2016 undergraduate research day

University of Wyoming
April 30, 2016

Student Abstracts

Oral Presentations: Classroom Building,
University of Wyoming Campus
8:00 – 5:00 PM

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

ACKNOWLEDGEMENTS

The University of Wyoming Undergraduate Research Day would not be possible without the contributions of many people and programs. We are especially grateful to the following:

Working Group

Susan Stoddard, McNair Scholars Program
Angela Faxon, Office of Research and Economic Development
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Susan Aronstein
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Brian Toelle
Xuebing Fu
Vladimir Alvarado
Gustave Anderson
Craig Tingey
Neal Neumiller
Pete Christian
Gordon Posposil

Department of Chemical Engineering Session Judges

David Bell
David Bagley
Joseph Holles
John Myers
Karen Wawrousek
William Schaffers

Department of Electrical and Computer Engineering Session Judges

Bob Kubichek
Fred Benson
Walt Marshal
Josh Tomayer

Department of Mechanical Engineering Session Judges

Angie Shrader
James Kretzschmar
Robert Rennard
Aarne Haas

The Phi Beta Kappa Awards for Excellence in the Liberal Arts are made possible by an endowment presented to the University of Wyoming Phi Beta Kappa chapter by Harald V. Johnson of Bensenville, Illinois. This endowment, in honor of Louise A. Lee Johnson is now used to support undergraduate students whose scholarship and research display excellence in the liberal arts excellence in the liberal arts. Mrs. Johnson participated in the University of Wyoming Phi Beta Kappa Chartering in its inagural year of 1940. Today, University of Wyoming is one of only 286 colleges and universities in America to meet the rigorous qualifications for hosting a chapter. This year, the members of the University of Wyoming Chapter are honored to be able to recognize undergraduate researchers who expertly weave together physical, intellectual, ethical and social issues in their research.

Development of Additional Primary Recovery Wells in the Charlton 30/31 Field

Mitchell Acheson, Nathan Driver, Jeremiah Ennis, Ce Gao, and Kole Stewart
Faculty Mentor: Dr. Brian Toelle
Department of Petroleum Engineering
Oral Presentation with Powerpoint
Department of Petroleum Engineering *Laramie, WY*

The Charlton 30/31 Field is located in Otsego County, Michigan. In this field, the producing formation is the Niagaran Brown formation (of the North Silurian pinnacle reef trend). Several oil wells have extracted 2.6 million of the estimated 7 million barrels of oil in place, all in around 40 year's time. The solution for extracting more oil economically from a field that has been active for so long is difficult. This is due to previous field activity from both injection and production wells. They have an influence on the remaining oil in the reservoir, on the remaining reservoir pressure and various other factors that impact primary recovery. Therefore, the purpose of this study is to overcome these technical difficulties to identify the optimal surface location(s), drilling methods, and stratigraphic zones for drilling additional wells that will recover the majority of the oil remaining in the field.

The stratigraphic zones that are most effective for oil production are dolomite intervals that lay throughout the carbonate reservoir in the Charlton 30/31 Field. Specifically, the dolomite intervals have been found to contain higher porosity and permeability than the limestone intervals. Therefore, targeting those oil saturated dolomitic areas in the matrix is the priority of the project, while planning to drill around fault planes and wells already in place is a secondary, yet still important focus. The dolomitic oil-bearing trends from well to well will all be identified on a static model in Petrel, which is built from interpretations of well logs and a 3D seismic survey. In this study, the designing of a static model and the plan behind developing additional oil wells in the Charlton 30/31 Field will be discussed at a higher level.

Rural Healthcare for Persons with Parkinson's Disease: Exploring Barriers

K.M. Adams, R.L. Singh, E.J. Bush, M.J.C. Hidecker
Division of Communication Disorders and School of Pharmacy
University of Wyoming
Oral Presentation
Department of Communication Disorders and School of Pharmacy *Monument, CO*

Parkinson's disease is a neurodegenerative disorder that can result in deficits of gross and fine motor movements, speech production, swallowing abilities, and dementia. Little research exists regarding Parkinson's disease community needs in rural areas. This study identified the barriers to effective healthcare outcomes for the Wyoming Parkinson's disease community. Five focus groups of 30 stakeholders were conducted to explore the perceptions and experiences of members in this community. The central, structuring question was *what barriers exist in improving the lives of persons with Parkinson's disease in Wyoming?* Three emergent themes were noted about community barriers. The first theme was a lack of access to specialized medical support as well as current and relevant research. A second theme was isolation of people in the Wyoming Parkinson's community due to lack of communication and technology options. A third theme was a lack of active support groups. This study confirms that Wyoming is home to a rural community with insufficient or lacking healthcare resources for people with Parkinson's disease. Several participants expressed a strong desire for networking services that could bridge the gaps in care created by the specified barriers. Future plans include identifying resources for improving the healthcare and quality of life within the Wyoming Parkinson's disease community.

Chemical EOR Powder River Basin Field Screening

Solomon Adeniyi, Hindi Alhajri, Jarah Almahasheer, Thomas Pointon, Maxwell Wong
With Dr. Xuebing Fu
Department of Petroleum Engineering
University of Wyoming

Oral Presentation

Department of Petroleum Engineering *Riverton, WY*

This project received a large data package from the EORI. We screened through the data to find the top fields best suited for a particular chemical EOR method, and then determined incremental production increases. Finally we created a report detailing our process. In order to accomplish the above tasks, we first started with planning our project by dividing the work into four phases. We then went into screening and ranking fields by doing a field screening and ranking analysis, then used equations and reservoir techniques to provide the expected incremental production increases. Field screening compares a list of parameters from multiple fields (depending on the screening method, various parameters are used) to values on lookup tables that have been determined by experts for each enhanced oil recovery method. These lookup tables provide no more than a 'Go' or 'No Go' answer for each field; other methods (such as indexing) are required for ranking if multiple fields fit all parameters for a certain EOR method. An initial screening of our project reduced the number of fields from 4500+ to 114, and out of those fields, some of the data required for screening was missing. Accessing the WOGCC, our group was able to download well logs and go to other public sources for the screening information needed. Our indexing method involved comparing the range of field parameters against comfort reference values to find an index for each field, and using higher index values as better candidates.

Charlton 30/31 Field Static Model and Recommended Field Development Plan

Badi Alanazi, Jacob Westley, Marvin Noreña Bazan, Mannan Qazi, and Yilihamujiang Tayier, Dr. Brian Toelle
Department of Petroleum Engineering
University of Wyoming

Oral Presentation

Department of Petroleum Engineering *Al Khafji, Saudi Arabia*
Estes Park, Colorado
Huánuco, Perú
Srinagar, Kashmir, India
Korla China

The Charlton 30/31 field, is located in Otsego County, Michigan as part of the Northern Silurian Reef Trend. The Reef Trend consists of the remnants of coral reefs and can act as traps for oil forming reservoirs. The Charlton 30/31 field is about 300 acres and is mostly low porosity, low permeability limestone with some irregular zones with higher porosity and permeability. The field was developed with 6 wells and produced 2.6 million barrels of oil during primary production. For this project, the objective is to use provided data, including well logs and a 3D seismic survey, to produce a static model of the field. Then, using the static model, a recommendation on the best approach to further develop the field will be provided.

RASC-AL Robo-Ops Rover Design Competition Finalists: Cowboy Robotics, Computer Science Team

Nasser Alawami , Richard Yang, John Ross Petrutiu, Brian Moore, Mohammed Busaleh
Faculty Mentor: Dr. Ruben Gamboa
Department of Computer Science
University of Wyoming
Oral and Poster Presentation

Department of Computer Science, University of Wyoming — *Laramie, Wyoming*
Wyoming NASA Space Grant — *Toulouse, France*
National Institute of Aerospace/NASA — *Littleton, Colorado*
Al-Hasa, Saudi Arabia
Al-Qatif, Saudi Arabia

The Cowboy Robotics team was selected as one of eight finalists to compete in the 2016 RASC-AL Robo-Ops Rover Design Competition, sponsored by NASA and managed by NIA. The competition asks university teams to design teleoperated rovers that will collect small, colored rock samples from the Johnson Space Center's Rockyard, while operated from their respective university campuses.

Our two rovers run the Debian-based Robotics Operating System (ROS), which facilitates the implementation of distributed robotics systems over IP networks. Our control system utilizes ROS to remotely communicate with on-board ATMega328p microcontrollers, which drive each rover's steering servos, arm servos and drive motors.

Lower level communication between the rovers and mission control (on the UW campus in Laramie) is done over 3G/4G cellular networks, and an externally hosted VPN is used to quickly establish secure and reliable connections. This networking infrastructure will ensure the seamless transmission of commands and sensor readings (e.g. odometry data) between our rovers and mission control.

Using streams from the rovers' multiple on-board wide-angle cameras, and a Real-Time Appearance-Based Mapping (RTAB-Map) implementation in ROS, we will generate a 3-Dimensional model of the rover's surroundings to assist our drivers at mission control. This model would also serve to simplify the future implementation of automated exploration and target discovery.

Mapping beetle infested stands in Medicine Bow National Forest: Importance of spatial and attribute accuracy of field data

Elizabeth M. Wirsching[1], Jacqueline Alexander[2], Dr. Ramesh Sivanpillai[3]
1. Department of Ecosystem Science and Management, 2. Department of Civil and Architectural Engineering, 3. Department of Botany
University of Wyoming

Oral Presentation

WyCHEG *Cody, WY*
WyomingView *Rock Hill, SC*

Since 2002, the beetle infestation has killed millions of lodgepole and spruce trees in the Medicine Bow National Forest and throughout the Rocky Mountain Region. Once attacked, first these trees lose their hydrologic conductivity, then the green needles turn to red and grey colors, which is followed by tree mortality. These changes in vegetation impact water flow and other ecosystem processes. In order to model these ecosystems, land cover maps depicting these changes are necessary. Remotely sensed imagery data can be used for mapping these changes in vegetation conditions by associating their spectral reflectance values with earth surface features such as different types of vegetation, and other classes. Through field surveys data are collected about different features and their location, and are associated with the imagery data for training the image processing algorithms. This relationship is used to generate the land cover map for the area of interest. Quality of field data in terms of location and description is important in order to generate reliable land cover maps. This presentation will describe how individual tree-level data within 46 plots were aggregated to plot-level. Next, using distance between plots, and their vegetation conditions (live, dying and dead trees), the plots were grouped to match the pixel resolution of Landsat images. As vegetation conditions changed every year these plots were regrouped from 2008-2015. This research highlights the importance of matching the image and field data characteristics prior to analyses.

YMCE Engineering

Group: Yousif Alqatari, Michael Seas, Christian Jones, Eric Fabrizius **Mentor:** David Bell
Department of Chemical Engineering
University of Wyoming

Oral Presentation

Department of Chemical Engineering *Laramie, WY*

Our presentation will be about an innovative new idea to directly convert methane to methanol via a catalytic pathway that involves a platinum bipyrimidine complex. The United States currently has an abundance of natural gas, and many researchers are working on taking this abundant resource and turning it into something more valuable, so developing a direct route for conversion of methane to methanol can provide the foundation for efficient utilization of natural gas. Despite natural gas being a decent source of energy, the production and use of the natural gas are strongly limited by the difficulties in the transportation of the product. Methanol is an energy dense liquid that can be transported easily with existing infrastructure. Our project will detail the chemistry and industrial design behind our process. It will also incorporate economics to assess feasibility of implementation of the design. We will be considering modern issues such as environmental pollution, location, global supply and demand, and other possible uses of natural gas in our economic assessment. By the end of our project, we hope to be able to make a recommendation to any that would pursue this project as to whether it is economically viable.

EBTAX: The Conversion of Ethane to Aromatics via Catalytic Conversion

Saud Alshahri, Aaron Cheese, Bridger Martin, Emily Schwichtenberg, Mentor: Dr. David Bell
Department of Chemical Engineering
University of Wyoming

Oral Presentation

Department of Chemical Engineering *Dhahran, Saudi Arabia*
Rock Springs, Wyoming
Casper, Wyoming
Norwood Young America, Minnesota

Over the semester, the goal of EBTAX was to create an economically viable process for the conversion of ethane to various valuable aromatics, specifically benzene, toluene, and xylene, commonly referred to as BTX. A recent oversupply of natural gas in the United States has caused a significant price drop in the national market. This creates an economic opportunity to use natural gas, specifically ethane, as a feedstock to create valuable chemical products. A recent patent, US8772563, describes a platinum-germanium zeolite catalyst which converts ethane to BTX with high selectivity. Using this catalyst, a system of two reactors was designed to produce 700 million pounds per year (MMlb/yr) of BTX from ethane. Large amounts of hydrogen is also produced in the reactor, which can be sold in addition to the primary BTX products. In the design, a full complementary separation system was devised with industry standards and precedents to maximize product quality and profits. Preliminary economic analyses show high profit potential, and EBTAX recommends moving forward to a pilot plant to verify key assumptions made in the design phase.

Baja Steering Team

Abdulkhaliq Alshekh, Robert L. Capron, Sheldon P. Evans and Dr. Kevin Kilty
Department of Mechanical Engineering
University of Wyoming

Oral and Poster presentation

Department of Mechanical Engineering, ASME, SAE *Laramie*, WY

This year our goals for the 2016 Baja Steering Team are to reduce the turning radius from 15’ to 7’, eliminate bump steer, to increase the allowable space for the drivers foot operations within the cockpit and eliminate Ackerman angle. To eliminate bump steer we have ensured that the tie rods pivot about an arc concentric with the pivoting arc of the front A-arm. We achieved this by designing the tie rods to be the same effective length as the front a-arms. The rack and pinion will be lowered the maximum distance allowable before bump steer is introduced and will be on a parallel plane with the steering knuckle. This will maximize the cockpit space available for foot control operations. A larger angle of wheel orientation while turning will be implemented due to the suspension obstruction. However, a cutting brake will reduce the effective turning radius to 7’ while allowing the wheels to remain parallel, effectively eliminating Ackerman angle. The bump steer was eliminated, however there will be a slightly larger turning radius due to the obstruction. The maximum lowered distance of the rack and pinion still resulted in an elevated floor board due to the safety constraints, necessary to eliminate bump steer. The goal of a 7’ turning radius will be achieved with a cutting break and is significantly smaller than last year’s model. Bump steer and Ackerman angle were also eliminated with our design.

Bottom-up vs. top-down controls on ant abundance in forests impacted by the 1988 Yellowstone Fires

Isaac T. Andersson and Dr. Hayley C. Lanier
Department of Zoology and Physiology, University of Wyoming at Casper
Poster Presentation

Wyoming INBRE *Casper, Wyoming*

During the last three decades, wildfires in the Western United States have been increasing in numbers and intensity. As wildfire season grows and the resulting burn areas cover more of the Western states, it has become imperative to understand the natural fire cycle and the factors involved with burn area recovery. Formicidae, or ants, are a key species in healthy ecosystems throughout the world. Ants aerate the soil and influence the chemical balance, they are important predators and prey species, and they also consume and recycle large amounts of organic materials. Because of their critical role in ecosystem functioning, it is important to understand how ant populations are shaped by the recovery and maturation of previously burned areas. Limitations on ant populations in post-burn areas may be related to the abundance of food (seed bearing plants and invertebrates) relative to adjacent mature pine forests (bottom-up controls). Alternatively, top-down effects from predators, such as spiders and shrews, may be the driving factor for ant populations. For this study we used the pitfall samples of invertebrates collected in 2014 and 2015 as part of a long-term study of the 1988 Yellowstone Fires. Invertebrates were sorted to order and, in some cases, family. We compared models of ant abundance relative to explanatory variables that were bottom-up (vegetation characteristics, downed trees, and abundance of invertebrate prey), top-down (shrew and spider captures), or both to determine which model best explained the observed abundance data. Ants are small, silent, relentless shapers of the Western landscape, and by understanding better how they are impacted by post-fire succession of the forest cycle will help us to better understand the interdependence and change in this regions.

Taste of the Past: A Critical Look at the Modern Historicity of Historic Preservation

Lucas Anderson, Dr. Anthony Denzer
American Studies
University of Wyoming
Oral Presentation

Honors Program *Cheyenne, Wyoming*

The historic preservation movement in the United States is dedicated to preserving the nation's historic resources, primarily in the built environment. However, historic preservation presents a major flaw in terms of definition. The common definition of historic preservation uses the term 'historic' in both the term and its definition, making it a victim to the phenomenon of circular definition. The word shouldn't be used to define itself. What the definition of historic preservation tends to skirt is that of the specific understanding of the word 'historic.' 'Historic' is not intrinsically meaningful. Rather, it has a more specific cultural definition that depends highly on how one views the relationship of the present to the past and what role the past has in informing the future. Ultimately, these specific definitions of 'historic' govern specific sets of resources that should be preserved. The buildings that are preserved thus inform a particular construction of what history itself is by claiming certain buildings to be 'historic' and the rest to be doomed as 'non-historic.' The purpose of "Taste of the Past" is to explore the origins of the historic preservation movement's particular version of history. I argue that historic preservation's history is consistent with the general philosophy of history employed by the Modern episteme, with specific reservations made in favor of certain aesthetical qualities that communicate desirable values. Historic preservation indeed looks to preserve history, but the conglomerate history gleaned from preservation projects tells a very

selective version of history that is perceived to have values that are still applicable in various ways to the present.

Stable isotope quantification of resource use by crayfish in the Laramie River to inform food web analyses

Andrew Annear (student), Frank Rahel (mentor), Bryan Maitland (mentor)
Department of Zoology and Physiology
Poster Presentation

Dept. of Zoology & Physiology *Cheyenne, WY*

Stable isotopes are useful for assessing the functional role of species within food webs, as C isotope ratios can trace the origin of an organism's energy sources, and N isotope ratios can reveal an organism's trophic position. However, this approach requires an understanding of the isotopic variability of species within food webs of interest. Crayfish are an important component of food webs in the Laramie River, yet niche attributes like trophic breath and ontogenetic diet shifts are poorly explored for this generalist species. Because crayfish predators, such as Brown Trout, are size-selective, it is important to know if the isotopic signature of crayfish varies with crayfish size. We evaluated the isotopic niche of crayfish collected from the Laramie River in the fall of 2015 through stable isotope analysis of C and N to characterize their trophic function. Trophic position and diet breadth varied among size classes of crayfish indicating ontogenetic niche shifts. This information will allow researchers to target the appropriate size group of crayfish when calculating stable isotope baseline values for food web analyses.

Assessment of Cardiac Function in DGAT1-/- Mice Fed a High Fat Diet

Macayala Arrington, Ben Sabat, Alyssa Sanders, Luiza Bosch, Cassidee Lish, MacKenzie Price
Bud Chew
Biology
Western Wyoming Community College
Oral Presentation

INBRE *Rock Springs, Wyoming*

Ingested triglycerides (fats) become fatty acids and glycerol. They are then are packaged for transport into the intestinal absorptive cell and are converted back to triglycerides prior to absorption in the blood. Diacylglycerol acyltransferase 1 (DGAT1) is a key enzyme in this final conversion; when absent, an animal cannot store fat. Recently, a DGAT1 knockout mouse model (DGAT1-/-) was developed, allowing for research on this possible therapeutic target for obesity. Little is known about the overall health of this animal, particularly cardiac function. When wild type (WT) mice are placed on a high fat diet (60%) for six months, they develop heart failure. We hypothesized that DGAT1-/- will not develop heart failure after six months of a high fat diet, while WT mice will have impaired cardiac function, as assessed by Pressure Volume Loop analysis (PV). PV involves the placement of an electronic catheter in the left ventricle of the heart, simultaneously measuring pressure and volume of blood in the heart. PV is currently the most comprehensive method of determining heart function. At the time this abstract was written, PV data was being collected on WT and DGAT1-/- mice on high fat diets for six months.

