 min. Sperm head movement was greater ($P<0.01$) for samples frozen with 200 mM Tris extender. The AIs resulted in 15% fertility (12 of 80 lambing) and evaluation of the frozen-thawed sperm indicated that 200 mM Tris is an acceptable extender that enables increased metabolic activity and motility. Future research is warranted to find optimal AI protocol and time to be used in conjunction with the 200 mM Tris extender.

**Barbed Wire Playground: Remembering Childhood Inside Heart Mountain**

Samantha Worden and Dr. Jessica Clark
Department of History
Western Wyoming Community College

Oral Presentation

*Sweet Memories: Historical Research Group* *Rock Springs, WY*

A sad smile crosses Bill Shishima's face as he recounts Toru Shibata's story, Heart Mountain's lost boy. Dared by his brother to swim across a local canal, cold water shocked Shibata and carried him away. Shishima recounts the story, remembering just two weeks before the incident Shibata asked their church leader "what happens when we die?." Shishima takes long pauses and a deep sadness is prevalent. Softly nodding his head, he stumbles over words, remembering his fellow troop members holding hands walking across the canal, searching for their lost friend. According to Shishima the boys knew they had found their friend dead, as a troop member ran screaming from the canal. Looking up, speaking carefully and thoughtfully, Shishima remembers Shibata being cheerful. Shibata's foreshadowing resonated throughout Shishima's internment narrative. After the suspension of Executive Order 9066, former Japanese-American internees, like Shishima, recorded their memories of hardships associated with internment. These memories tell of forced evacuations, barbed-wired barracks, and deaths. Nevertheless, stories also possess happy childhood memories despite imprisonment. One hundred and eight former Heart Mountain internees reveal a struggle between the established collective narrative of hardship and deep individual memories of pastimes. Recognition of these deep memories shows multiple layers of the collective memory by complicating the accepted history of Heart Mountain.

**Effect of Spraying Mosquitoes on Macroinvertebrates in Spring Creek, Laramie, WY**

Sarah Wurzel with Lusha Tronstad
Wyoming Natural Diversity Database
University of Wyoming

Oral Presentation

*Wyoming Natural Diversity Database* *Powell, WY*

Many local governments have mosquito control programs to prevent West Nile Virus throughout the community. The pesticides administered in each city may not target mosquitoes exclusively. In Laramie, the broad adulticide sprayed in the air settled into Spring Creek where a variety of aquatic invertebrates live. We sampled invertebrates with a Hess sampler and drift nets at two sites along Spring Creek. Drift samples were collected before, immediately after, and a day after application. We collected two pre-application and two-post application samples with the Hess sampler. Diversity and abundance of invertebrates increased in post-application drift samples. We are currently processing benthic samples and worms, nematodes, ostracods, and *Baetis* mayflies are abundant in benthic samples. We will present our results to date on how the invertebrate community differs before and after application during the summer. Determining the effects of mosquito pesticide on the Spring Creek invertebrates will inform the city's future mosquito control program and allow managers to make informed decisions. A better understanding of pesticides' effects gives us the opportunity to protect people from West Nile virus while minimizing the effects on aquatic ecosystems.

**Assessing the Occurrence of Microplastics in the Snake River**

Ellen Yeatman with Professor Kirsten Kapp
Department of Arts and Science
Central Wyoming College

Oral and Poster Presentation

*INBRE* *Jackson, WY*

Over the past 40 years, world production of plastic resins increased 25-fold creating a global waste stream comprised of 60-80% plastics. Microplastics, plastic particles less than 5mm in size, are receiving increased attention as a potentially detrimental environmental contaminant. Primary sources of microplastic pollution include plastic pellets and powders produced by manufacturers for industrial sale that enter the waterway via spills, improper dumping or facility accidents and microbeads used as abrasives or exfoliant in commercial products. Secondary sources of microplastic pollution are fibers and fragments from the deterioration of larger plastics. Synthetic fibers enter our waterway as micro-sized fibers shed from laundry in our household sewage effluent that urban wastewater treatment centers are unable to capture. Microplastics have been found throughout our oceans, but little has been done to quantify them in our freshwater systems. This study examines the Snake River for the presence of microplastics. By looking at an entire river system, we hope to identify hot spots and sources of microplastic pollution, such as wastewater treatment facilities or recreational areas. Grab samples (average volume of 1.8 liters) and volume reduced samples with a 100-micron mesh plankton net (average volume of 3,328 L) were collected throughout the summer of 2016 approximately every 50 river miles along the Snake River out to the Pacific Ocean. In this presentation, the results from the grab samples collected at all 28 sites will be revealed. Of the 23 grab samples visually inspected to date, 16 contained putative microplastics.