Assessment of Cardiac Function Using Pressure Volume Loops in 3, 6, 9 Month Old RBM20-/-

Luiza Bosch, Cassidee Lish, MacKenzie Price, Alyssa Sanders, Macayla Arrington, Ben Sabat
Bud Chew
Biology
Western Wyoming Community College 2500 College Drive Rock Springs, Wyoming
Oral Presentation
Supporting Program –INBRE *Rock Springs, Wyoming*

RNA binding motif 20 (*Rbm20*) is a muscle-specific splicing factor that mainly regulates post-transcriptional isoform switching of titin, a giant sarcomeric protein responsible for diastolic properties of the heart. *Rbm20-/-* (KO) rats fail to splice titin from fetal to adult isoforms, thus increasing compliance of ventricular walls, causing systolic dysfunction and dilated cardiomyopathy. The pathology seen in Rbm20-/- rats resemble those of humans. Although previous data have shown that ejection fraction in KO rats is significantly lower than that of *Rbm20+/+* (WT) rats at 10 m old, little is known of cardiac function in KO rats versus age-matched WT rats with development using pressure volume loop analysis (PV). We hypothesized that KO rats would develop cardiac dysfunction early in life, and performed PV on rats at 3, 6, and 9 m of age. Results of 6 m old rats show significant ($p<0.05$) decreases in cardiac output, heart rate, stroke volume, ejection fraction, stroke work, and cardiac efficiency. End-systolic elastance was significantly lower in KO, indicating an increase in systolic compliance, while neither end-diastolic elastance nor Tau, both indexes of diastolic compliance, were different. We conclude that KO rats show significant evidence of heart failure as early as 6 m of age. At time of abstract submission, data analysis of 3 and 9 m rats was underway.

Dazed and confused? Fungivory of selenophilic fungi by *Tribolium confusum*

Jelard T. Aquino, Blair E. Durham, Bonnie L. Harrison, Aaron M. Nowotny, Chad R. Wangeline, Dr. Zachary P. Roehrs, Dr. Ami L. Wangeline
Department of Natural Sciences
Laramie County Community College
Poster Presentation
Department of Natural Sciences, INBRE *Cheyenne, WY*
Olongapo City, Philippines

The elemental defense hypothesis suggests that plants and fungi accumulate high concentrations of specific elements, such as selenium (Se), as a defense against herbivory and fungivory. To test this hypothesis, we examined the effects of two Se accumulating fungal isolates, *Alternaria tenuissima* and *Alternaria astragali*, on a fungal grazing beetle, *Tribolium confusum*. To determine if *T. confusum* beetles could tolerate Se-rich fungi, *A. tenuissima* and *A. astragali*, grown with and without Se, were provided as the sole food source to *T. confusum*. The beetles were randomly placed in tubes filled with ~30g of fungi grown with 10ppm and 30ppm of Na_2SeO_4, 10ppm Na_2SeO_3, or fungi grown without Se for non-choice feeding experiments. At the end of the feeding period, the beetles, remaining fungal tissue, and frass were weighed, dried and acid digested for analysis using total reflection x-ray fluorescence (TXRF) to determine Se concentrations. *T. confusum* was found to feed on both fungi in all Se treatments, with greater consumption of *A. astragali* ($\bar{X}$=83%) than *A. tenuissima* ($\bar{X}$=60%). The beetles' Se accumulation was variable between reps and treatments ranging from 64ppm to 217ppm when fed on 10ppm fungi. These data show that *T. confusum* was able to metabolize high levels of Se above what is found in the environment, which suggests the elemental defense hypothesis is not applicable to the fungi. However, this apparent Se

tolerance could aid the beetles in consuming a wider variety of fungi and may allow them to be used for treating anthropomorphic Se contamination.

How do Animals Make Decisions?
Identification of New Decision Making Circuits in the Songbird Brain

Ethan Atwood
Department of Zoology and Physiology
University of Wyoming

Oral Presentation

INBRE Program *Casper, Wyoming*

What structures and functions in the brain underlie the ability of the mind to make decisions? The decision making process is a cognitive behavior that is associated with activity in a complex system of neuronal connections. The two fundamental components of a decision are perceiving information through sensory stimuli and taking action based on that information. Although much is known about how signals are perceived and motor commands are initiated, the pathways that link those processes and thus may forge the causal link in sensory-based initiation of actions remain poorly understood. Here we turn to an animal model of decision making to enable us to explore the circuits that link perception to action. Specifically, we investigate the circuits that underlie the decision of mate choice in female Bengalese finches. Our project integrates a range of techniques including light-evoked manipulation of activity in specific cells (optogenetics), behavioral studies, and microscopy to identify circuit connectivity. Through microscopy analyses we have discovered a previously uncharacterized neural pathway related to how the selection of mate choice is influenced by the perception of song. Identification of this neural network, identified through 3D rendering of confocal microscopy images, has aided in our preliminary studies using light evoked manipulations of cells in that pathway. This is important for our further work on better understanding how the selection of mate choice is influenced by the perception of a sensory song stimuli.

One Click Away: Examining the Perceived Impact of Screen Time Among Pharmacy Students

Luke Aust, PharmD candidate 2017, Sarah Bockman, PharmD candidate 2019, Carol J. Kobulnicky, PhD, RPh
School of Pharmacy
University of Wyoming

Oral and Poster Presentation

Honors Program *Rock Springs, WY*

Technology has advanced significantly within the past decade and with it has come the ability to use a variety of devices for academic purposes. While this can make accessing information much easier and allow for new organizational methods, it can also provide the opportunity for more distractions. The purpose of this study is to research how access to screens, such as smartphones, tablets and computers, impacts studying and academic performance in college students. We examined how this distraction potential can play a role in studying experiences and academic performance and how these students attempt to overcome it. Focus group interviews with current pharmacy students were conducted, audio-recorded and analyzed. Participants reported using screen time for many activities ranging from communication and entertainment purposes to educational purposes such as note taking, studying and researching. From an academic standpoint, the positive contributions of screen usage reported are improved accessibility and organization, while the negative repercussions are the distraction, obsessive habit surrounding use and poor sleep hygiene. Strategy to overcome the negative aspects of screen usage was overwhelmingly the need for self control. Students spoke of using screen access as a reward for studying, setting clear limits on time spent using screens for non-academic reasons and intentionally restricting personal access to the

Internet. Helping students to generate a self-awareness of the need for this self-control provides a unique opportunity for collaboration among student leaders, instructors and administrators.

The Crushing Weight of Bombs, Money, and Political Revenge: How the International Community Tipped the Scales in the 1975 Cambodian Revolution

Kayle Avery, Dr. Michael Brose
Department of History
University of Wyoming
Oral Presentation

Department of History(Senior Capstone) *Laramie, Wyoming*

This project aims to apply the revolutionary theories of Jack A. Goldstone and Theda Skocpol to the 1975 Cambodian revolution. In doing so, the project illustrates how unstable the Cambodian government was prior to its collapse and how the direct and indirect involvement of foreign powers hastened its sudden replacement by the Khmer Rouge regime. This was discovered by comparing Goldstone and Skocpol's theories of revolutions to secondary sources that outlined the conditions present prior to the 1975 Cambodian revolution. Conditions included a large agrarian working class, a weak and unpopular leader, an inefficient and hamstrung military, and an ideologically driving force. Crystalizing these conditions into a full-fledged revolution were the actions of foreign powers. Bombing records of Eastern Cambodia, reports of destabilization, and records of economic and militaristic support of the Khmer Rouge regime were all used to justify this claim. This project highlights the role of the international community in further destabilizing already unstable governments.

Glycerol to 1,3-Propanediol Through Anaerobic Fermentation

Rex Bagley, Christian McWorkman, Spencer Nelson, Graham Wallace, Professor John Myers
Department of Chemical Engineering
University of Wyoming
Oral Presentation

Department of Chemical Engineering, Honors (Graham)

Auburn, WY
Anchorage, AK
Torrington, WY
Casper, WY

1,3-Propanediol (1,3-PDO) is a common building block for some of the most widely used polymers and composite materials. It can also be used to make adhesives, sealants, laminates, coatings, paints, perfumes, fragrances, personal care products and laboratory-scale chemicals. Due to the increase in bio-diesel production, Glycerol - a byproduct of this process - is available in excess. Because of this excessive amount of Glycerol in the chemical marketplace, the price of Glycerol has subsequently dropped by a significant amount. Our senior design project evaluated the economic viability of the production of 1,3-PDO using the fermentation of Glycerol by *Klebsiella pneumoniae* on an industrial scale. We also looked at the environmental, and social impacts of this process.

Guitar Studio

Marcus Kelly, Phillip Daniels, and Logan Bailey, Dr. Ruben Gamboa

Department of Computer Science
University of Wyoming
Oral Presentation

Department of Computer Science *Cheyenne, WY*
Brighton, CO
Casper, WY

The guitar is one of the most popular instrument played by amateur musicians in the United States of America. While there is sheet music available in the standard format that classically trained musicians can read, untrained musicians may not be able to read music in that format as easily. For this reason, the most popular style of sheet music for the guitar is called guitar tablature, which presents to the reader where on the guitar they should play each note. Our phone application was designed for the amateur guitarist that is looking to begin writing their own guitar tablature. The application will record the user playing on the guitar and will then generate the corresponding tablature and print it to the screen.

Enhanced Oil Recovery Field Screening in Wyoming

John Baldwin, Jake Duda, Dylan Morin, Jordan Polzin, Kyle Scalise
Mentor: Dr. Xuebing Fu
Department of Chemical and Petroleum Engineering
Oral and Power Point Presentation

Department of Chemical and Petroleum Engineering
Laramie, WY

Enhanced oil recovery is the process of producing additional oil after the initial primary recovery stage. Enhancing recovery efforts after the primary recovery of a well is dependent on the forces that control reservoir behavior as well as oil properties. Each reservoir has it's own characteristics that must be considered in selection of secondary recovery effort. An extensive set of field data was collected by the Wyoming Oil and Gas Commission for our team to investigate. Screening fields and eliminating fields to determine optimal candidates was our main objective. One of the most important screening considerations is potential profitability. The expected production needs to outweigh operational cost of the recovery effort. After the data is streamlined, the remaining fields will be ranked to determine which fields are the best contenders for EOR. While this project is highly focused on data analysis, technical applications of petroleum engineering were paramount. This project gives insight into petroleum prospect generation for secondary recovery efforts.

Wyoming Disabled Hunters Self Loading Game Trailer

Mike Barbero, Nate Benzel, Vincent Vogt, John Ysebaert
Department of Mechanical Engineering

University of Wyoming
Oral and Poster Presentation

Once an animal has been shot in the field, the real work begins. For many people who are disabled, this is a large barrier to becoming an independent hunter. They require another person hunting with them to assist in processing and field dressing the game animal. Our senior design project is aimed to help with this problem by the use of an innovative trailer. Our trailer design includes a hydraulically powered hoist arm utilizing a winch for game retrieval. Upon shooting an elk, deer or antelope, the trailer is backed up to the animal within the distance of the winch cable and retrieved using the power winch. Once the animal is at the trailer, the arm is used to lift the animal into the air where it can then be field dressed and skinned by a person in a wheelchair from ground level. The design of our system has incorporated safety as the main priority since the beginning of the design process, along with reliability and functionality. Our projects purpose is to help handicapped and physically challenged hunters to get back out into the wilderness doing what they love and creating new memories with more independence than before.

Charlton 30/31 Field Development Project

Elizabeth Barsotti, Charles Cole Monroe, James Segrave, Darren Turner, and Mitch Weigel, Prof. Ken Baum
Department of Petroleum Engineering
University of Wyoming
Oral Presentation

Department of Petroleum Engineering *Laramie, Wyoming*

It is clear from well logs and information available in the literature for the seven wells in the Charlton 30/31 Field that the field is not producing optimally. Located in Otsego County, Michigan, the Charlton 30/31 Field contains wells that, though drilled more than thirty years ago, have produced relatively small quantities of oil. To increase oil production from the field, the locations of new wells are proposed based on the analysis of both a static and a dynamic model. The static model was built to indicate high permeability, high porosity zones for potential well sites, while the dynamic model was constructed to simulate the productivity of the potential well sites. Monetary profit and environmental impact are also analyzed to ensure true optimization of the field.

Generation, Modification, and Analysis of Synthetic FRP Microstructures Based on Experimentally Observed Microstructures

Student: E. John Barsotti
Faculty Mentor: Ray S. Fertig
Presentation Type: Oral

Composite materials are becoming increasingly popular as building materials in a wide range of areas because of their high stiffness and strength; however, the source of variability in their material properties is not well understood. This could have drastic consequences given the risks associated with some of the areas in which they are used, such as the automobile and aerospace industries. The research project that I am currently working on seeks to predict the material properties of composites through analyzing their underlying *microstructures*, which are made up of glass or carbon fibers, only a few microns in diameter. The fibers can take on a variety of geometric configurations, meaning that microstructure characteristics can vary drastically. By creating computer models of microstructures and modifying them so that they contain statistically equivalent geometries to those of experimental microstructures, we can use finite element software such as ABAQUS to analyze obtain their mechanical properties. My focus has been on accurately rearranging the fibers to obtain statistical equivalence. The computer code that I wrote to do this has been proved successful for microstructures of varying dimensions and fiber morphologies. I am currently using it in tandem with ABAQUS to predict their mechanical properties.

90 Minutes of Entertainment, Months of Planning, a Lifetime of Memories

Michelle Bartlett with John Ritten
Agriculture and Applied Economics
University of Wyoming

Oral Presentation

Honors Program *Parker, Colorado*

Someone walks down the street and sees an advertisement that catches their eye, and they think that they might want to attend the event. They buy tickets and anxiously await the affair. The day comes and they walk through the front doors and hand their ticket to the attendant, then stop by the concession stand for popcorn, and find their seats. They watch the show and enjoy their 90 minutes of entertainment and return home. For the spectator, that's the end of the experience. However, for the people behind the scenes, it is far more intensive, there are months of planning, collaborating, rehearsing, communicating, and time that goes into the mere 90 minutes of any event.

This personal narrative will allow the reader to have a better understanding of the work that goes on behind the scenes, and inform the reader about the processes of event planning through my personal experience as an event production intern. An event will leave the spectator with a small 90 minute satisfaction, but it leaves the event planner with a lifetime of experience and memories that they will never forget.

Conversion of Biomass to Biofuels via FCC

Seth Bassham, Kevin Grauberger, Joe Graves, Katherine Rosecrance, Alex Tyrrell

Chemical Engineering
University of Wyoming
Oral Presentation

Department of Chemical Engineering

Casper, WY
Mitchell, NE
Sheridan, WY
Fort Collins, CO
Greeley, CO

Global energy consumption continues to increase along with the demand for renewable, carbon-neutral, non-food fuels. Biofuels meet these requirements. We developed an Aspen Plus simulation to model the production of 500 million pounds per year of liquid fuels derived from corn stover, an agricultural waste product. Our process pyrolyzes ground corn stover to bio-oil with the reaction byproducts supplementing plant energy costs. Hydrotreating reduces doubly bonded oxygen compounds in the bio-oil before the bio-oil is converted to a liquid fuel mixture via fluid catalytic cracking. A series of distillation towers separate the liquid fuel mixture into olefins, benzene, toluene, and xylene. A second Aspen Plus simulation alternatively uses the fluid catalytic cracking reactor to derive gasoline, liquefied petroleum gas, light and heavy cycle oils from vacuum gas oil co-processing. Our economic analysis considers the costs of the required equipment, costs of obtaining feedstock, sale prices of both mixed and separated fuels, and a sensitivities analysis. Initial results suggest our process is feasible.

PhotoHound: Using Geographic Location, Pictures, and Adventure to Create a New Application for Social Media

Jordan Bates, Keegan Haukaas, Jack Murdock, and Samuel Robertson, with Ruben Gamboa
Department of Computer Science
University of Wyoming
Oral Presentation

Department of Computer Science

Cheyenne, WY
Evanston, WY
Laramie, WY
Wheatland, WY

Social media applications have become ubiquitous and they can take up huge chunks of our time. Most social media apps are used at home and can sometimes keep people from venturing outside. Our app aims to give people the fun of social media while also giving them the excitement of discovering a new place. The app will allow users to create *PhotoCaches*, photos with geo-location information that other users can "complete". These PhotoCaches will be viewable and can be added to a to-do list. With this app, users will have to explore the location where the original PhotoCache was taken in order to complete said PhotoCache and receive the reward for completing it. Completing a PhotoCache involves discovering the location and position where the original photo was taken, and taking a similar photo. The new photo is evaluated through geographic location and orientation of the phone to determine if the photo is similar enough to the original. PhotoCaches are organized into separate, easily navigated streams. These streams include PhotoCaches near the user, popular PhotoCaches around the world, and PhotoCaches that pertain to interests the user has listed in their

profile. With all the included features, we hope to produce an enjoyable user experience that will create a vibrant crowd-sourced game.

The Structural Design of Laramie County Community College Student Center

Katie Bayles with Derek Swanson
Civil and Architectural Engineering
University of Wyoming

Oral

Honors *Green River, WY*

Structural Engineers are put to the task of designing the structural systems for a building while maintaining the architectural identity of the design. The structural engineer must choose the most cost effective material that will support the forces that the building will experience. Concrete, steel, and wood are the most common building materials that are used in structural design, and to determine the appropriate structural system and materials the engineer must consider the building's location, site parameters, architectural elements, and budget. Once the structural system is determined, all the structural members and connections are designed to specified code standards. The final designs are included in a set of construction drawings that allow for the construction of the building. This senior design project considers the building's parameters to choose an efficient structural system that maintains the architectural vision for a student center on the campus of Laramie County Community College (LCCC) in Cheyenne, WY. The project discusses the aspects of the design process including schematic design, design development, and ending with construction drawings. All structural aspects of the building have been designed including girders, beams, columns, decking, as well as all the connections of the members. Additionally, a sufficient lateral system is designed and considerations are made for the foundation design. The project creates a feasible structural plan for the student center at LCCC.

Environmental Policy and Vinayakar Chadturti Festivals in Tamil Nadu: When Tradition Collides with Conservation

Kathie M. Beasley[1], Dr. Ramesh Sivanpillai[2]
1. Department of Social Sciences, 2. Department of Botany & WyGISC
University of Wyoming

Oral presentation

Haub School of Environment and Natural Resources
Laramie, WY

In the state of Tamil Nadu, India, as part of the Vinayakar Chadturthi festival, lead based paints are used to adorn Lord Ganesh statutes. At the conclusion of this festival, large and small statues of this deity are immersed in standing and running water bodies. Although this festival takes place only once per year, the environmental pollution left behind is lasting due to lead content in paint, and other materials used for making the statutes. This research addresses the following research questions: a) how increasing demand for Lord Ganesh statues have resulted in the creation of small scale industries (SSI) that manufacture lead based paints?, b) how are they regulated?, and c) what are the impacts of decorative lead based paints on water quality? This research will identify the extent of this problem, identify local ordinances in regard to the Vinayakar Chadturthi festival, and report on local conservation efforts to clean the Irruptupallam Dam, one of the several water bodies where the immersion of Lord Ganesh takes place.

Enhanced Oil Recovery Screening

Ryan Yarger, Daniel Bebo, Lyndon Copithorne, Athos Nathanail, & Elyse Robinette with Ken Baum
Department of Petroleum Engineering
University of Wyoming
Oral Presentation

Department of Petroleum Engineering *Doylestown, PA, USA*
Loveland, CO, USA
Rocky Mountain House, AB, CAN
Voula, GRC
Denver, CO, USA

Team #1 of the Petroleum Engineering Senior Design Program was tasked with investigating the suitability of Wyoming oilfields for enhanced oil recovery (EOR). The end deliverable consisted of an overall top five ranking of fields based on their EOR potential, along with a completed data set for the top two fields. Data for this project was provided by the Enhanced Oil Recovery Institute (EORI) at the University of Wyoming. Any necessary supporting data was sourced from the Wyoming Oil & Gas Conservation Commission (WOGCC). The project was split into six phases: Research EOR Methods, Initial Field Screening, EOR Method Evaluation/Screening, Initial Ranking, Field-Level Investigation, and Final Ranking & Production Estimation. The final deliverable was achieved by confirming the suitability of the top fields for EOR and settling on a single producing horizon for each field if multiple productive zones were present. The research that took place utilized the WOGCC well files to determine production volumes, current completion and production methods, and more detailed information on lithology. OOIP was estimated to determine potential incremental recovery and to support the team's decisions. The project concluded on April 15, 2016 with the assembly of the final data set for the deliverable.

Diverse synthesis of Iron Carbides, Morphology, and Electrochemical uses

Brittney Beck, Cheng Wan, Brian Leonard
Chemistry Department
University of Wyoming
Oral Presentation

EPSCoR Cheyenne, Wyoming

Iron carbide compounds have been investigated as catalysts for several energy related applications. These carbide materials also have other unique properties inducing stability, high melting points, and extreme hardness. Iron carbides however haven't been studied as nanomaterials due to limited synthesis techniques. We are studying a low temperature amine metal oxide route to form iron carbide as nanoparticles. This technique has been tested at temperatures ranging from 650°C to as high as 800°C. Iron carbide was successfully made using three separate diamines these conditions. We have also studied the amount of amine and have made them with a minimal amount of amine, with as low of a ratio as 1 Iron precursor to .02 parts amine. Even when iron carbide is consistently made, the morphology of Fe3C changes with various ratios of iron precursor to amine. SEM pictures have shown nanorods, nanotubes and most commonly, bricks with carbon coating. Once the synthesis of these materials is better understood, we will test the product for their catalytic activity for hydrogen evolution and oxygen reduction reactions. These high surface area cheap materials have the promise to be great catalysts for future energy applications.

Drilling Simulator Advancement

Kirsten Behla, Lance Beyer, Chelse Felts, Jacoby Johnson, Quentin Ridinger
Professor Ken Baum

Department of Petroleum Engineering
University of Wyoming
Oral Presentation

Department of Petroleum Engineering *Snohomish, WA*
Rapid City, SD
Cody, WY
Gillette, WY
Cheyenne, WY

Academic advancement and industry exposure via drilling simulator allows students and professionals alike to gain hands-on experience with common drilling practices, specific drilling problems, and well control events. This project's scope rests upon the successful implementation of both the DrillSIM5000 and the DrillSIM5 into a student-based course at the University of Wyoming. Team members chose five individual fields to research and serve as a foundation for course material. In order to successfully simulate the chosen fields and create course materials, team members were required to fully understand the capabilities of the system. Team members have created "snapshots," or pre-programmed drilling scenarios, to simulate drilling problems and well control events. More basic snapshots will be used in an introductory course to acclimatize students to simulation controls. Furthermore, drilling complications will be implemented with the expectation that students are able to identify and remediate problematic conditions. As such, a final course outline has been prepared to implement into the Petroleum Engineering program.

How challenges in natural resource management can be solved with sustainability, an analysis in respect to science and global resource management.

BJ Bender with Maggie Bourque
Haub School of Environment and Natural Resources
University of Wyoming
Oral Presentation

UW Honors Program *Orange County, California*

Perception of sustainability is an important tool in resource management. The nuances in perceptions of sustainability were evident in the various experiences I have had abroad, in the field, and in my studies through the University. I wanted to take a deeper look into the resource management of these situations. In particular, I wanted to compare the observations I was able to make in my classes and in my study abroad opportunities in India and Southern Chile to the observations of sustainability in the field in Wyoming. As a student at UW, I have been exposed to the understanding of sustainability from a scientific point of view. Through an investigation of over forty different scientific papers I have found that the definition of sustainability in the range research community is detailed, complex, and elegant. This definition is incomplete; however, the experiences I have had outside of the classroom have shown there is more to add to this definition. The resource managers' perception of sustainability in particular has important aspects to both contribute to and learn from the scientific definition of sustainability. There is potential for a valuable partnership between resource managers and scientists that could benefit from expansion. With a well-defined goal of sustainability and a working partnership of scientists and land managers, finding relevant and functional sustainable practices becomes a practical and attainable goal.

Grain size and sorting distribution in an experimental delta

Sam Berg, Brandon McElroy
University of Wyoming

Poster Presentation

EPSCoR Saint Louis, Missouri

My research is beginning during this semester and will continue throughout the summer. This study will look at the grain size distribution throughout an experimental delta. The experiments will occur in an artificial basin with dimensions of 1.0 meters by 1.6 meters with a constant base level. Water and sediment will travel through a 0.5-meter length pipe and enter the basin just below the base level. Using Matlab code, I can analyze grain sizes and sorting from photographs. I will take photos at different locations of significance in the delta (channelized areas vs. high elevation areas, closer to the river vs. far into the basin) to determine the distribution and ranges of variance. For this presentation I will discuss my methods and initial experiments, as well as predictions and expectations based on my first experiments.

U-series Geochronology and the Age of Steep Cone, Sentinel Meadows, Yellowstone National Park

Shauna Bladt
Mentored by Dr. Ken Sims
Department of Geology & Geophysics
University of Wyoming

Oral Presentation

Honors Program *Longmont, CO*

Hydrothermal systems have strong potential as sources of energy and mineral resources and as origins of geologic hazards, and thus they are important targets for scientific investigation. This study explores the temporal development of Steep Cone, a hydrothermal feature in the Sentinel Meadows region of Yellowstone National Park. Steep Cone was chosen for this experiment because domal mounds are the most common hydrothermal features in the park and are thought to have the best potential for long-term depositional records. Several hydrothermal silica sinter samples were collected from Steep Cone in July of 2015. Gamma ray spectrometry and multi-collector inductively coupled plasma mass_spectrometry were used to detect activities and abundances of U-series radioisotopes in each sample. This data was used to date the approximate time of deposition of each sinter and to test the following hypothesis: Either, Steep Cone developed after the end of the Pleistocene Pinedale glaciation and thus formed within a period of no greater than 15,000 years, or its formation began before the recession of the glaciers in northwestern Wyoming.

Improved Microgravity Environment

Alexandra Crook and Adam Block, Dr. Kevin Kilty and John Wickman
Department of Mechanical Engineering

University of Wyoming
Oral and Poster Presentation

Department of Mechanical Engineering *Brigham City, UT*
Cheyenne, WY

Drop facilities are one of the main forms of ground based, microgravity testing available. By employing drag shields or vacuum chambers, aerodynamic drag is minimized while a payload enters a state of free fall. Microgravity environments of $1x10^{-3}$ to $1x10^{-5}$ g can be achieved for 2.2-5.2 seconds in these types of facilities. Disadvantages of drop facilities include high expense and potentially long experimental waitlists. The objective of this project was to create a quality, inexpensive, microgravity environment for duration of time equivalent to or better than current drop facility capabilities. An alternative method to achieve microgravity was employed by dropping an aerodynamic payload from an unmanned weather balloon at an altitude of 30,500 m AGL. In order to comply with current international design standards, the project utilized CubeSat micro-satellites and acted as a screen test for future, large scale, CubeSat testing. This permits housing CubeSats up to a 3U form factor. All electronics, instrumentation and experiment testing equipment are contained within the CubeSat. This project was constrained to CubeSat requirements for flight and experimentation to provide a seamless transition from ground-based testing to orbital microgravity testing. The exterior shell of the payload functions as an aerodynamic monocoque with a parachute recovery and balloon cutaway system. A systems engineering methodology was utilized to reduce risk and improve the probability of success. Designing this platform to accommodate a variety of experiments allows it to be used as an important part of STEM education strategies and potential overflow for future NASA missions.

Why do Breakups "Hurt?"

Molly Bloodgood, Dr. Jonathan Prather
Department of Zoology and Physiology
University of Wyoming
Oral Presentation

Honors Program *Torrington, WY*

A common phrase surrounding relationships is a "painful breakup." From an outside perspective, it doesn't seem these people are experiencing a physical pain stimulus, but few people would disagree with the description of pain. Certain responses to both painful and emotional situations have been very similar in different individuals, and the ultimate question is, "why?" Some other examples of emotional stress include embarrassment and frustration and emotional reactions to these instances have been similar to those expressed when experiencing pain. The purpose of this project is to identify certain similarities and differences in the way the brain processes physical pain and emotional stress. Are there physiological similarities? What is happening in the body? How are the signals in the brain similar and/or different? By looking at existing data on these subjects, this study aims to answer these questions and explain why breakups "hurt." By evaluating the data and having physiological explanations, this can help answer the question of whether or not an individual is experiencing actual pain or something else. If coping mechanisms exist, those may also be revealed on a mental health level.

Keratoconus

Celia Rachelle Bloom with Dr. Michael Dillon
Zoology and Physiology

University of Wyoming
Poster Presentation

Honors Program

Keratoconus is a condition that is characterized by the cornea having an abnormal conical shape, and by its progressive thinning. Its cause is not known, but there are some ideas that link the disorder to trauma and physical irritation—eye-rubbing, for example—of the keratocytes. The cornea is multilayered, and keratoconus can involve each layer, elongating or degenerating the cells. Many improvements have been made in the diagnostic evaluation and the treatment of this disorder. Contacts are a popular way to combat the side effects—loss of vision, most importantly—of keratoconus. There have been, however, newer and more effective ways to treat it, since contacts may actually worsen the condition of the cornea over time. Among these newer methods are intrastromal corneal ring segments, phakic ocular lenses, and collagen cross-linking. Ring segments help to correct the shape of the cornea, while corneal cross-linking involves stiffening the cornea to stop the disease from progressing further. Phakic ocular lenses can be implanted to improve vision. All of these methods are newer, advanced ways to combat the disorder.

Testing field methods to assess interactions between native caddisflies and the invasive New Zealand mudsnail (*Potamopyrgus antipodarum)*

Meghan Bochanski, Dr. Amy Krist
Department of Zoology and Physiology
University of Wyoming

Oral Presentation

EPSCoR *Fairfax, Vermont*

In Polecat Creek, WY, located in the Greater Yellowstone ecosystem, the invasive New Zealand mudsnail (*Potamopyrgus antipodarum*) has been found to reach densities exceeding 500,000 individuals/m². This extremely high density of *P. antipodarum* has been observed to consume much of the gross primary production and has a negative impact on native macroinvertebrates such as the *Hydropsyche* caddisfly. The current population of *P. antipodarum* in Polecat Creek has declined suggesting the population "boomed and busted"; it was observed in data collected in 2000-2001 that there was a "boom" period of *P. antipodarum*, and in 2011, a "bust" period of *P. antipodarum.* The native *Hydropsyche* caddisflies have increased dramatically in biomass during the 10-year span of data, which may indicate that some native macroinvertebrates have increased in biomass due to release of suppression by *P. antipodarum*

During my research this summer I assisted a graduate student, Daniel Greenwood in assessing several possible methods to test suppression of *Hydropsyche* by *P. antipodarum*. We devised methods to collect *Hydropsyche* and determined whether *Hydropsyche* can survive in experimental chambers for use in a future field experiment. We built *Hydropsyche* collection tiles out of 4x4x2 inch wood blocks with ~ ¼ inch grooves along the length of the tile. Collection was successful with approximately two *Hydropsyches* collected per tile in a 24-hour period. Based on the low survival of *Hydropsyche* within experimental chambers, the use of different experimental chambers will be necessary. Specifically, chambers that are open on the upstream side should be used to better allow a fast flow of water, which is a requirement for *Hydropsyche* food collection.

Disseminating Probiotic Yogurt Recipe and Educational Materials to Underserved People with Type II Diabetes in Albany County

Caleb Brackett and Rachel Watson
Department of Microbiology
University of Wyoming

Oral Presentation

Honors Program *Big Piney, Wyoming*

There is a growing concern in the underserved population of Albany County with not only Type II Diabetes but with food insecurity, where there is limited access to medical resources and food for balanced diets. This is especially seen in low-income patients at the Laramie Downtown Clinic, one in three of whom have Type II Diabetes. One solution to these problems is to target an imbalance in the gut microbiome through a probiotic food source. This will help to both treat Type II Diabetes and to empower these patients through food dignity. Last semester our research consisted of creating a probiotic yogurt with bacterial strains known to be beneficial for Type II Diabetes, including *Lactobacillus rhamnosus* and *Lactobacillus acidophilus*, as well as, *Streptococcus thermophilus* and *Lactobacillus bulgaricus* (found in all yogurts). A probiotic yogurt was produced that has acceptable concentrations of all four of these bacteria, which also maintained normal yogurt characteristics. This yogurt not only provides a good meal for patients diagnosed with Type II Diabetes, but it also provides probiotics that will be beneficial for insulin tolerance and blood glucose stability. In order to next implement our lab research finding within the Albany County Community, more research was required. This consisted of taking the recipe and trying different ways of creating yogurt at home through various cost-effective methods. Once methods are determined and local resources such as Interfaith Good Samaritan, the Soup Kitchen, and others are incorporated, educating these patients becomes the next priority. This will be done through the use of brochures in both English and Spanish and through dissemination of yogurt recipes and yogurt-making demonstrations (later to

come). This holistic approach to Type II Diabetes and food insecurity will be of great benefit to our community.

Augmentative and Alternative Communication Funding in Wyoming

Amy Bradley, Chloe Storaci, Darcy Regan & Dr. Mary Jo Cooley Hidecker
Department of Communication Disorders
University of Wyoming

Poster

Department of Communication Disorders *Gillette, WY*
Longmont, CO

Augmentative and alternative communication (AAC) is an umbrella term for all forms of non-oral communication that are used to express thoughts, needs, wants, and ideas. AAC is referred to as a system with four components: symbols, aids, strategies and techniques. These components are used to supplement or replace speech to create more effective and efficient communication. The purpose of this research is to identify funding opportunities for AAC in the state of Wyoming. Funding can be offered through the school district, vocational rehabilitation centers, and insurance programs. With the information gained in this study, we will better understand how often Wyoming professionals are applying for funding, where they are seeking funds, how often the applications are approved or appealed, what population is receiving the AAC device, and what type of AAC system is being requested. The impact of this study will expand the current knowledge regarding AAC funding as well as provide direction for future development towards accessibility of AAC in Wyoming.

Cowboy Food Sharing: supply the soup kitchen and reduce waste

Samantha Brant with advisor Dr. Christine M. Porter
Division of Kinesiology and Health Promotion
University of Wyoming

Oral and Poster Presentation

Honors Program *Glenrock, WY*

In the US we throw away 30-40% of our food, and yet over 50 million of us struggle to be sure we will have enough food to put on the table. Across the nation, some corporations, restaurants and universities have taken a lead in developing "food recovery: programs that take high-quality food that would otherwise be wasted and donate it to organizations that share it with people who are facing food insecurity. In 2013 a group of students at the University of Wyoming recognized the issues of food insecurity in the Laramie community and proposed to help UW enact their own rood recovery program. Cowboy Food Sharing was born that year and in the fall of 2015 UW's Residence Life & Dining Services began sharing good, safe food that would otherwise be thrown away with the Laramie Soup Kitchen. This presentation will share the story of this project, including the process of drafting and implementing a new food sharing policy and how many people and partners were involved, and will discuss future directions for this work.

The Effect of Dehydration and Soil Salinity on Bean Plant Growth and Physiology

Brenden Bremer, Kaylee Weeden, Teresa Giandonato, and Jordan Thompson, with Ami Erickson and Sadanand A. Dhekney
Natural Sciences
Sheridan College

Poster Presentation

EPSCoR and INBRE *Sheridan, WY*

The growth of bean plants can be affected by elements in their surrounding environment. Some factors that play a role in the growth of bean plants include water availability and the salinity levels in the soil. In this experiment bean plants were grown and tested in a greenhouse environment to discover the plant's response to water and salt stress. The plants were separated into four treatments: a control group which was watered normally, a group which received no water once the experiment began, a group which was watered with a mixture of 60 millimolar NaCl solution, and a group which was watered with a mixture of 240 millimolar NaCl solution. After germination the bean plants were watered regularly for one month. Once beans produced flower buds, the experiment began and the randomly selected plant groups were subjected to the four treatments. Pot weight and leaf water potential was recorded weekly. After four weeks, beans were harvested for dry weight data, and soil salinity was recorded. The control plants showed the most growth, and the plants treated with the 240 millimolar NaCl solution showed the least growth.

Effects of Soil Salinity and Dehydration on Biomass and Water Potential of Peppers

Brenden Bremer, Jordan Thompson, Teresa Giandonato and Kaylee Weeden with Ami Erickson and Sadanand Dhekney
Natural Sciences
Sheridan College

Supporting programs: EPSCoR and INBRE *Sheridan, WY*

Growth of pepper plants (Capsicum annum) can be affected by elements in their surrounding environment. Multiple factors that play a role in the growth of pepper plants include water availability, soil salinity and plant water potential. In this experiment pepper plants were grown and tested in a controlled greenhouse environment to discover the plants' responses to water and salt stress. The treatments applied to the plants were regular water, no water, 60 mM NaCl and 120 mM NaCl. The data collected included change in biomass, soil salinity and leaf water potential. Soil salinity and leaf water potential was measured weekly and biomass was collected after three weeks of treatment. Our hypothesis was that the plants with the highest salinity would have less biomass and lower leaf water potential than the other treatments.

Family and Pediatric Dentistry Business Plan

Jordan Headrick and Kegan Brenner, Even Brande
College of Business
University of Wyoming
Oral Presentation

Honors Program *Cheyenne, WY*

Often times, families with young children have to visit multiple dentists to meet everyone's needs, which means more time taken out of their busy daily schedules. Although we are aware that dentistry in urban Wyoming is a saturated market, our goal is not to beat our competitors, but rather to fill a gap in the marketplace that they have overlooked. There are no convenient dental care options available for this particular market segment, which is why we have made it our goal to design a one-stop dental shop.

For our honors project, we have created a business plan for Sweet Tooth Family and Pediatric Dentistry that will fill this gap in the marketplace, and give us a powerful competitive advantage. By offering families in urban Wyoming a dental practice that specializes in care for both adults and children, we hope to capture this underserved target market, who would benefit from a convenient, family-friendly dental practice. The business plan itself will be a summary plan consisting of around 10-15 pages due to the early development of the plan. The areas of focus will range from industry and market analysis to the marketing and operations plan, and even touch on financial projections.

The Fight Against HIV/AIDS: Public Education Standards Across the Globe

Kristanza Bronnenberg with Dr. Robert Kitchin
Honors Program
University of Wyoming
Oral Presentation

Honors Program *Cody, WY*

The HIV/AIDS epidemic is one that has plagued the international community since its discovery in the 1980's. At the time of the discovery that HIV causes AIDS, researchers believed a vaccine for the HIV virus would be available within two years. But today, over 30 years later, no effective vaccine against HIV has been developed. In the fight against the spread of HIV/AIDS, prevention and education are the best weapons we possess. However, the standards and content of sex and HIV/AIDS education in public schools worldwide are extremely varied and often ineffective. In this literature review, I examined the standards of sex and HIV/AIDS education in various countries and regions, including: the United States, Great Britain, Sweden, Senegal, and Latin America. I then analyzed the effectiveness of these standards based upon the prevalence of HIV/AIDS and other sexually transmitted infections (STI's), teen pregnancy, and parental and public opinion. Finally, I examined the possibility of the development of a universal sex and HIV/AIDS education plan to be implemented internationally to further aid the fight against HIV/AIDS.