**Type 1 Diabetes and Eating Disorders: The Importance of Healthcare Provider Knowledge of Eating Disorders in Type 1 Diabetes**

Breanna Young with Dr. Jenifer Thomas
Physiology
University of Wyoming

Oral Presentation

*Honors Program* *Glenrock, WY*

Type 1 diabetes affects more than 3 million people in the United States and the rate of incidence is increasing on a global level (Atkinson, 2014). The diagnosis of type 1 diabetes often occurs prior to or during adolescence and the disease requires a high level of self-management. Adolescence is a challenging time for most people, especially in regards to body changes, weight gain and body image. Due to the diligence required surrounding food and exercise with type 1 diabetes, disordered eating is more likely to occur in these individuals. The rate of eating disorders in those with type 1 diabetes is as much as two times higher than that of their nondiabetic counterparts. Often the presence of an eating disorder is not apparent until complications such as neuropathy, nephropathy, or retinopathy develop, and there is little that can be done to reverse the damage. It is difficult for healthcare providers to detect eating disorders in those with type 1 diabetes due to a lack of education, training, and criteria to diagnose. The goal of this project is to review existing literature for eating disorders among individuals with type 1 diabetes. This literature review also addresses the lack of current diagnostic criteria for the diabetes-specific eating disorder, diabulimia, creating a gap in knowledge for many healthcare professionals. Very few guidelines and support are provided for healthcare providers, therefore an approach on how primary care providers and endocrinologists can better address the needs of individuals with type 1 diabetes and eating disorders is presented.

**Applying Change Theory to Kombucha making at the Albany County Downtown Clinic**

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Oral Presentation

*Honors* *Cheyenne, WY*

In the Microbiology Senior Capstone class last semester, we learned to propose, preform, and present a scientific research study to address a real problem in Laramie. My group partnered with the Albany County Downtown Clinic (DTC) and investigated makeing kombucha, a probiotic drink, while also supplementing it with additional bacteria. Passionate about the research study, I am continuing research with the Downtown Clinic and kombucha. However, instead of manipulating the components of kombucha, I have turned to investigating how Change Theory can apply to structuring a future class on how to make kombucha for the clients and family members of the Downtown Clinic. As a society, we constantly preform research, but how do our results efficiently reach our desired audience? Change Theory is a technique which: 1) identifies long term goals and 2) maps backward to structure preconditions. The purpose of the study is to administer a survey to the clients of the DTC in order to understand these preconditions. After the surveys are completed, Change Theory will be applied to analyze the survey data, which will allow for conclusions about how to structure a kombucha class. Probiotics are a poorly understood concept for many people, and I believe administering this survey to the clients of the DTC will bring us one step closer to teaching people about the benefits of probiotics and how to make an affordable and easy to make probiotic drink by structuring a kombucha class in the future.

**Glycosylation Patterns of Two Distinct Astrocyte Populations Affecting Regeneration of Cells**

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Oral Presentation

*INBRE* *Cheyenne, WY*

When damage to the central nervous system occurs, the body's immediate response is gliosis; the growth and increase of cells that leads to glial scarring. Continued activation and inflammation within the CNS may cure the injury, but this process also results in unfavorable consequences as well. Unfortunately, gliosis prevents regeneration of two cell types: astrocytes and microglia, which both play a crucial role in neuronal support. Research has been done discovering different types of cytokines, chemokines, and other components which affect reactive gliosis[1,2,3]. However, changes in glycosylation patterns are rarely studied due to difficulties intrinsic to the study of glycans. Glycosylation patterns have been noted to be responsible for many physiological and pathological processes[4], including gliosis[5]. Thus, the experiment conducted was reaching to generate homogenous populations of reactive astrocytes from glial precursor (GRP) cells in serum-free reactive conditions, which has never been done before, to use in studying glycosylation of two different astrocyte populations: $GDA^{BMP}$ and $GDA^{CNTF}$. The use of serum-free conditions is novel and significant because serum can vary from bath to batch[6], and the serum could introduce a confounding variable to the experiment. The end goal of this study was to assess whether the differences in glycosylation are functionally important in inhibiting or promoting nervous system regeneration. Knowing these differences can lead to new drug developments, which may one day incorporate glycans that promote regeneration. Therefore, the outcomes of these studies could provide new directions for basic investigation of the biology of reactive gliosis and future avenues for therapeutics.