Locating groundwater resources with electrical resistivity tomography (ERT) in the Paleocene Fort Union, Eocene Wasatch, and Oligocene White River Formations, Converse County, Wyoming

Brandon Brown, Mike Carter, Terra Hess, Mark Hines, Mike Jimenez, Colter Reed and Dr. Kent Sundell – Casper College, Casper, Wyoming

The resistivity method of shallow geophysical analysis is an inexpensive and efficient way of locating shallow reservoir rocks (aquifers) that may contain significant groundwater in terrestrial fluvial systems. All three formations studied contain 65-95% very conductive clay-rich mudstones and siltstones representing over-bank floodplain deposits along ancient river systems. The formations also contain highly resistive lenses of coarse grained quartzofeldspathic sandstones and minor conglomerates, representing ancient stream channel deposits. These small 10'thick x 100'wide shoestring-like channels often compose less than 5% of the formation and hence are very difficult to locate by random drilling methods.

For this application the team at Casper College used the Advanced Geoscience, Inc. (AGI) SuperSting R8 with a 56 passive electrode array equidistantly placed at five meter intervals. In addition to the resistivity equipment, geolocating was performed with Garmin GPS and ArcMap by ESRI. Changes in elevational grade along the electrode line were measured with a Brunton hand transit, Jacob's staff and tape measure. The acquired data was downloaded and processed using AGI SuperSting Administrator and AGI EarthImager software.

The results are easy to interpret and are fairly reliable to several hundred feet in depth. Shallow extremely resistive sandstone bodies may represent air-filled pores and are probably dry reservoirs. The final results were verified by both previous and post measurement drilling of the sandstones for both water and uranium resources. These formations, covering hundreds of square miles of dry surface lands in Wyoming contain often unrecognized and undiscovered ground water resources.

The Effect of Weight on Mechanical Properties of Legs in Cockroaches

Katelyn Brown and Dr. Will Clark
Biology
Western Wyoming Community College, Rock Springs, Wyoming, March 2016

Oral Presentation with PowerPoint

Research Program at WWCC *Salt Lake City, Utah*

This research examines the legs dynamic mechanical properties as cockroaches run and their function in determining whether cockroaches rely on leg movement for balance or if their legs act as energy-absorbers. Therefore, by testing, *Blaptica dubia*, on two different substrates researchers can see if energy storage or stability plays a more vital role in locomotion. Researchers used 12 male cockroaches. The cockroaches were housed in the following groups 3 *B. dubia*, for a control, 30% weight increase, 50% weight increase, and a 75% weight increase. By adding particular amounts of the cockroaches body weight to one side of their body researchers will be able to clarify if cockroaches use energy storage or stability more as a means of movement. Furthermore, organisms will be tested on flat and irregular terrain separately, at random and multiple times. Researchers used neon paint on each of the legs of the organisms to amplify the part of the body that is being examined specifically. By videoing the organisms running on a treadmill through the varying terrain researchers are able to time how long it takes for the cockroach to fatigue, as well as examine speed and stability of the specimens. Preliminary results suggest no statistical difference in rate of completion between the different groups ($p > 0.05$) for irregular terrain or flat terrain. Researchers conclude that the irregular leg movements are involved with balance rather than energy recovery however more advanced experiments remain to be tested.

Pregnancy and Childbirth-Related Experiences and Moral Discourses among Addicted Women Engaged in Street-Based Prostitution in Denver, CO

Kyria Brown mentored by Dr. Susan Dewey
Gender and Women's Studies
University of Wyoming
Oral and Poster Presentations

EPSCoR *Laramie, WY*

This research project examined the moral code and discourses that street-based sex workers, a group of predominantly African-American and Latina women in profound poverty, use to describe their childbirth and mothering experiences. Women employed these moral codes to navigate the social construction of "bad motherhood" and addiction through their interactions with their families and health care providers, along with the internalized stigma attained from social norms of pregnancy and motherhood. The research team conducted 55 in-depth semi-structured qualitative interviews concerning pregnancy, childbirth, mothering, and life experiences while street-involved. The research team then coded the interviews for themes related to the women's perceptions and experiences, positive and negative support systems, and the moral code used during pregnancy, childbirth, and motherhood. Our participants' accounts were triangulated with quantitative data from a transitional housing facility for women leaving the sex industry, where all of the women in the study had sought services at. We analyzed factors including age of entry into the residential facility, racial background, number of children, and custodial loss frequency. We argue that by comprehending the methods used by women in street-based sex work to navigate pregnancy while addicted and street-involved, the public health implications that surface due to addiction and stigma can be analyzed and improved upon to enhance the prenatal care, maternal/infant mortality/morbidity rates, and maternal mental health of these women and therefore the health of their infants.

Song Divergence in Passerines

Dianna M. Brutsman, Dr. Matthew D. Carling
Department of Zoology and Physiology
University of Wyoming
Oral Presentation

Wyoming Research Scholars Program *Cheyenne, Wyoming*

Song is important for mate choice among passerines because males use song to attract mates and females determine mate quality based on song. Therefore, song is likely a reproductive isolating mechanism between populations or species. We can examine the differences in song between hybridizing and non-hybridizing species to better understand speciation. We compared song parameters for 23 pairs of closely related hybridizing and non-hybridizing sympatric passerine species. We predicted that hybridizing species pairs would have more similar songs than non-hybridizing species pairs. Hypervolumes were constructed, from song parameters, for each species and we quantified the differences between pairs as the distance between centroids of the hypervolumes. We found a non-significant trend where hybridizing species had greater differences in songs than non-hybridizing species, which is not what we predicted. Most pairs of hybridizing and non-hybridizing species had the same range of song differences. Hybridizing species pairs with the greatest song differences were Eastern and Western meadowlarks, Golden-winged and Blue-winged warbles, and Grace's and Black-throated Gray warblers. Non-hybridizing species pairs with the smallest song differences were Bay-breasted and Blackburnian warblers, Northern and Louisiana waterthrushes, and Pyrrhuloxias and Northern Cardinals. Song has an influence on reproductive isolation for certain species, but across passerines it might not be a good predictor for reproductive isolation. Environmental niche divergence might be a better predictor for reproductive isolation across passerines than song.

Neural Interfacing with Keyboard Output

Adam Kacmarsky, Thomas Glade, and Tyler Brutsman, Dr. Ruben Gamboa
Department of Computer Science
University of Wyoming

Oral Presentation

Deparment of Computer Science *Windsor, CO*
Dubois, WY
Cheyenne, WY

Brains produce signals in response to motor functions. These signals can be read using a Brain Computer Interface (BCI), such as the Emotiv Epoc. The Epoc uses a set of fourteen electrodes which make contact with the skull at various locations, producing a series of corresponding signals. These signals are unique to an individual based on the action performed. As a result, these signals can be classified for comparison to new signals. The goal of this project is to map incoming signals to emulate a keyboard output. Using OpenVibe software and Matlab scripting, our project uses machine learning algorithms to classify unique patterns in brainwaves. These patterns are compared to incoming signals and associated with various keyboard commands. Users have the ability to assign their signals to keyboard outputs used to drive a simple program. Our project has the potential to increase keyboard usability among people with impaired motor capabilities.

Metal Concentrations on Reclaimed Natural Gas Well pads in Southwestern Wyoming

Isabella Buongiorno, Dr. Indy Burke
Department of Agriculture, Haub School of Environment and Natural Resources
University of Wyoming

Poster Presentation

Wyoming Research Scholars Program *Cheyenne, WY*

Sagebrush ecosystems currently face many challenges, including disturbance by oil and natural gas extraction. Therefore, effective reclamation of disturbed sites following extraction is of primary importance. This is true particularly in Wyoming, where there is a history of reclaiming old gas well pads. Different reclamation techniques have been scrutinized for their ability to reestablish big sagebrush populations, due to the plants' major ecological importance to these ecosystems. Previous studies have examined the effects of these techniques on levels of organic matter and nitrogen between reclamation techniques and undisturbed sites over a range of resource extraction methods. Metal contamination, however, is rarely studied, and the effects of metals on the sagebrush ecosystem are not well known. This research will investigate if there is a significant difference between metal concentrations on reclaimed natural gas well pad sites versus undisturbed reference sites, and if so, clarify these differences.

Assessing spatial and temporal snowpack evolution and melt with time-lapse photography

Caitlin Bush with Dr. Brent Ewers
Botany
University of Wyoming

Oral Presentation

EPSCoR *Taos, New Mexico*

The objective of this experiment was to quantify spatial and temporal patterns of snowpack evolution and melt rates while minimizing perturbations to snowpack through the use of time-lapse photography via trail cameras. Field cameras were assessed as a method to quantify snow depths throughout the 120 ha No Name watershed at approximately 3000 m elevation in central Wyoming. RGB trail cameras were installed at three systematically chosen sites within the watershed to correlate physical and biological drivers of snow distribution. Five stakes were placed in each site in heterogeneous spots that remained in the frame of the camera. Stakes were divided into five centimeter increments, alternating black and white bars, with red bars denoting each half meter. Images were then taken at two-hour intervals over a period of three-months and analyzed with the ImageJ program. Snowpack distributions, as well as melt rates, were variable at both the plot and watershed scales. Meteorological and physical drivers, primarily topography and radiation, accounted for the greatest variability when comparing among plot across the watershed; however, LAI and soil and air temperature were the most significant drivers within plots. Snow-melt rate increased as soils and course woody debris became exposed increasing ground and soil temperature. These data will improve process model predictions of streamflow from the watershed.

Investigating Sensorimotor Circuits to Understand
How the Brain Generates Different Sounds Used in Vocal Communication

Ashkia Campbell
Sponsored by Jonathan F. Prather
Neuroscience Program, Department of Zoology and Physiology
University of Wyoming
Oral Presentation

INBRE *Laramie, WY*

Among animals, songbirds learn the sounds they use in their songs in a way that is strikingly similar to how we learn the sounds used in speech, and the songs of different species are composed of different sounds and syntax. To help us understand how features of our brains underlie healthy or pathological speech, we study the neurobiology of song performance in different species. My central question is: do different songs emerge because song-related brain circuitry is different between species or because different species use the same circuitry in different ways? The songbird brain contains a site that is functionally analogous to parts of the human cortex responsible for speech. That site, called HVC, contains a pathway to the premotor vocal cortex (HVCRA) and another pathway to the avian basal ganglia (HVCX). Those pathways are important for both song perception and performance, respectively. We used electrophysiological techniques to record the properties of all types of HVC neurons in Bengalese finches. Those experiments are underway, but our early results indicate that circuits and properties of HVC in Bengalese finches are essentially identical to those found in zebra finches (Mooney and Prather 2005). Thus, the song-related circuitry appears to be strongly conserved across different species. If this trend continues, these data suggest that different species have solved the challenge of learned vocal communication in similar ways. These parallels between how birds learn their songs and how we learn speech and language suggest that lessons learned in the songbird may help us understand the neural basis of speech.

Effect of *Agrobacterium* co-cultivation time on recovery of transgenic *Petunia hybrida* plants

C. D. Carlson[1], D. R. Bergey[2] and S.A. Dhekney[2]
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Type of Presentation: Oral

Supporting program: Wyoming INBRE *Greybull, WY*

Agrobacterium-mediated transformation genetically alters plant cells by transferring a DNA fragment (T-DNA) from the bacterial cell to the host species. This method is useful to insert traits of interest in plants for research and commercial purposes. *Agrobacterium* regrowth and subsequent culture contamination is a common problem leading to culture necrosis and poor recovery of transgenic plants. The goal of this research was to study the effect of *Agrobacterium* co-cultivation time on the recovery of transgenic cultures and plants in *Petunia hybrida* cultivar Mitcham. Petunia seeds were surface-sterilized in 50% bleach solution for 10 min followed by 3 washes in sterile distilled water and transferred to MS medium. After eight weeks of growth, leaf discs were obtained in vitro grown seedlings and used for co-cultivation. *Agrobacterium* strain 'EHA 105' harboring the green fluorescent protein (gfp) gene and MYBA1 gene coding for anthocyanin pigmentation, was grown overnight on a rotary shaker. Leaf discs were immersed in bacterial solution for 10 minutes and then transferred to Petri dishes containing MS medium. Leaf discs were co-cultivated for 24, 48 or 72 h and then transferred to MSP medium (MS medium containing 8.8 µM BA and 0.05 µM NAA) containing carbenicillin, cefotaxime and kanamycin antibiotics for inhibition of bacterial growth and selection of transgenic cells. Transient and stable gene expression frequency was recorded in various co-cultivation period treatments.

A significant difference in transient gene expression frequency was observed between leaf discs co-cultivated for different periods of time. While no transient gene expression was observed for the 24 h treatment, significantly higher levels of transient gene expression frequency (60% and higher) were observed in leaf discs co-cultivated at 48 and 72 h. We are currently recording the number of transgenic shoots produced from each explant along with bacterial regrowth and subsequent contamination occurring in cultures. Transgenic plants obtained after rooting of shoots will be hardened and transferred to a greenhouse. Scanning electron microscopy will be used to study changes in plant morphology and anatomy between transgenic and non-transformed plants.

Waterflooding and Brine Characteristics

Cole Carpenter working for Vladimir Alvarado
Department of Chemical and Petroleum Engineering
University of Wyoming

Oral Presentation

EPSCoR *El Dorado Hills, CA*

While water flooding has been used in the oil industry since the early 19th century with success; an even more efficient method of water flooding is starting to be used. "Smartwater flooding" is accomplished by optimizing the ionic composition of the injection water. While observed effects can vary, there is strong potential for it to become a consistent method of increasing recovery in a reservoir. By fine tuning the oil-brine interaction, oil recovery can be maximized. By observing lab data using various oil and brine conditions, it is hoped to find a clear relationship between brine/ oil properties and oil recovery rates.

Sage Thrasher Nest Roofs as a Response to Predation and Temperature

Jason D. Carlisle, Kayla Joy Carr, Dr. Anna D. Chalfoun
Wyoming Cooperative Fish and Wildlife Unit, Department of Zoology and Physiology
University of Wyoming

Oral Presentation

Wyoming Cooperative Fish and Wildlife Unit, Department of Zoology *Laramie, WY*

Songbirds employ a multitude of nesting strategies catered to safely rearing young. The Wyoming Basin is inhabited to three sagebrush obligate songbirds, including the Sage Thrasher. Previously, researchers documented the existence of roof structures on some, but not all of the Sage Thrasher nests. We sought to investigate three primary questions about this interesting nest architecture: 1) How common are nest roofs? 2) What is their size, structure, and composition? 3) Are these roofs built in response to predatory pressure, or in attempt to avoid heat stresses in the summer months? We located and monitored 155 Sage Thrasher nests outside Sweetwater Station, Wyoming during the summers of 2013 and 2014. Preliminary results suggest that roofs are more common than not (63% of nests have a roof). We are still exploring the possible mechanisms behind the construction of these nest roofs. These findings will shed light on interesting nest architecture of the Sage Thrashers and provide insight to possible behavioral strategies nesting songbirds employ to ensure higher rates of nest survival.

Non-GMO Project Application

Neil Carrico, Michael McCormick, James Scott, Bridger Lewis, Dr. Ruben Gamboa
Department of Computer Science
University of Wyoming

Oral Presentation

Department of Computer Science *Parker, CO*
Cody, WY
Thermopolis, WY
Rawlins, WY

With cell phone and tablet users growing, health/food applications are becoming very popular and useful in today's daily life. The ease and effectiveness of these applications are very vital to their success. When shopping, individuals may not know if a food product is genetically modified or not. Our senior design project aims to solve this problem by giving the user quick and useful feedback on a desired product. Our application is designed around a simple and understandable user interface that maximizes time. Since time is usually the most important asset while shopping we designed all function behind it. The application allows the user to scan a barcode on the food product and receive instant feedback telling them if it is has any genetically modified material in it. Other functions include a verified product list that can be searched and a manual keypad to enter barcodes. The overall goal of our project is to give the user an enjoyable shopping experience while using the application.

Exploration with GPR: an undergraduate research project investigating the utility of geophysical techniques in archaeology, hydrology and paleontology

Student Authors: Michael Carter, Terra Hess, Colter Reed, Jordan Short
Faculty Mentor: Beth Ann Wisely, PhD
Earth and Environmental Sciences, Casper College

Poster Presentation

EPSCoR, WYCEHG *Casper, Wyoming*

Casper College undergraduate students on an EPSCoR/WYCEHG grant collected ground-penetrating radar (GPR) data at several sites of interest in Natrona and Johnson Counties during the summer of 2015. Targets included archaeological remains at the Battlefield of Red Buttes, hydrologic boundaries at the structurally complex western base of Casper Mountain, and paleontological remains at Pumpkin Buttes. Students learned to use a variety of instruments including the Noggin 100, 250, and 500 MHz GPR, mapping grade Trimble GPS receivers, and matLAB/matGPR software to process and reduce data. Minimum penetration depth was 10 cm, with a maximum penetration depth of 1.5 m.

The survey at Red Buttes was executed in an array of parallel lines with 0.5 m spacing in attempt to locate an historical shallow mass grave of up to 21 U.S. Army soldiers. Due to the high clay concentration in the surface deposits at this location, severe wave attenuation occurred, producing unfavorably shallow penetration depths and inconclusive results. Casper Mountain data was collected in long transects utilized to locate hydrologic boundaries related to the structural geology of the property. At this location, penetration depths were some of the deepest collected and the data highlight a slight offset in the groundwater table at an unmapped fault, the presence of springs, as well as the bedrock/terrace deposit interface. Lastly, the survey at Pumpkin Buttes did not produce conclusive results, as the permittivities of the bone mass and surrounding sands may be too similar.

Red-backed vole movements through complex habitats: do downed trees act as highways?

Lorraine C. Carver[1], Dr. Zachary P. Roehrs[2], Meredith A. Roehrs[2], Dr. R. Scott Seville[1],; and Dr. Hayley C. Lanier[1]
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[2]Department of Natural Sciences, Laramie County Community College

Oral Presentation

Wyoming INBRE *Thermopolis, WY*

Despite their small size, mice and voles can impact their environments in big ways. They influence plant and animal abundance through foraging, serve as prey to larger species, and can act as a vector for disease. Abundance and movements of mice and voles appear to be influenced by post-fire succession. Fire-killed trees create habitat for small mammals, impacting population sizes and movements corridors. We examined the movements of the southern red-backed vole (*Myodes gapperi*) using mark-recapture techniques and fluorescent powder tracking in the Greater Yellowstone Area. Aspatial analyses of recapture-based distance estimates indicated variables such as sex, age class, and year of capture were generally important in determining the distance traveled. However, coarse woody debris also varies between trap sites and may impact movement patterns in ways that cannot be discerned from aspatial analyses. Using spatial interpolation to model intermediate vegetation conditions between sampled trap sites, we examined whether the presence of downed trees was correlated with increased movement distances in voles. Our results suggest individuals often move along downed trees (often on top of the tree), but tree usage does not translate to greater distances traveled in burned habitats relative to the adjacent unburned areas. By understanding the factors influencing individual movements, we can better predict the recolonization of burned areas or spread of vole-vectored disease based upon vegetation characteristics and post-fire succession.

Post-fire landscape heterogeneity and its impact on small mammal presence and abundance

Lorraine C. Carver[1], Dr. Zachary P. Roehrs[2], Meredith A. Roehrs[2], Dr. R. Scott Seville[1], ; and Dr. Hayley C. Lanier[1]
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Poster presentation

Wyoming INBRE *Thermopolis, WY*

The last several decades have seen fires become stronger and more prevalent throughout the western United States. As a result, our need to understand the ecosystem and community-level responses to fires may be greater than ever. Fire-killed trees alter habitat for small mammals, impacting population sizes and animal movements. Fires also act to create mosaics of burned and unburned areas on the landscape, interspersing areas of new growth and old growth and leading to scale dependent differences in resource availability. We examined whether fire and the resulting habitat modifications have long-term impacts on the occurrence of small mammal species using mark-recapture techniques in the Greater Yellowstone Area. By applying geographically weighted regression models, we examine the influence of vegetation characteristics on species capture history and abundances across these heterogeneous landscapes. Our results suggest it is important to account for heterogeneity and spatial correlation in our models to understand why species show differential response to landscape change.

Helminth Presence in the Dark-eyed Junco: Related to Malaria or Thermogenesis?

Jarelly Castro & Aspen R. Smith with Eric C. Atkinson
Biology Department
Northwest College

Poster

INBRE *Powell, WY*
Greybull, WY

Helminths include four distinctive groups with superficial similarities; the phyla Annelida (Trematodes), Platyhelminths (Digeneans and Cestodes), Nematoda and Acanthocephala. Helminths are parasitic worms that feed on a living host to gain nourishment and protection, while causing poor nutrient absorption, weakness and disease in the host. These worms are referred to as intestinal parasites because they mostly inhabit the small intestine of their host. Recently, we have been investigating the prevalence, diversity and distribution of helminths by collaborating with a study being performed in Colorado by Maria Stager and Doug Eddy on a common avian species that is inhabiting the entire world, the Dark-eyed Junco (*Junco hyemalis.*) We are heavily relying on 30 preserved digestive tracts of these birds sent to us by Stager and Eddy to search for cestodes, nematodes, and trematodes. We will dissect each tract and preserve our findings in ethanol. We will then scrape the epithelial tissue from the inside of each sample, or tract, and search for the presence of helminth eggs through the floatation process. Once we have our quantitative data on the number of helminth worms and eggs we find, we want to further investigate to find if these numbers correlate or are related to the thermogenic capacities of the birds and the presence of malaria found in these birds as well. Analysis thus far has shown a negligible amount of helminth worms in the digestive tracts.

An Investigation Concerning Avian Health Regarding Thermogenic Capabilities in Dark-eyed Juncos

Jarelly S. Castro and Aspen Smith with Eric C. Atkinson
Biology Department
Northwest College
Oral Presentation

INBRE *Powell, WY*

Thermogenic capabilities have been a new way to determine avian health. Malaria and West-Nile virus have been prevalent throughout centuries. However, they have been studied more than now in the early 1880s and 1900s. The understanding of finding new ways to combat these diseases has been very difficult, due to the lack of studies and research being conducted. Recently, we began investigations into these parameters by collaborating with a study being done in Colorado, across avian species by relying upon preserved digestive tracts; in this case Dark-eyed Juncos (*Junco hyemalis).* Respectively preliminary analyses have indicated that higher elevations may pose a risk for higher numbers of helminths implicating more diseases. These thermogenic capacities essentially have to do with the ability of the Dark-eyed Juncos to regulate their internal temperatures by utilizing Oxygen in specific weather conditions. The primary goal in this study was to determine the degree of helminths. The number of the helminthes found would be influenced by thermogenesis. In order to investigate this we dissected 15 samples of the digestive tracts to determine the amount of cestodes (tapeworms) nematodes (roundworms), and trematodes (flatworms or flukes). After we found the helminthes we preserved them in 70% ethanol and recorded the data. Thus far, we have completed the 15 samples and have only encountered two helminths, which included a cestode in the outside of the intestine, as well as a nematode inside of the intestine. The results were different than what we expected since they were found in different locations. The data that we found altered our expected results since there might not be as much malaria and West-Nile virus as we hypothesized. Therefore, our findings have lead to more questions that will be explored later on in our research. We will be examining the parasites more closely to determine for malaria and West-Nile virus and wheather or not this affects thermogenic capacities. Our results can demonstrate a strong linkage between climate change and the rapid spread of diseases.

Searching for Novel Antibiotics in Lichen Secondary Metabolites

Scott Chanthongthip and Dr. Elise Kimble
Biology and Chemistry
Northwest College
Poster 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* and *Caloplaca citrina*) 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 *X. chlorochroa* on *S. aureus* (zone of 9.5 mm) and Pseudomonas (zone of 4.0 mm), whereas *C. citrina* extract inhibited only *S. aureus* (zone of 5.9 mm). 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 to identify specific properties that inhibit pathogens.

Low Speed Open Circuit Wind Tunnel Design

Students: Wyatt Chapdelaine, Clint Dunn, Jeremy Helstrom, Chris Lambrecht, Randy Layton, Stephan Munari and Advisor: Kevin Kilty
Department of Mechanical Engineering
University of Wyoming

Oral Presentation

Mechanical Engineering Senior Design *Laramie, WY*

This senior design capstone project focuses on the design and manufacture of a small low speed open circuit teaching wind tunnel and its associated instrumentation. The wind tunnel is to be utilized in teaching laboratories in the Mechanical Engineering department at the University of Wyoming. The tunnel is designed to produce high quality flow within the test section to enable aerodynamic testing. Aerodynamic models are attached to a model mount which simultaneously determines the lift and drag. The fan and thus airspeed within the tunnel is controlled by a central LabVIEW program which also reports the lift and drag data from the model mount to the operator terminal.

Impacts of glacial recession on the chemical, physical, and biological properties of the upper Dinwoody Creek

Austin Chase and Lulu Kennedy, Jacki Klancher
Environmental Health and Saftey
Central Wyoming College

Oral and Poster Presentation

EPSCoR, WyCHEG, NCAR, INBRE *Lander, Wyoming*

Global climate has contributed to the loss of a precious freshwater source – Wyoming's high alpine glaciers. In the Wind River Range, home to the greatest concentration of glaciers in the lower 48, there has been a measurable loss of glacial ice mass. This has a direct impact on water availability in the Wind River Basin – home to 20,000 people. The water that runs through the Wind River Indian Reservation surrounding towns, and eventually into the Wind River, starts in the alpine environment below the Dinwoody Glacier. Two seasons of data describing the chemical, physical, and biological properties have been collected. The winter seasons preceding the study period were markedly different, and may indicate future trends for the high alpine environment. Biological diversity in the aquatic macroinvertebrate community was much different across years - most notable was the near absence of the Plecoptera family in 2015, specifically the *Zapada* spp. The pH levels from 2015 were higher than 2014 - increasing from 6.5 to 7.73. Specific conductivity also demonstrated an increase from 7.39 μs to 10.25 μs. If these trends continue, macroinvertebrate diversity may also continue to decrease. Because this area is heavily traveled, the proper management of human waste is also of contemporary concern. Water samples were collected and field incubated to determine presence/absence of *E.coli*. Analysis of samples from 2015 revealed all negative results for *E.coli*. Increasing water temperatures, increased traffic to this location, and other biological factors could create a more fertile breeding ground for future summers.

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

Elias Chavez, Andre Francis, and Caleb Wilhoit, Christopher Wenzel
Division of Science and Mathematics
Eastern Wyoming College
Poster Presentation

Division of Science and Mathematics *Torrington, WY*

Soils and groundwater in east central Goshen County, Wyoming have been documented to have high nitrate levels since the 1950's (Rapp et al., 1957; Parks, 1991). EPA studies have indicated that nitrates are harmful to both human and animal health at concentrations above established limits. The focus of this study is to document the extent to which the presence of nosZ, narG, nirK, and nirS gene-containing bacteria, reduce soil nitrate levels and subsequent groundwater nitrate levels by the natural process of denitrification. In addition, nitrous oxide (N_2O) emissions will be assayed to further assess denitrification activity. Thus far, DNA and RNA have been extracted from soil bacteria, and molecular techniques to will be used to amplify the gene fragments and to quantify presence of nitrate reducing soil microorganisms.

Assessment of Commercial Development in Laramie, Wyoming

Mark Christensen, Dr. William Gribb
Geography Department
University of Wyoming
Oral Presentation

Honors Program *Cheyenne, Wyoming*

Economic development is essential to the welfare and longevity of communities across the United States. Commercial and business developments promote thriving, prosperous municipalities. Laramie, Wyoming is no exception to this condition. This senior honors project will help identify and quantify the available land for business and commercial development in the City of Laramie. To do so a description of planning on the municipal level must first be addressed. After this briefing, the study will examine how the inventory of undeveloped, under-utilized, and residential units in high use districts was completed using the city GIS database and other mapping technologies. Raw numbers and statistical analyses will be compiled and reported for the gathered parcel data. This will then transition into a discussion on why a study of this degree is essential to future developments and future land use plans in a municipality. The study will culminate with data and recommendations on land availability for B1, B2, and C2 zoning districts, which the City of Laramie Planning Department will utilize.

To Be A Constitutional Revolution:
The Iranian Constitutional Movement of 1906-1907 and Its Failure At a Constitutional Revolution

Courtney Christner, Dr. Michael Brose
Department of History
University of Wyoming
Oral Presentation

Department of History *Yoder, Wyoming*

The Iranian Constitutional Movement of 1906-1907 began as an elitist movement to reign in the shah of Iranian's power and secularize the government. Only a year after its passage, the Iranian Constitution was amended by its Supplement in 1907 to return *shari'a* law as the law of the land. By analyzing Jack Goldstone's argument that a constitutional revolution by definition requires that the constitution removes religious law from the government and as the movement towards a constitution for the Iranian government, it failed to secularize the government after its supplement in 1907. This proves that the Iranian Constitutional Movement of 1906-1907 could not be considered a constitutional revolution because of its lack of secularization to the government.

SAE Mini Baja Powertrain

David Cisneros, Carl Hampton, Donald Kennedy, Dr. Rob Erikson
Department of Mechanical Engineering
University of Wyoming
Oral Presentation

Mechanical Engineering Department *Jackson, WY*
Worland, WY
Evanston, WY

The SAE Mini Baja is an international go-kart competition. Teams are provided with design regulations which must be followed and proven to the governing board. Some of the powertrain requirements are as follows: every team must use an unmodified Briggs & Stratton Model 20 engine, rotating components must be guarded from hand entry, and if the vehicle has a reverse, it must have a reverse light and backup alarm. SAE has very few regulations as far as how the engine's power is transmitted to the wheels. This year, our team decided to approach the task in a different manner than years before - by implementing a hydrostatic transmission. This drive method runs the engine at a constant speed while the driver controls the displacement of an oil pump and its attached motor to regulate ground speed and direction, instead of using gears or belts to vary drive ratios. A hydrostatic transmission allows smooth, infinite speed adjustment between stationary and full speed in either direction, aiding the driver in low speed maneuvers as well as providing dynamic braking to slow the vehicle from any speed without using the service brakes.

Our design centers on an easily controlled, lightweight, and effective powertrain solution to be implement in a go-kart which maximizes the capabilities of the required engine and the vehicle it is installed within.

Comparative Effectiveness Research: Campus Wellness Programs

Ashley Clark with Beth Young-Jones
Kinesiology and Health
University of Wyoming

Oral Presentation

Honors Program *Gillette, WY*

Comparative effectiveness research is used in healthcare fields to provide information on the effectiveness, benefits, and harms of different treatment options. In this study, a comparative effectiveness approach was used to learn about and compare a variety of campus wellness programs, the services they offer, and their successes with their student communities. The purpose of this study was to learn about the successes of five various campus wellness programs in efforts to evaluate and improve the University of Wyoming's Wellness Center and programs. The University of Wyoming Wellness Center opened in November 2015 and provides health education programming and services that promote holistic health and wellness. I have been an intern at the Wellness Center since its opening and have been a part of its growth. I wanted to do this research to learn ways that other universities cater to what their students want/need from a wellness program and learn how they market their programs and services to students successfully. Directors from five colleges and universities were contacted to learn about their wellness programs. The small sample of campus wellness programs includes universities and a community college in different regions, of different sizes, and with both new and well developed wellness programs. This study showed many differences in services and programs across the sample as well as various strategies to improve success at the University of Wyoming's Wellness Center. This study will hopefully be incorporated for future intern use and continued research and evaluation.

Birdsong, Music, and Value Judgments

Catherine Cloetta and Dr. Jonathan Prather
Department of Zoology and Physiology
University of Wyoming

Oral Presentation

Honors *Jackson, WY*

Can birdsong be classified as music? This is a question posed by ornithologists and musicologists alike, and one that integrates the disciplines of science and philosophy in its quest for an answer. The task of answering such a question is complicated by the broad spectrum of behavior that is birdsong and the lack of an indisputable definition of music. After examining the essentials of music and the basics of birdsong, I observed significant parallels between the two.

The question, "Is birdsong music?" is ultimately subjective. How does one make such a judgment? When listening to music, it doesn't take long to start tapping a foot, or conversely, hit the "skip" button. In this short period, there is undoubtedly an intricate network of synapses that play their part in integrating external experience and motor action. Birds also make judgments, not with regard to whether birdsong is music, but to whether they value a particular song. Our lab is embarking on an optogenetic study of the avian brain (specifically the caudal mesopallium, where there are high-order sensory neurons specialized for processing song features) to understand how female Bengalese finches (*Lonchura striata domestica*) assign value to their male counterparts on the basis of song alone. The circuitry that underlies song preference demonstrated by female Bengalese finches may provide insight into the value judgments made by human beings, if only to the slightest degree. Deciphering this aspect of human cognition could shed light on how we answer such philosophical inquiries as, "Is birdsong music?"

The Influence of "Dead Presidents" in Hip-Hop

Joey Cohen
Honors Program
University of Wyoming
Oral Presentation

Honors Program *Fort Collins, CO*

"Dead Presidents" is a term used in hip-hop culture referring to money or the influence money has. The power of money is a major theme seen in the hip-hop genre and its influence is often referred to. This influence, however, has a negative stereotype associated with it that contradicts the opinions of some of the key players in hip-hop. Many artists in hip-hop take on a materialistic emphasis in terms of how money affects them and this has become the ideology that represents all of hip-hop. This stereotype is strongly contested and my project is to demonstrate through artists such as Kendrick Lamar, Eminem, Macklemore, and others, that this negative ideology that has been painted on this genre is not fairly representing many artists in this genre. This is just one area where hip-hop has inconsistencies but it is something, as an accounting major and the Director of Finance for ASUW, I believe should be addressed.

Synthesis and Characterization of Fe(II) Coordination Complexes and Their Reactivity with Hydrogen Peroxide

Rachael E. Coleman and Dr. Elliott B. Hulley
Department of Chemistry
University of Wyoming
Oral Presentation

Wyoming Research Scholars Program *Cheyenne, WY*

Selective oxidation of C-H bonds occurs readily in biological systems, but the same result is difficult to replicate outside of a cell. Notable examples of this phenomenon include the heme-containing cytochrome P450 or the TauD enzyme, both of which contain a high-valent iron-oxo (FeO) intermediate. At present, there are catalyst systems that can selectively oxidize C-H bonds; however, large amounts of unreacted starting material can remain ($\leq$ 30%) and catalyst loadings are typically high. In addition, little is known about how the FeO species forms kinetically when hydrogen peroxide is the terminal oxidant. We will report on efforts to modify the secondary coordination sphere surrounding the iron in order to understand formal O-atom transfer from hydrogen peroxide such that we can better facilitate proton movement. This scaffolding is inspired by the method's biological origins — the secondary coordination sphere mimics active sites of enzymes, which frequently allow for catalysis via proton migration. We will present iron systems from our lab and their reactivity with hydrogen peroxide.

A Retrospective on the Trump Candidacy

Hunter Collins, Dr. Andrew Garner
Political Science
University of Wyoming

Oral Presentation

Honors Program *Moose, WY*

Donald Trump's candidacy along with his ascendance to the top of the Republican primary field is one of the most remarkable events to have occurred in modern American politics. For many current students this is the most unique and unexpected campaign of their lifetimes. However Mr. Trump's success baffles many mainstream commentators and political scientists struggle to fully explain the runaway elections of this primary cycle. This project will attempt to explain Mr. Trump's triumphs along with analyzing the mistakes made by his opponents and more general social and political conditions that have led us to where we are today. The primary season is always fluid and this election is no exception, therefore as the election continues to evolve so too will this project, however many of the roots of Mr. Trump's candidacy stretch back much further than his successes this spring and this investigation may prove that the die was cast some time ago.

Mapping Differences in Alfalfa Growth Patterns using Landsat 8 images

Julia Collins[1], Ramesh Sivanpillai[2]
1. Department of Ecosystem Science & Management, 2. Department of Botany
University of Wyoming

Oral Presentation

WyomingView *Crowheart, WY*

Farmers and ranchers manage their fields to achieve uniform crop growth. Remotely sensed imagery data provides an efficient and inexpensive means to monitor crop growth and identify within field differences. Producers can then adapt appropriate management practices to improve crop growth. The objectives of this study were to a) compare the crop growth differences in wet and dry portions of an alfalfa field in Crowheart, WY, and b) create management zone maps based on crop growth in two alfalfa fields in Torrington, WY. Landsat 8 images collected from 2013-15 for the Crowheart farm were obtained from USGS and spectral reflectance values from pixels corresponding to the wet and dry portions of the field were extracted. Normalized Difference Vegetation Index (NDVI) values were calculated for each sample and the differences between the groups were analyzed for each year. Results from this analyses showed that there was significant difference in crop growth between the wet and dry areas of the field in 2013 and 2015. Landsat 8 images were collected from 2013-15 for the two Torrington fields. Spectral reflectance values were converted to NDVI values and crop growth in each year was classified as high and low based on their median values. These annual crop growth maps were combined to generate a zone map for each field to identify areas of consistent high or low growth along with other intermediate classes. Landsat 8 data are useful for distinguishing crop growth patterns and generating zone maps to highlight areas of concern. Farmers can use this information to address disparities in crop growth in their field.

The Effect of BMP8b Secretion on Protective Mechanisms Against Non-Alcoholic Fatty Liver Disease

Ross Cook (Student Researcher) Baskaran Thyagarajan (Mentor)
School of Pharmacy, Cell Signaling Lab
Poster Presentation

INBRE Fellowship Program *Lander, Wyoming*

Non-alcoholic fatty liver disease (NAFLD) is a comorbidity associated with diet-induced obesity characterized by chronic inflammation leading to scarring and degeneration of liver function. Hepatocyte damage is induced by cycles of hypertrophy and apoptosis causing secondary tissue death and subsequent immune responses. Mediation of this process revolves around modulation of storage and metabolism of lipids in the liver. Dietary capsaicin (CAP) has been shown to decrease hepatic lipid accumulation in mice models and upregulate lipolytic and lipophagic mechanisms thus sparing liver function and composition. The signal transduction pathway through which CAP induces these protective mechanisms is not fully understood though activation of transient receptor potential protein vanilloid 1(TRPV1) channels and thus calcium signaling has been indicated as a likely candidate. Bone morphogenic proteins (BMPs) are a family of secreted peptide hormones implicit in transcription factor activation. BMP8b is known to activate receptor kinase cascades which are believed to regulate lipolytic mechanisms such as the peroxisome proliferator protein family members (PPARs) in the liver which may provide a novel mechanism for prevention and treatment of NAFLD. Our preliminary experiments indicate that TRPV1modulates conversion of white adipose tissue to beige adipose tissue (BEAT) and increases activity in brown adipose tissue (BAT). BMPs are secreted by both BEAT and BAT and our data indicates that positive control cell line secretion of these peptides can be regulated with TRPV1 channel agonists. Thus the purpose of this project is the exploration of CAP induced TRPV1 dependent BMP8b secretion and downstream signaling pathways relevant to NAFLD.