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**Accuracy of documentation and monitoring of oral chemotherapy in a small community cancer center**

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*INBRE* *Cheyenne, WY*

Newly approved oral chemotherapy agents include endocrine therapy and cytotoxic agents. These self-administered agents provide patients with convenient options and perceived benefits of less clinic visits and complications. Oral chemotherapy is only effective when patients adhere to the prescribed administration schedule and the potential for drug-drug interactions and unwanted toxicity can lead to non-adherent patients. Chemotherapy education can help identify initial potential problems, but continued monitoring and assessing patient adherence through clinic visits can lead to better efficacy, patient outcomes, and overall survival. Retrospective chart reviews were completed and de-identified prior to analysis. We evaluated oral chemotherapy patients in a small community oncology clinic over a two-month period in 2016. Documentation for adherence, chemotherapy education, monitoring parameters per package insert from manufacturers, home medication list per electronic medical record (EMR) and drug interactions were reviewed and assessed for each identified patient. Twenty of the 48 patients identified were on oral chemotherapy. Adherence to oral chemotherapy or endocrine therapy was not specifically documented in provider notes for the 48 patients. Chemotherapy education was not consistently documented in the EMR and monitoring parameters were not discussed in provider notes. Home medication lists accessible by other departments utilizing the EMR did not include these medications in >50% of the patients. Drug-drug interactions were not documented in most cases and upon review many patients had drug interactions that were category D. Medication lists were incorrectly documented. This study illustrates the difficulty of documenting patient adherence and toxicities with new oral chemotherapy agents. Currently, there is no mechanism within the EMR that requires providers to specifically question and document oral chemotherapy. EMR support will be developed for documentation of therapy within this population of patients. Utilization of clinical oncology pharmacists is critical to provide the necessary management, monitoring, and documentation of appropriate therapy in oral chemotherapy and endocrine therapy patients.

**The Limiting Effect of Cytoplasmic Volume and Microtubule Dynamics**

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Oral Presentation

*Honors Program* *Cheyenne, WY*

Mitotic spindles play a key role in cellular division. These structures, which are composed of dynamic filaments called microtubules, are responsible for separation and segregation of chromosomes during mitosis. Spindles must be the correct shape and size to insure fidelity of this process, however, their formation and assembly are still not entirely understood. For example, the mechanisms that govern spindle shape and determine individual spindle size for a given cell type are still unknown. Based on evidence from recent studies of spindle scaling, in which spindle size effectively scaled with cell size, we hypothesize that within small cytoplasmic volumes, spindle building blocks become limiting and thereby limit spindle size. This hypothesis predicts that microtubule dynamics within the spindle will be adversely affected by changes in cytoplasmic volume. By combining cell-free cytoplasmic extracts, microfluidics, and confocal microscopy, we hope to measure changes in microtubule dynamics and elucidate the relationship between cell volume and spindle size within the cell.

**Family Characteristics Associated with Parents' Knowledge and Beliefs Regarding Preschoolers' Physical Activity**

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Oral presentation

*Honors* *Moorcroft, WY*

The obesity epidemic has been rising in magnitude for several decades and has spread its influence to include children of all ages. Much research has been done to examine the effect that physical activity (PA) has on an individual's weight. The amount of PA that children participate in is mediated by various factors: high socioeconomic status, more green space, having a sibling, and parental support for PA are all associated with greater child PA. While all of these factors influence PA participation, their concurrent effect is unknown. A holistic perspective is imperative to the understanding of childhood PA, as children are not experiencing just one of these influences at a given time. The purpose of this project was to determine how family characteristics, including number of siblings and socioeconomic status, are associated with parental behaviors, knowledge, and beliefs regarding child's PA. A secondary goal was to determine how child PA varies according to family characteristics. Of special interest is the role of siblings and birth order in determining preschooler PA (min/day) and whether or not children participate in rough & tumble play. Parent and family characteristics, child PA, and parental knowledge and beliefs regarding child PA were assessed via a web-based survey (modified Preschool Physical Activity Questionnaire, Pre-PAQ). Linear regression and logistic regression analyses were used to determine variation in child PA and parenting behaviors according to family characteristics.