VIA AIR MAIL – A Historical Choreographic Exploration

Trevor Cook with Dr. Margaret Wilson
Theatre and Dance
University of Wyoming
Oral Presentation

Honors Program *Cody, Wyoming*

Recently I came across a news story of a veteran reunited with a letter he wrote his wife as a soldier in World War II. She had recently past away, but watching his emotional reaction to being brought back to their separation and hearing of their deep love for each other really struck me. I have always been fascinated with stories lost to time, and this article inspired me to purchase a collection of a husband and wife's World War II love letters on Ebay. What was hidden inside their tattered, Air Mail envelopes was more inspiration than I ever expected.

Using these letters I choreographed a vignette dance piece created using only information found in the letters. By using recordings of the text, period music, and visual projection, I crafted a dance rooted in the 1940's which illustrated one couples challenges of being separated by war. The movement vocabulary illustrated my performers occupying the same physical space onstage, while being in completely separate emotional worlds. The vast majority of my research occurred in rehearsal with my dancers using improvisation and abstraction techniques to craft a truthful piece rooted in fact. Using the period as a catalyst for choreography I used the primary letter sources and historical fact to update the personal experiences of those that lived through World War II for a modern audience in the form of a concert dance.

Bullying: A performance piece addressing emotional and verbal abuse between children

Julia Cooper with Jennifer Deckert (Advisor)
Theatre and Dance
University of Wyoming

Oral Presentation

Honors Program *Fort Collins, CO*

Bullying is a perpetual struggle for many children and young people, particularly at school. Many schools work to provide information about bullying and its consequences, however this material is often presented in lecture format. The goal of this project was to address this issue from another perspective and hopefully allow the children to physically see the effects through relatable movement and text. This project consisted of extensive research and a resulting dance performance designed to address bullying in the form of verbal and emotional abuse between children. Meant for grades 3, 4, 5, and 6, the performance was designed to connect emotionally to the students, increase awareness of the situation, and hopefully alter the individual's choices and actions. Working with six dancers, the contemporary dance performance was presented at Spring Creek Elementary in Laramie, Wyoming. The students were asked to participate by identifying the victim in an attempt to create an emotional connection to this character. As a group, they were also asked to consider their options as a bully, victim, and bystander. It was one step towards creating a new dialogue of an old problem. This presentation will include information collected during the research phase, explanation and video of the dance performance, observed reactions and results, and finally how this project might be further adapted for future performances and alternative venues.

Design and Synthesis of Inhibitors of Rab Geranylgeranyltransferase

Taylor Cortez and Haley LeFaivre, Dr. Rocky Barney
Department of Chemistry
Western Wyoming Community College

Oral Presentation

Wyoming INBRE *Cheyenne, WY*
Rock Springs, WY

The Ras Superfamily of proteins consists of over 100 proteins involved in cellular functions including signal transduction and cell proliferation. Furthermore, mutations in Ras proteins are implicated in ~30% of all human cancers, making drugs that target the Ras Superfamily of proteins attractive as potential cancer therapeutics. One specific enzyme, Rab geranylgeranyltransferase (RabGGTase)—a member of the Ras Superfamily—is of interest as an enzymatic target with limited examples of potent and selective inhibitors in the literature. It is well-established that the binding site of the active substrate contains a catalytic zinc cofactor. We are working to design and synthesize inhibitors of RabGGTase that will exploit the presence of the Zn^{2+} ion, opening the door to more potent enzymatic inhibitors.

Enigma Field

Jason Creel, Andres Fernandez, Erik Johnson, Doug Nale, Sarah Scott; Xuebing Fu
Department of Petroleum Engineering
University of Wyoming
Oral Presentation

Department of Petroleum Engineering *Cheyenne, Wyoming*
Enumclaw, Washington
Centennial, Colorado
Greeley, Colorado
Laramie, Wyoming

The Enigma Field is located in Washakie County in Northern Wyoming and is apart of the Tensleep formation. The formation is sandstone, all wells are drilled vertically, and only oil and water are produced, giving a conventional drilling situation. This field was discovered in 1987. The field has been under a water flood since 1992 and continues to produce to this day. This field is currently being considered as an analogue for other fields in the area. Therefore, this project seeks to analyze the secondary recovery methods that have been used on the Enigma Field and determine their effectiveness. An economic analysis of the current situation as well as explored alternative methods will be presented. In addition, many of the production values for this field will be determined. This project will provide a thorough analysis of the Enigma Field.

Polarization in American Politics: A Legislative Hindrance or a Precursor to Violence?

Adam Croft
With Andrew Garner
Political Science Department
University of Wyoming
Oral Presentation

University of Wyoming Honors Program *Sundance, WY*

Over the last quarter of a century, politics in the United States of America have taken a disproportionate turn for the extreme. Partisanship and ideology have taken the place of cooperation, thus creating dysfunctional governing bodies at every level of American government. Many causes are to blame for this trend, including electoral incentives for polarized political rhetoric from candidates and a highly efficient and newly diversified media environment. The result of the trend toward political polarization thus far is that legislatures in the United States have gone from semi-productive bodies in which legislators collaborated and conceded to unfruitful gatherings in which ideologues fail to accomplish much of anything for American citizens. However, this consequence is less dire than the fact that American citizens are now more divided on politics than ever before, and that many Americans tend to sort themselves geographically based on these divisions and seek media that validates their perspective on such divisions. This paper and presentation will argue that political polarization and its subsequent effects on American culture are potential precursors to increased political violence in the United States. This paper will substantiate this argument through textual analysis of political media in the United States, critical analysis of political events, and through a review of relevant research on both political polarization and political violence. This presentation and paper will also provide an overview of the issue of polarization in American politics and its root causes as a means of providing context to the argument that such polarization is an indicator of future political violence, and will conclude with possible solutions for mitigating or reversing the trend of polarization in American politics.

Small Vehicle Dynamometer

Sam Crone, Brad Orr, Logan Williamson, Division of Research Support
Department of Mechanical Engineering
University of Wyoming

Oral and Poster Presentation

Department of Mechanical Engineering *Gillette, WY*
Casper, WY
Moorcroft, WY

A dynamometer serves to measure power and torque. In our case, these measurements will be taken at the wheels of the SAE Baja vehicle. This gives the University of Wyoming Baja Racing Team a way to quantify their vehicle's potential. While engine size used in the Baja vehicle is constrained (10 horsepower), actual torque delivered to the wheels may vary due to drivetrain efficiency. Currently, industry does not supply a dynamometer for this class of small vehicles. Our senior design project aims to design and construct a chassis dynamometer that assists in design and tuning of the drivetrain and other necessary components for this year's and future Baja vehicles. Our chassis dynamometer includes a stand that supports the vehicle and a single mechanical friction brake to apply load at one wheel. A load cell placed beneath the brake caliper measures force generated by the torque delivered to the wheels. RPM at the engine and the wheels is measured using a magnetic proximity sensor. Measured force multiplied by the distance between the center of rotation and load cell position, gives torque. Once known, wheel speed and torque are used to calculate the power delivered to the wheels. Closed loop electronic control was applied to engine throttle and applied brake load to automate testing.

The Effect of Sex and Seasonal Variation on Raccoon (*Procyon lotor*) Home Ranges in Laramie, Wyoming

Emily Davis
Sarah Benson-Amram, Department of Zoology and Physiology
University of Wyoming

Oral

EPSCoR Pittsboro, NC

Knowledge of intra-species variation in home range distribution and size allows for important insights into how a species behavior and ecology varies across different environments. Home range size in raccoons (*Procyon lotor*) has never been studied in the Rocky Mountain West of the United States. My research seeks to determine the effect of high elevation and harsh climates in areas like Laramie, Wyoming on raccoon home ranges. Using VHF radio telemetry I am currently gaining location points on 13 radio-collared raccoons to build home ranges for each individual. With the home range data I will be analyzing whether or not the sex of an individual and the season affect the size and distribution of raccoon home ranges in Laramie, Wyoming. By comparing my data to home range information collected in other populations, I will be able to assess whether raccoons living in harsh environments, like Laramie, Wyoming, exhibit differences in their space use compared to raccoons living in more temperate climates or at lower elevations.

Novel in Progress

Nicole Davis
With Brad Watson
Creative Writing
University of Wyoming
Oral Presentation

Honors Program *Erie, CO*

For almost six years now, I've been writing my way into a novel I'd like to complete before I graduate from the University of Wyoming. This novel is written from the points of view of six different characters. In order to pull this off without giving my potential readers too much mental whiplash, I needed to differentiate my characters' voices and separate the concrete details of their pasts. To do this, I decided to write a series of short stories, each from a different character's point of view, that revolve around pivotal moment in their pasts, moments that will converge in a way that becomes critical to creating the architecture of the novel.

The Running Atlas: A Literature Review of Running Form and Technique

Sharron Davis and Gretchen Sewczak-Claude
Honors Department
University of Wyoming
Oral Presentation

Honors Department *Cody, Wyoming*

Running is a form of physical activity that is prevalent and widely studied all over the world. People run for various reasons ranging from competitions to health-related motives. Although running is a common type of physical activity, it is considered a repetitive motion, stressing the body and causing a number of injuries such as Achilles tendinopathies, plantar fasciitis, and iliotibial band syndrome. Because running-related injuries are common, it is important to understand correct running form. Correct running technique encompasses the entire kinetic chain, involving the combined effects of an individual's musculature, skeletal, and nervous systems. Not only is correct running form important in order to minimize the risk of injury, but understanding the type of footwear best suited for an individual is significant in order to provide the best support, enhancing an individual's technique. Examining how the musculature, nervous, and skeletal systems coordinate and affect the kinetic chain will provide information on the most energy-efficient and least injury-prone running technique.

ENHANCED OIL RECOVERY FIELD CANDIDATE SCREENING: WYOMING

Rushton Davis-Hall, Cameron McCallum, Evan Oughton, Cullen Taylor, and Brendan Rath
Dr. Brian Toelle.
Department of Petroleum Engineering
University of Wyoming
Oral and PowerPoint Presentation

Department of Petroleum Engineering *Cochrane, AB*
Calgary, AB
RedDeer, AB
Calgary, AB
Stettler, AB

Various Operators within Wyoming have been producing from oilfields that have demonstrated steady declines in production over time. In order to maximize overall recovery within fields in Wyoming proposed methods of Enhanced Oil Recovery (EOR) will be researched and all available field data will be screened in order to determine the most probable field candidates for EOR implementation. The EOR methods of interest are; Nitrogen and Flue Gas flooding, Thermal Injections, Hydrocarbon Flooding, Carbon Dioxide Flooding, Polymer Flooding and Alkaline Flooding. Our Team chose to conduct the field candidate screening process of all the fields within Wyoming. The team was provided the data from Mr. Nick Jones of the Enhanced Oil Recovery Institute (EORI) in Wyoming as well as provided access to the Wyoming Oil and Gas commission database. The project objective is to perform a successful screening of field candidates based on different EOR method criteria. The results of this screening will reduce the field candidates down to only five per EOR method. From there incremental production increases will be calculated for each candidate field and economics will be estimated. These results will provide the final recommendations of the top two field candidates for each EOR method.

Shepards of Change: Trauma, Media, and Matthew Shepard

Melia Dayley, Dr. Jessica Clark
Department of History
Western Wyoming Community College

Poster Presentation

Sweet Memories: Historical Research Group *Sugar City, ID*

"Shoot a Gay or Two," read the graffiti on a billboard in Laramie, Wyoming. Alarmed, but none-to-surprised, Ric Turley, a gay Laramie native, found this symbolic of the prejudice and discrimination that existed in his community. He believed there was, at least for those outside the social norms, a need to "live on guard all the time, having a hyper-awareness for what's going on." The *Laramie Boomerang*, the community's newspaper, published Turley's story on October 11, 1998 in the article "The Signs of Unacceptance for Gays in Laramie are Evident." This story ran just days after the brutal beating of Matthew Shepard, a gay University of Wyoming student, and the day before Shepard had succumbed to his injuries. Along with Turley's words this article featured the words, feelings, and concerns of others in the Lesbian, Gay, Bisexual, and Transgender (LGBT) community of Albany County. The reporter, Tiffany Edwards, concluded that gays in Wyoming must never forget the "Don't ask, Don't tell" policy, as it may spare them from a fate similar to Shepard.

The language in the aforementioned article became normal for news sources in Wyoming following the 1998 Matthew Shepard murder. Despite evidence to the contrary, the media framed the possibility of this case being Wyoming's worst hate-crime. Seeing as controversial stories are the lifeline or revenue-generating avenue for the media industry, it thrives off controversy, similar to the one that surrounds Shepard's murder. Indeed, the media dramatization of events, as is evidenced in this case, greatly influences the creation of beliefs, opinions, narratives, and legacies. By reporting on traumatic memories, the journalists of this era created a hate-crime narrative for the murder of Matthew Shepard long before the police completed their investigation.

International Obstacles To Social Integration

Aidan Deiter, Dr. Yi-Ling Chen
Department of Global and Area Studies
University of Wyoming

Oral Presentation

Honors Program *Jackson, WY*

In many nations around the world, it is unfortunately common for an individual's character and potential to be judged by their racial or ethnic identity. As a result, even many developed countries continue to struggle with socially ingrained prejudices, which act detrimentally in relation to the advancement of social integration. The purpose of this research paper is to identify the key issues that different countries face in terms of tolerant coexistence between racial and ethnic groups, and to determine what policies or programs may help to counteract tension between these groups and allow for the advancement social integration. The three countries that will be focused on will be China, Japan, and the United States. These countries were chosen due to their exceptionally different policies concerning immigration and the rights of minority groups, as well as their differing pre-existing records of social integration programs. This study will determine what variety of potential social integration policies may be applied in a way that can benefit each nation, if each nation's respective societal issues render said programs as viable options. The end-goal of this research paper is to shed light on the potential for various peoples in different countries to live in relative peace and show benefit in extending developmental programs and equal access to governmental protections and resources to citizens of all racial and ethnic groups, rather than simply those constituting a majority.

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

Denise De Loera1,2, Mingming Sun1, Chaoqun Zhu1, Andrea Sanchez Walk1,3, Peter W Nathanielsz1, Stephen P. Ford1 and Wei Guo1

1Center for the Study of Fetal Programming, Department of Animal Science, University of Wyoming, Laramie, WY; 2Microbiolgy Program, University of Wyoming, Laramie, WY; 3Department 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 survive, 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 under nutrition. 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.

"Our Relationship with Cognitive Dissonance"

Ezekiel Matthias Denison

With: Walt Scott

Psychology

University of Wyoming

Oral Presentation

Honors Program *Laramie, WY*

Cognitive dissonance is the state of having inconsistent thoughts, beliefs, or attitudes, especially as relating to behavioral decisions and attitude changes. We as humans run into situations causing these cognitive dissonant states regularly throughout our lifespan. The dissonance created from the inconsistencies can cause major stress, general unease, fear, questioning of previously solid personal foundations, and other negative effects. The severity of the effects can range from minor importance to major significance depending on the situation. In this presentation I use a meta-analysis of previous studies on cognitive dissonance and use information from current personality science. I inspect the varying effects from and situations where dissension is present, and also examine the relationship between this dissonance and how we conceive our idea of "self". My aim is to use the science behind the conception of self and its relation to cognitive dissonance to help promote well-being. Applying concepts of awareness, nonattachment to thought, and alternative views of self can potentially help with our problems resulting from cognitive dissonance and promote more optimal personal development.

History of the 1848 and 1849 Revolutions in German Speaking Europe: Changing Views Regarding a 'Complete' Historigraphy

Aaron Derner, Instructor: Michael C. Brose.
History
University of Wyoming
Oral Presentation

Honors Program, History Department *Waterford, WI*

Despite several historians' claims that the historiography concerning the German Revolutions of 1848 and 1849 is exhaustively (even redundantly) complete, this belief is largely influenced by both the historical dialogue as it was presented by historians well grounded within narrative historical methods as well as the overshadowing focus on Nazi-era Germany in recent scholarship, and is subsequently false. While some scholars have made essays into argumentative historical analysis of the 1848-49 revolutions, such attempts have been extremely limited in both frequency and efficacy, largely missing the most glaring oddity of these revolutions: namely their semi-irredentist foundations. In order to conclude that this historiography is complete, argumentative analyses must be made which tackle at the very least the political irredentism unique to the 1848-49 Revolutions of German-speaking Europe.

Methane to Aromatics

Audra DeStefano, Tim Gunderson, Andrew Mann, Aric Von Buettner
Chemical Engineering
University of Wyoming
Oral with PowerPoint

College of Engineering *Laramie, WY*

A recent downturn in natural gas prices has opened up alternative chemistry methods to create hydrocarbon products, including aromatics. One such process involves using a catalyst to convert methane directly to benzene and toluene, with the formation of hydrogen and naphthalene byproducts. Several molybdenum catalysts, including Mo-H/ZSM-5, Mo-H-MFI, and Mo-MCM-22, are available for this reaction; however, this process has not been done commercially in industry as of this point (2016).

In this presentation, we propose producing aromatic products via the catalytic conversion of methane in a stainless-steel plug flow reactor. We selected the catalyst MO/H-MFI-B for this process due to its high selectivity of methane to benzene. Byproducts of this process, such as naphthalene, and hydrogen can be sold and and thus improve the economic feasibility of this project. Using Aspen Plus, in addition to several research papers and patents, we were able to simulate a feasible and profitable process to turn methane into aromatic compounds at a rate of 480 MMlb/yr.

Nanoparticle Deposition with Controlled Density and Placement

Audra DeStefano and Dongmei Li
Department of Chemical Engineering
University of Wyoming

Oral Presentation

EPSCoR *Gillette, WY*

Hydraulic fracturing utilizes water containing chemical additives and propping agents to increase oil and gas production in low-permeability reservoirs. Recent increase in the use of hydraulic fracturing to develop oil shales has resulted in a rise of water usage in well completion processes. Stimulating a single well can use up to five million gallons of water, with between ten and thirty percent of that water being returned to the surface in the form of flowback water. Flowback water is contaminated with hydraulic fracturing additives and naturally occurring organic compounds, making it unsafe for immediate reuse and resulting in fiscal and environmental costs. Using ultrafiltration membrane modules shows promise in treating flowback water for reuse, but has been held back by fouling attributed to dissolved organic compounds and high total dissolved solids.

In this presentation, we focus on addressing membrane fouling resulting from dissolved organics by using catalytic nanoparticles to modify commercial membrane surfaces. Catalytic nanoparticles, such as hydrophilic TiO_2, convert fouling organic molecules to smaller molecules such as CO_2 and H_2O. Existing deposition methods, such as dip coating, result in poor nanoparticle dispersion and, consequently, particle aggregation, which significantly reduces water flux. We demonstrate that this problem can be mitigated by optimizing nanoparticle deposition using polymeric membranes that have different surface properties and pore sizes. We have studied in-situ deposition in liquid phase via covalent bonding and a well-controlled, self-limiting deposition approach in vapor phase. Both methods improved nanoparticle dispersion and performance of the resulting membranes.

Reservoir Evaluation and Simulation of CO_2 Miscible Enhanced Oil Recovery

Joseph Determann, Briana Dodson, Jesse Stinson, and Darya Rezaei Hariri, Dr. Xuebing Fu
Department of Petroleum Engineering
University of Wyoming

Oral Presentation

Department of Petroleum Engineering *Cheyenne, WY*
Castle Pines, CO
Pinedale, WY
Calgary, AB

It is clear that the demand for oil is ever increasing and is likely to follow this trend for years to come. Even if the demand for oil does not increase at the rates it has in years in the past, the demand for oil will likely remain high for years to come until oil can be completely replaced. Because of this demand, it is important to obtain all the oil possible at an economically feasible level. CO_2 injection has been very beneficial to many sandstone reservoirs in the past, as well as currently, and it is possible that miscible CO_2 injection could allow for an increase in production in the South Willson Ranch Field located in Nebraska. Our senior design project aims to predict just how useful miscible CO_2 injection could be in this field using a variety of programs developed to aid the production of oil and gas. Our project will determine this by creating a model in Petrel, which will model the reservoir at a static level, followed by creating a model in CMG, which will model the reservoir at a dynamic level allowing us to predict the benefit of CO_2 injection. The project is very beneficial not only for the company that has provided us data but also for fields which contain similar properties in the future.

United States Housing Policy and Social Inequality: Homeownership, Renting, and the Necessity of Change

Cullen Dilldine, Dr. Matthew Painter
Department of Sociology
University of Wyoming
Oral Presentation

Honors Program *Craig, CO*

U.S. federal housing policy has communicated a preference for homeownership over renting for the past 100 years. Arguments to encourage homeownership include its economic and social benefits and the general stability it provides to both the individual buyers and the surrounding neighborhoods and communities. This paper explores how renting policies have created and maintained social inequality. Changing economic conditions, predatory and discriminatory lending practices, and demographic shifts have all contributed to the conditions under which homeownership receives preferential treatment in terms of housing assistance as compared to rental assistance. These conditions suggest that shifting policy towards rental assistance could help facilitate both immediate and long term housing assistance success in a way that homeownership may not. Ultimately, shifting federal housing policy towards rental assistance could create more accommodating policy and more effectively reduce the social inequality inherent in housing in the United States today.

Composite Snowmobile Driveshaft

Kyle Kuhn, Christian Rundberg, and Matthew Doherty, Dr. Nancy Peck and Dr. Dave Walrath
Department of Mechanical Engineering
University of Wyoming
Oral Presentation

Department of Mechanical Engineering *Laramie, WY*
Laramie, WY
Gillette, WY

Today's snowmobiler demands more from their machines than ever before. As a result, snowmobiles have evolved into high performance sport machines over their lifetime. Technical progression in the industry permits rider and machine to operate in situations and conditions not even conceived of a mere decade ago. As with any performance oriented vehicle, weight reduction is paramount and has arguably been the significant driver of snowmobile evolution. Reducing the weight of the machine increases the power to weight ratio with the intent of improving acceleration and maneuverability. Weight reduction in snowmobiles has been realized for numerous components with both original equipment manufacturers (OEM's) and aftermarket companies contributing to the cause. The majority of this weight reduction has been applied to non-structural static components of the snowmobile. However, weight reduction of more critical components can have significant impacts on performance for any machine. These components include those that tend to translate or rotate. An instance of one of these critical components is the snowmobile driveshaft which has been left wanting by snowmobile OEM's and entirely untouched by aftermarket companies. The focus of our senior design project is directed at the performance enhancement of the snowmobile driveshaft by means of weight reduction.

Flowers in Place of Guns: A Critical Analysis of Kyrgyzstan's Tulip Revolution in Theoretical Context

Vikki Doherty, Dr. Michael Brose
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Oral Presentation

Honors Program *Casper, Wyoming*

With its 2005 Tulip Revolution, Kyrgyzstan joined other countries in the former-USSR and the Balkans in what some call a revolutionary wave. These "Color Revolutions" of the early 2000s were generally characterized by non-violent civil resistance in response to corrupt or authoritarian regimes, and sought to promote democracy. The protesters in each country adopted a color or flower to represent their movement, hence the moniker "Tulip Revolution." This paper critically analyzes Kyrgyzstan's Tulip Revolution, arguing that it was instead more of an attempted or failed revolution, as the policy of non-violent resistance proved insufficient to make lasting changes to existing political and social structures in the country. The revolution also failed to successfully establish democracy, instead entrenching existing political corruption. This paper utilizes mostly secondary source materials, concerning the history of the USSR and its collapse, Kyrgyz sociopolitical history, and publications by historians and social scientists about revolutionary theory. To justify its place within the existing historiography, this paper contextualizes the Tulip Revolution in a discussion of prominent and divergent existing theories about revolution, challenging the validity of defining the 2005 events as a revolution at all.

Mechano-fluorescent Polymer for Micro-crack Detection in Composites

Matthew Doherty, Dr. Ray Fertig
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Oral Presentation

EPSCoR *Gillette, WY*

Composite materials are an essential component of the modern world. Being lightweight, strong, and having the ability to be tailored to a specific application, allows composites to replace more traditional materials. These benefits are of utmost importance to industries such as the automotive and aerospace industries, where cutting weight from vehicles adds much needed gains in fuel efficiency. Even with all the advantages of composites, composites are a poorly understood class of materials. Composites have complex failure mechanisms that are currently somewhat unpredictable and failures in composites are catastrophic. This has led to the overdesign of many composites, limiting the weight advantages that are possible and the applications of composites in certain components. Modeling the failure of composites is important to continue progress. In order to build a model of a composite failing, the failure of the composite must be first understood. The goal of my study was to impregnate carbon fiber composites with a crack detecting polymer for the use of viewing crack initiation and propagation in the composite. With further work, this new crack detecting composite could potentially be used for future study of composite failure.

Wyoming Field Candidate Screening for Enhanced Oil Recovery

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Oral Presentation

Department of Petroleum Engineering *Mianyang, China*
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Year after year, global energy consumption is increasing. This is fueling the requirement for increased innovation and efficiencies in order to extract oil economically. Wyoming is particularly interested in using Enhanced Oil Recovery (EOR) methods to increase production from aging oil fields. EOR is simply the application of techniques that increase the amount of oil that can be extracted. Wyoming has an estimated 1 billion barrels of oil in reserves which, using EOR, could be produced to meet future national and global demand. The Enhanced Oil Recovery Institute (EORI) was established by the state of Wyoming in order to help oil producers recover a large resource of stranded oil in depleted reservoirs as rapidly, responsibly, and economically as possible. The scope of this project has been developed in conjunction with the EORI, and it is intended to add value to the energy industry in Wyoming. Our senior design project aims to select the top five field candidates for EOR in the state. The field candidates will be chosen from a large data pool which has been provided by the EORI. By screening the data and applying both production and economic models, the candidates can be further studied and ranked according to their theoretical EOR potential.

The Effects of Bisphenol A (BPA) on the Neural Development of the Xenopus laevis Tadpole

Mark Merlino and Katelynne Donnelly, Dr. Kara Pratt
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Oral Presentation

INBRE Program *Lingle, WY*
Cheyenne, WY

Bisphenol A (BPA) is a component in plastics that has been a growing concern since the middle of the 1990's when it was discovered to be an endocrine disruptor. More recent work suggests it could also affect the nervous system. The aim of this project is to identify the sublethal effects of BPA on nervous system development and function. For this we will use the Xenopus tadpole visual system as our model system. This model allows us to study the development and function of a neural circuit at the behavioral, circuit, and cellular levels. Preliminary data has shown that concentrations at 20uM BPA have significant morphological effects and high lethality rates. Tadpoles subjected to 10uM BPA display impaired visual avoidance behavior, an indication of malfunctioning visual system. Initial imaging of the visual neural pathway in tadpoles exposed to BPA have shown abnormalities when compared to control tadpoles. Next, we will characterize the effect of BPA on visual system function at the circuit level by measuring the response of neurons to light projected onto the retina.

Gendered Experiences at an Outdoor Adventure Camp

Jessica Dooley and Dr. Matthew Painter
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Oral Presentation

Honors Program *Bloomington, IL*

The outdoors and activities associated with them have historically been the domain of men, and studies have shown women to face unique challenges both to entering and continuing their participation in the outdoors. This is unfortunate given the fact that such a novel environment provides numerous benefits for both people in general and women specifically. This study examines the experiences of women as outdoor leaders in a conceptually and physically male dominated environment. Using a method of covert participation at a large outdoor adventure camp, this research demonstrates the special challenges that female staff members face, how they tackle these challenges, and the ways in which they navigate this gendered setting. These challenges include the experience of being a woman in a highly masculine environment, sexist remarks, and campers' expectations of gender roles to be carried out. Both gender conforming and nonconforming techniques were displayed by individual female staff members to navigate these obstacles. This work adds a unique perspective to the current body of research in the field of gender and the outdoors, and it increases our understanding of what exactly individuals must deal with as women in this particular environment and how their challenges can be confronted and overcome.

Investigating Ecological Effects of Wind Turbines on Herbivorous Insect Abundance

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Oral Presentation

Wyoming EPSCoR *Laramie, Wyoming*

Wind power is growing rapidly across the globe, and we know that wind farms can alter local environmental conditions. Much less is known about the impact of wind farms on organisms. Currently we know that birds and bats mortality can be high around wind turbines, but far less is known about lower trophic levels. One important aspect of this knowledge gap is the impact that wind farms may have on invertebrate herbivores and the repercussions that may have on plant communities. Our study collected insects with sweep nets and sticky traps, and vegetation data in photographs. We collected data at upwind control sites, two wind farms, and downwind sites in a southeast Wyoming prairie with grazing cattle, wind farms, and a wildlife habitat management area. Hemiptera, Diptera, Coleoptera and arachnids were the most abundant invertebrates in our samples. Similar numbers of invertebrates were collected in sweep nets at up wind control sites (158 individuals) and wind farms (289 individuals; $p = 0.22$). We captured a similar number of invertebrates on sticky traps at up wind control sites (12 individuals), wind farms (13 individuals), and downwind sites (7.0 individuals; $p = 0.37$). Damaged sticky traps from grazing cattle decreased the number of individuals (5 individuals) identified on sticky traps compared to undamaged traps (12 individuals; $p = 0.09$). Most herbivores were plant piercers and we observed little plant damage by chewing insects. Baseline data is needed to assess the impact of wind farms on plants and animals to understand the degree to which ecosystems change from harvesting wind energy.

Effects of Wind Turbines on Ecological Cascades

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Oral Presentation

Wyoming NASA Space Grant Consortium *Laramie, Wyoming*

Growing demand for renewable energy motivated the U.S. Department of Energy to implement a minimum goal of 20% U.S. electricity to come from renewable energy by the year 2030. This reinforced wind power as the fastest growing renewable energy source. Despite the massive ongoing and proposed land development for wind power, we have a limited understanding of the impact wind turbines may have on ecosystems. Some research suggests significant bird and bat mortalities, but little research has addressed potential effects on lower trophic levels. One important aspect of this knowledge gap is the impact that wind farms may have on insects and the repercussions those potential changes may have on plant communities. Our study collected insect and vegetation data at upwind control sites, two wind farms, and downwind sites. We are examining the abundance and diversity of insects, and related changes in floral resources and fecundity at these sites. Preliminary data suggested that the abundance of insect orders were similar among sites; however, identifying insects at lower taxonomic levels will provide more information. This study seeks to expand our knowledge of how wind farms interact with the environment to aid land managers in making decisions regarding wind farm placement and use.

Architecture Rising

Paul Drake, Jon Gardzelewski
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Oral Presentation

Honor's Program *Cheyenne, WY*

This presentation will demonstrate some of the buildings, structural frames, mechanical systems, and infrastructure I worked on for my Architectural Engineering Senior Design projects. The first included an 80-story skyscraper and plaza. For the project, the leaning design had to be resolved architecturally with complete and detailed renderings of the building. Then the preliminary structural and mechanical systems had to be developed and modeled. My second project includes designing the full structural system for a low-rise office building. The third project includes fully designing and analyzing a Net-zero multi-family building being designed for a competition in Portland, Oregon. My final project is research I have done concerning urban heat islands and city-wide infrastructure. This includes commentary about the design process, the energy saving measures, and reaching a net-zero energy use intensity. For the projects, various software packages were used to model the building, estimate the interaction to the surrounding climate, and analyze specific functionalities of the building. These analyses included computational-fluid dynamic airflow analysis to view how air flows through and around buildings, solar daylighting analysis which is required for LEED accreditation, and advanced parametric design strategies for unique architectural structures.

Opposing forces of seed dispersal and seed predation for an invasive cactus in East Africa

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Oral and Poster Presentation

Supporting programs: Honors Department, EPSCoR, Center for Global Studies, Arts and Sciences Department, Haub School of Environment and Natural Resources

Idaho Falls, Idaho

The invasive prickly-pear cactus (*Opuntia stricta*), has reduced rangeland quality and altered understory-plant communities throughout much of the globe. In the Lakipia Highlands of central Kenya, olive baboons (*Papio anubis*) frequently consume *O. stricta* fruits and disperse the seeds via defecation. This animal-mediated dispersal can increase germination and subsequent survival of plants, which is of concern to both ranchers and conservationists due to *O. stricta*'s ability to outcompete native plants consumed by livestock and wildlife. However, consumption of seeds by rodents (seed predation) may offset the potential benefits of seed dispersal for cactus establishment. We investigated whether seed predation by an abundant rodent—the fringe-tailed gerbil (*Gerbilliscus robustus*)—could reduce or altogether offset the benefits of seed dispersal for *O. stricta* establishment. We tested if foraging by gerbils was biased towards seeds in baboon feces. Using remotely-triggered cameras, we monitored paired sites, each consisting of a control pile of seeds and a pile of baboon feces containing seeds. We then used a Cox regression model to determine that seed predation was higher for seeds embedded within baboon feces than for control seed piles. These data suggest that high abundances of rodents—characteristic of areas from which large ungulates have been extirpated—may disrupt the process of seed dispersal and
reduce rates of cactus establishment. Future research should focus on if and how seed predation by gerbils ultimately affects the spread of this invasive plant.

A Mini Systematic Review of Subthalamic Nucleus Deep Brain Stimulation as a Treatment for Gait and Dysarthria in Parkinson's Disease

Kayla Duffee with Dr. Erin Bush
Department of Communication Disorders
University of Wyoming
Oral Presentation

Honors Program *Pueblo, Colorado*

This review investigated the efficacy of subthalamic nucleus deep brain stimulation (STN DBS) as a treatment for gait and dysarthria in patients with Parkinson's disease. Over two hundred articles were found concerning gait, three of which were used, based on how recently they were published and their relevance to the topic. Concerning dysarthria, five group experimental studies from two databases were evaluated for their internal validity, and their findings were compared. It was discovered that though STN DBS effectively treats gait abnormality in Parkinson's patients, it usually exacerbates rather than improves dysarthria. It was concluded that STN DBS is not an efficacious treatment for speech intelligibility.

Para-Xylene Derived from Biorenewable Feedstock

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Department of Chemical Engineering
University of Wyoming
Oral Presentation

Chemical Engineering Department – Senior Design Course *Rock Springs, WY*
Rock Springs, WY
Laramie, WY
Littleton, CO

Para-xylene is an organic chemical which has been historically produced in the petroleum industry. It is has several uses in the chemical industry, but is most prominently used as a feedstock to make terephthalic acid, purified terephthalic acid, or dimethyl-terephthalate-saturated polyester fibers. These compounds are widely used to make plastics. Although the non-renewable resources used to produce para-xylene are not projected to be completely depleted anytime soon, it is assumed that they will run out one day. Thus, methods to produce this chemical from bio-renewable resources should be explored to prolong the production from non-renewable resources, and to have solely renewable production in the future. The purpose of this project is to investigate the production of para-xylene from D-fructose. This process is done in three steps: converting D-fructose to hydroxymethylfurfural (HMF), HMF to dimethylfuran (DMF), and DMF to para-xylene. This project was developed using Aspen Plus Version 8.4 and an economic analysis was performed to determine the feasibility of this project.

Phosphorus limitation and local adaptation of *Potamopyrgus antipodarum* in New Zealand and the Greater Yellowstone Ecosystem

Marissa Dyck with Dr. Amy Krist
Zoology Department
University of Wyoming
Oral Presentation

EPSCoR *McMinnville, OR*

Phosphorus is an essential nutrient for growth of organisms, but is often limited and varies in availability across natural populations. This can cause populations of organisms to evolve different responses to identical nutrient levels, a called local adaptation. We examined this phenomenon in *Potamopyrgus antipodarum,* a freshwater snail that is native to New Zealand and has spread into the Greater Yellowstone Ecosystem. in two separate experiments. Snails originating from lakes with low phosphorous should be adapted to coping with a low phosphorus diet, therefore we predicted that snails originating from lakes with low phosphorous content would suffer less when fed a low phosphorous diet, and snails originating from high phosphorous lakes would suffer more. We obtained snails from six New Zealand lakes and from Grand Teton National Park for the first experiment and from six New Zealand lakes for the second experiment. We randomly assigned snails to either a high phosphorus or low phosphorus diet and compared growth on each diet for 4 or 2weeks for each experiment. In contrast to our predictions, we found that snails from low phosphorus lakes showed a greater difference in growth between the low and high phosphorous diets than the snails from high phosphorus lakes. This result may be due to variable production by snails of alkaline phosphatase, an enzyme that allows snails to extract more phosphorus from their food. We predict expression of alkaline phosphatase to be higher in snails from low phosphorous lakes.

Analysis of Stream Bed Morphology in Oil and Gas Development Areas Using LIDar Data

Christopher Edwards with Dr. Scott Miller
Department of Ecosystem Sciences
University of Wyoming

Oral Presentation

NASA Space Grant Consortium *Laramie, Wyoming*

Previous work at the University of Wyoming has identified landscapes in Wyoming that do not follow traditional observations and contradict principal scientific understanding of watershed behavior. High resolution data was collected in oil and gas development areas in the Pinedale region to map channel dimensions. Predictable relationships of watershed and terrain characteristics could not be found during hydrologic analysis (Vithanage and Miller, 2014). The Moneta Divide, another active oil and gas development field in the central Wyoming area, bears similar characteristics in terms of climate and soils to the Pinedale region. It is of scientific interest to compare the findings of data analysis in the Moneta Divide to previously determined patterns of channel behavior in the state or region. In this research we have processed high resolution Light Detection and Ranging (LiDAR) data of stream channels in the Moneta Divide, to determine whether these morphological characteristics can be described by statistical relationships from other watershed data. This information will likely be useful to support future hydrologic modeling and field-based monitoring efforts in areas affected by oil and gas development.

Hox Genes: Literature Review and Clinical Overview of Human Defects and Cancer

Chris Ellbogen, Dr. Jonathan Prather
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University of Wyoming

Oral Presentation

Honors Program *Casper, Wyoming*

In animals appendage placement and axial arrangement is dependent on four to forty-eight Hox genes. Hox genes are evolutionarily conserved because mutations are usually lethal, and the presence of Hox genes is evidence for common descent among animals. Experiments with *Drosophila melanogaster* (the common fruit fly) result in extreme defects when Hox genes are altered. Natural mutations in HOXA13, HOXA1, HOXA2, and other human Hox genes result in more subtle defects and abnormalities of the limbs, genitals, face, and inner-ear. New research suggests that Hox genes are involved in far more processes than initially thought, including oncogenesis. Understanding the role of Hox genes in oncogenesis could potentially be useful in developing therapies used to treat cancer.

Ireland: From 'Celtic Tiger' to 'GIPSI' and Back

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University of Wyoming

Oral Presentation

Honors Program *Jackson, Wyoming*

In 2007 Ireland was a huge economic success, as the fastest growing country in Europe it was often referred to as the Celtic Tiger. Less than two years later, as a result of its rapidly declining economy, Ireland was relabeled as one of the GIPSI countries. Now, with the worst of the 2008-9 global crisis passed, Ireland's economic prospects are far more encouraging. Can it return to its Celtic Tiger levels of growth or are Ireland's economic problems just beginning? This presentation will examine the rise and fall of Ireland over the past half century through statistical and economic model analyses and attempt to both predict Ireland's future economic state and suggest ways to promote its growth.

Analysis of Role of Synaptojanin-1 in Diet-Induced Obesity

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Oral Presentation

INBRE *Cody, WY*

Synaptojanin-1 (SYNJ-1) is the most abundant inositol lipid phosphatase of the 5-phosphatase family. SYNJ-1 dephosphorylates phosphatidyl inositol (4,5) bisphosphate (PIP_2) to produce PI(4)P. SYNJ-1 is a PIP_2 phosphatase that regulates the function of several cellular proteins including transient receptor potential vanilloid 1 (TRPV1). Mice that are null for SYNJ-1 do not survive more than 72 hours after birth. Therefore, we evaluated the effect of haploinsufficiency of SYNJ-1 in SYNJ-$1^{+/-}$ mice. High fat diet (HFD; 60% calories from fat) *ad libitum* resulted in weight gain in both wild type and SYNJ-$1^{+/-}$ mice. However, SYNJ-$1^{+/-}$ mice gained significantly higher weight compared to wild type mice. Evaluation of metabolic activity in these mice revealed that HFD suppressed the respiratory quotient, heat production and locomotion activity of both wild type and SYNJ$^{+/-}$ mice. Supplementing capsaicin (0.01%) with HFD significantly prevented weight gain in both wild type and SYNJ-$1^{+/-}$ mice and increased the expression of thermogenic sirtuin-1, uncoupling protein-1 and lipolytic PPARα. Experiments performed to analyze the interaction between SYNJ-1 and TRPV1 in vitro using heterologous expression system revealed that SYNJ-1 overexpression increased TRPV1 activity when stimulated with lower concentration of capsaicin (10 pM). We hypothesize that SYNJ-1 dephosphorylates PIP_2 to produce PI(4)P, and relieves TRPV1 from the tonic inhibition of PIP_2. This potentiates capsaicin stimulated TRPV1 activity and enhances signaling mechanisms downstream of TRPV1 to trigger sirtuin-1 (cellular sensor that regulates metabolism and energy expenditure)-dependent pathways to increase metabolic activity and prevent obesity. Lack of SYNJ-1 results in increased levels of PIP_2 thus favoring the tonic inhibition of TRPV1 by PIP_2. Our data suggest that SYNJ-1 is an important phosphatase that regulates the role of TRPV1 in preventing diet-induced obesity.

An empirical analysis of the neophobic responses of captive raccoons (*Procyon lotor*) during a problem-solving task

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Oral Presentation

EPSCoR Research Fellowship Grant *Cheyenne, WY*

Raccoons are a medium-sized carnivore frequently found exploiting resources in human-modified landscapes. Our current understanding of the relationship between the raccoon's increasing presence in these landscapes and their cognitive abilities is vague. More specifically, it remains unclear if individual variation in neophobic responses influences the problem-solving abilities of raccoons and ultimately whether their problem-solving abilities enable raccoons to exploit human-altered landscapes. To investigate the relationship between neophobia and problem-solving success, a multi-access puzzle box with 3 solutions was baited and presented to individual captive raccoons. The puzzle box was a novel object, therefore neophobia was measured as the time it took a raccoon to make contact with the puzzle box. The total number of solutions that a raccoon correctly manipulated to access the food reward was used to estimate its problem-solving success rate. The order in which raccoons solved the puzzle box solutions was used to determine the complexity of each solution. We determined whether there was variation in the neophobic responses of individual raccoons, a relationship between contact latency and problem-solving success rate and whether there was a difference in the neophobic responses and problem-solving abilities of raccoons due to sex or origin. Lastly, we determined whether a particular puzzle box solution was more complex than another. These results could be useful for others interested in which cognitive factors may explain the raccoon's prevalence in human-modified landscapes.

Analysis of Effect of TRPV1 Activation on Triglyceride and Cholesterol Levels in an Obese Mouse Model

Jana Favela[1], Kaylan Schilling[1], Asia Williams[1], Rachel Tighe[1], Rachel Graham[1], Joy Watkins[1], and Anna Hepp[1] with Steven McAllister[1], Padmamalini Baskaran[2] and Baskaran Thyagarajan[2]
[1]Central Wyoming College;
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University of Wyoming

Poster

INBRE *Riverton, WY*
Lander, WY
Worland, WY
Crawford, NE

Metabolic syndrome is comprised of the conditions of obesity, impaired glucose metabolism, dyslipidemia, and cardiovascular complications. It can lead to stroke, a major cause of death worldwide. Previous research suggests that transient receptor potential vanilloid subfamily 1 (TRPV1) protein expressed in adipose tissue and vascular smooth muscle cells is a potential target to treat dyslipidemia, fatty liver and hypertension. Research from Baskilab demonstrates that TRPV1 protein is expressed in mammalian adipose and liver tissues and that activation of TRPV1 by capsaicin prevented high fat diet (HFD)-induced obesity, non-alcoholic fatty liver disease and hypertension, without modifying the quantity of food or water consumed by mice. In this research, we measured the triglyceride and cholesterols levels in the liver of normal chow or HFD (capsaicin; 0.01%)-fed wild type and TRPV1$^{-/-}$ mice. We evaluated the hypothesis that HFD-feeding increased lipid levels and that TRPV1 activation by capsaicin prevented this. Our data provides new evidence for the role of TRPV1 activation in regulating lipid metabolism, suggests that TRPV1 regulates *de novo* lipogenesis and lipolysis, and that activation of TRPV1 is a novel strategy to prevent hyperlipidemia and associated complications in diet-induced obesity.

Perception of action in vertical dance: visual discrimination of dance movements performed on the ground and in the air

Sean Feehan and Jieyu Peng, Dr. Qin Zhu
Department of Kinesiology & Health Promotion
University of Wyoming

Poster Presentation

EPSCoR *Rapid City, SD*

Previous studies have shown that visual discrimination of dance movements in point light displays (PLDs) by experts is superior to novices unless the movements are inverted (Calvo-Merino 2010). Vertical dance adapts movements from the ground and performs them upright and upside-down with the support of a harness. Our study aimed to examine if perceptual-motor expertise is required for judging vertical dance movements. Our study involved testing 10 vertical dancers and 10 non-dancers using an experiment compiled of paired PLDs created from recordings of dance motions on the ground and in the air with the support of a harness from one male vertical dancer and one female dancer using a 3D motion capture system. Each subject viewed a series of paired PLDs and determined if the two videos played back-to-back were the same exact motion or two different motions. Overall the vertical dancers judged the movements better than non-dancers specifically for the air movements but no difference was seen between groups for the ground movements. Both groups judged the air movement more accurately than the ground movement. Inverting the ground and air movements does not impact the visual trajectory information for detection of the movement difference. The study supported the visual coding theory for perception of biological motion (Zhu & Bingham, 2014).

Fabrication and Characterization of Copper Plated Liquid-Crystalline Elastomers

Michelle Fenn, Dr. Carl Frick and Dan Merkel
Department of Mechanical Engineering
University of Wyoming

Oral Presentation

EPSCoR *Pinedale, WY*

Glaucoma is a group of eye diseases that affect approximately 2.7 million people in the United States. These diseases result in high intraocular pressure (IOP) which damages the optic nerve and can eventually lead to blindness. Although there are many treatment options for advanced glaucoma, most are extremely invasive and do not provide a long-term solution. Currently, a collaborative effort is being made to develop a translimbal device to treat glaucoma that resolves the shortcomings of current treatment options. The new design incorporates a small implantable shunt that will drain excess fluid from the eye, lowering IOP. Inside of this shunt is a filter made from liquid-crystalline elastomer (LCE). LCEs possess shape-switching abilities that will allow a removable and replaceable filter to prevent filter clogging.

The main challenge with utilizing an LCE in a biomedical device is achieving antibacterial properties that are necessary to prevent infection. Copper, an element known for having natural antibacterial properties, can be deposited onto materials through an electroless deposition process utilizing polydopamine as an adhesive. Research was conducted to determine a method to create copper-plated, shape-switching LCEs. A variety of polymer substrates were plated with copper and mechanically tested to characterize copper film adhesion, deformation mechanics, and variations in film properties between dissimilar substrates. Copper-plated LCEs with shape-switching properties were also fabricated and mechanically tested to reveal excellent adhesion compared to other substrates as well as a unique lack of delamination of the copper plating even at over 100% strain.

Advance Tank and Construction Vertical Welding Buggy

Michelle Fenn, Dugan Hughes, Clayton Maxey, and Nicholas Reh
Mentor: Dr. Kevin Kilty
Department of Mechanical Engineering
University of Wyoming
Oral Presentation

Department of Mechanical Engineering

Pinedale, WY
Sundance, WY
Fort Collins, CO
Aurora, CO

Advance Tank and Construction (ATC) is an industrial construction company based out of Wellington, CO. They specialize in the design, fabrication, and erection of above ground storage, welded steel tanks, and other plate structures. ATC desired to improve their productivity by creating a reliable and robust method for welding vertical seams on their large industrial storage tanks. The company approached our senior design group with a project to design a new vertical seam welding buggy. A buggy is a cage structure that hangs off the side of the tank allowing a welder or laborer to perform a task. The previous buggy had difficulty accommodating the oscillating machine, track, and associated welding equipment necessary to weld a vertical seam. Previously, vertical seams were welded by hand, which is time consuming and can be unreliable. ATC provided us with a list of design parameters they wished to see in the new buggy design.

Utilizing these design requirements, our team was able to design a new buggy that is reliable, safe, and easy to use. The buggy is large enough to incorporate all of the welding equipment required for the oscillating machine to complete a vertical seam weld and allow a proper amount of work room for the operator. Safety was considered heavily in the design and the structure contains many convenient safety features and abides by all OSHA and ATC safety regulations. The design of this new buggy drastically increases the efficiency and productivity of tank construction by ATC.

Pip's Spatial Education in Charles Dickens's *Great Expectations*

Roslyn Fleming
Michael Edson
English Department
University of Wyoming

Oral Presentation

English Honors Program *Ringoes, New Jersey*

The concept of "spatial education" explains character actions and transformations in literary texts. In Charles Dickens's *Great Expectations* (1861), the main character Pip observes how people function in different environments, thereby learning that certain behaviors, attitudes, and interactions proliferate in each space and in the process, learning that his own expectations of environments need to be modified. Although scholars have discussed spaces' representation and how spaces and characters reflect one another, it is important also to understand how physical spaces foster particular interactions and behaviors that disrupt ascriptions of class identities/characteristics to those spaces. When we study the interactions, spaces, and characters of certain locations, we recognize Pip's changing expectations and behaviors that allow him to successfully operate in each space. Pip's observations of the interactions at the workplace and home of Jaggers, the London lawyer, and the physical appearances of these spaces evade Pip's expectations of what it means to live/work in London. In contrast to Jaggers's office is Pip's residences, Barnard's Inn and the Temple, which reveal Pip's learning process of what it means to be a London gentleman, as he adopts certain behaviors and fashions his homes in particular styles. Pip's experiences at the class-ambiguous marshes, raise expectations that the London gentlemen class live in environments that mirror their socioeconomic standing. However, Pip's spatial education in the novel demonstrates a person's qualities cannot be deduced by their class association nor can class identity be assumed by one's possessions and behaviors.

Addressing Bias in Snow Water Equivalent Measurements

Jordan French, Dr. Jefferson Snider
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Poster & Oral Presentation

EPSCoR *Laramie, WY*

Wintertime snow precipitation is the largest precipitation type in the northwestern United States. For example, in Wyoming at least 70 % of the State's water originates as snowfall. The majority of this snowfall deposits on mountain ranges where it accumulates over the winter season and is released into rivers during the runoff season (April to July). Wintertime snow accumulation is measured both manually and with the automated SNOTEL system. Accumulation is reported as a snow water equivalent (SWE) depth. Because of problems with both the SNOTEL and manual SWE measurements new methods are being developed. The objective of this study is to compare measurements of snowfall as SWE made manually and with a new system known as the hotplate snow gauge. My research is concerned with this manual SWE method and determining whether it is robust and unbiased. Understanding how well this manual method works will help us in understanding the source of the bias and should help to improve confidence in SWE measurements generally. Improved confidence in snowfall measurements is expected to result from this research.

Estimating surface area of three Wyoming Reservoirs using multi-year Landsat data

Colleen Friday[1], Dr. Ramesh Sivanpillai[2]
1. Department of Ecosystem Science & Management, 2. Department of Botany
University of Wyoming

Oral Presentation

WyomingView *Arapahoe, WY*

Reservoirs capture and store snowmelt which occurs from March through June in Wyoming. Farmers and Ranchers depend on reservoir water during the summer and fall for growing crops, and livestock water and feed. The objective of this study was to delineate the surface area for the Arapahoe, Ray Lake and Washakie Reservoirs over a 25 year Landsat time series for spring on the Wind River Indian Reservation (WRIR) located in Fremont County, WY. Two of the three reservoirs are ungauged and satellite-based estimates of surface area can provide insights about historical changes in these reservoirs. Landsat 5 Thematic Mapper (TM) data are collected every 16 days in six spectral bands, with a pixel size of 30m. Landsat 5 TM images were acquired from 1984 – 2011 and downloaded from the United States Geological Service (USGS). Normalized Difference Water Index (NDWI) and Modified Normalized Difference Water Index (MNDVI) were calculated from these images, and were classified as water or non-water using the rule-based classification. Water surface area was calculated for each year. Findings from this study will provide insights to tribal water engineers and natural resources regarding historical changes in each of the reservoirs.

Connecting salt and puberty: the neurokinin b story

Teresa Fuller
Mentor- Dr. Donal Skinner
University of Wyoming

Oral Presentation

University of Wyoming INBRE *Casper, WY*

One hundred years ago, the average age for a female living in the US to achieve menarche was between 16 and 17 years old. Today, this figure is below 13 years old. One potential explanation for this trend is increased dietary salt consumption. The goal of our research is to explore the physiological link between excess salt consumption and pubertal timing in females. Neurokinin B (NKB) is a neuropeptide synthesized and released from neurons within the arcuate nucleus and is important for both puberty and salt regulation. For this reason, we hypothesize that a high salt diet increases expression of NKB in the arcuate nucleus, and this increase in NKB is partially responsible for changes in pubertal timing. In order to test this hypothesis, we preformed qPCR for NKB in the arcuate nucleus of Sprauge Dawley rats before, during and after puberty, who were fed a series of diets ranging in salt content from .3% to 8%. In this way we are able to test changes in NKB expression throughout puberty under normal and high salt conditions. We found no significant differences in NKB expression throughout puberty between our control and high salt animals. These results lead us to hypothesize that there may be a change in the sensitivity of these neurons to the actions of NKB in response to high salt conditions throughout puberty. To test this we will preform qPCR of the same animals and area, but we will aim to quantify the amount of NKB receptors.

Precocious Puberty: The Role of Obesity and the Psychosocial Consequences of Early Pubertal Maturation

Teresa Fuller
Mentor- Dr. Amy Navratil
University of Wyoming
Oral Presentation

University of Wyoming Honors Department *Casper, WY*

Precocious puberty is simply onset of pubertal maturation at an age that is younger than the clinically defined norm. In the past decades, pubertal age has been continuously decreasing on average. One major theory to explain this trend in average pubertal timing is the increase in childhood obesity in many developed countries, including the USA. To summarize, in America girls are becoming more obese, and this is contributing to them going through puberty at a younger age. The aim of this report is to identify and discuss the biological mechanisms of puberty in human females, the physiological correlation between earlier pubertal age and obesity, as well as the psychosocial consequences of precocious puberty in females. By analyzing many experiments, studies, and personal accounts regarding the physiological, psychological and social impacts of precocious puberty it is hoped a better understanding of the whole picture of precocious puberty will be reached.

Alternatively Cured Compost on Tomato Plants

Shelby Gaddis
University of Wyoming
College of Agriculture and Natural Resources

Composting is a worldwide practice commonly used to enhance crop production as an alternative to synthetic fertilizers. Traditionally, composting is left exposed to the outdoor elements where freeze/thaw cycles can hinder both decomposition rates and compost availability. Alternatively curing compost by implementing a composting mechanism will shelter it from freeze/thaw cycles, which may improve the quality of the compost.

I will investigate the effect of alternatively cured compost on tomato plants. I hypothesize that alternatively cured compost will enhance tomato plant growth and yield. Three rows of 4-6 tomato plants per row will be planted in a garden plot at the UW ACRES Student Garden in Laramie, Wyoming. Two rows will be individually treated with either alternatively cured or traditionally cured compost. A third row will be used as a control. Alternatively cured compost will decompose in a composting barrel, fit with screens allowing for sufficient airflow. Traditional compost will be sourced from ACRES which practices outdoor curing methods. Plants will be purchased from the same distributor and treated with the same cultivation practices. I will measure plant height and fruit counts at pre- selected time intervals throughout the growing season.

While composting studies on tomato plants have been done before, this study will evaluate the importance of further curing compost prior to application. In high-elevation areas such as Laramie, short growing seasons and semi-arid climate are concerns. Alternatively cured compost will eliminate such factors, because the plants will be equipped with higher organic matter content.

Caste War of 1847-1901

Alton Garcia, Michael Brose
Department of History
University of Wyoming

Oral Presentation

Department of History *Laramie, WY*

This project will focus on the Caste War of 1847-1901 in the Yucatán peninsula located in southern Mexico by compiling various primary and secondary sources. It will focus on the militarization of the natives and how the Mexican Army was able to overpower the native Mayan population, it will also focus on the revolutionary aspects of the native population and popular Mayan revolutionary figures during the time. The project will also look to explore the lifestyle and how the native population in the Yucatán lived their daily lives through various archeological files and reports, and how their lifestyle effected the progress and ultimately led to the failure of the Mayan revolution in the Yucatán. The project will look to prove why the revolutionary struggle of the native people in Yucatán was never able to progress after the first push forward for an independent state. Results will be reported in a research style paper as well as an oral report. The project will help provide a better understanding of pre 20th century native Mayan revolution and why it could not succeed, it will also provide a better understanding for political and military strategies used in the future to put down other Latin American revolutions. This project will look to prove that the Mayan revolution in the Yucatán was never successful because the lifestyle that the Mayan people lived, and because the Mayan people were never able to band together in order to form a strong revolutionary spirit among each other.

Assessing the habitat preferences of shrews in the Greater Yellowstone Area: does burn history matter?

Michelle Sherwin[1], Molly E. Loetscher[2], Gabriel L. Garcia[2], Zachary P. Roehrs[2], and Hayley C. Lanier[1]

[1]Department of Zoology and Physiology, University of Wyoming at Casper; [2]Department of Biology, Laramie County Community College

Type of presentation: Poster

Wyoming INBRE *Casper,WY*

In northern regions, shrews (*Sorex* spp.) are one of the most important mammalian predators on insects. These tiny, voracious mammals can consume up to one and a half times their body weight in invertebrates every day, making them important in structuring ecological communities. Over that last 26 years hundreds of specimens of shrews, along with other small mammals, have been being collected in four different trapping grids as part of a long-term study on the 1988 Yellowstone Fires. Despite the fact that they comprise as much as 30% of our captures, we know relatively little about the diversity and habitat usage in shrew species. This is due to the difficulty of species identification in this groups. We evaluated the 5 shrew species that could be found living the Greater Yellowstone Area to determine if any of the species of shrews might favor different habitats based upon fire history. By applying both morphological and molecular identification techniques we tested whether the two most common shrew species (*Sorex monticolus* and *S. cinereus*) were specializing on burned or unburned habitats and evaluated the vegetation characteristics that influenced their capture. By identifying the role of habitat modification and usage in shaping shrew distributions, we can determine if species are separating themselves into these different environments or partitioning invertebrate resources in the region. This can also allow us to better understand how shrews are responding to successional changes after wildfires.

Elemental Analysis of Shrew Teeth from Control and Burned Plots of the 1988 Yellowstone Fires Using Scanning Electron Microscopy and Energy Dispersive Spectroscopy

Gabby L. Garcia[1], Molly E. Loetscher[1], Chad R. Wangeline[2], Dr. Ami L. Wangeline[1], Dr. Hayley C. Lanier[3], Dr. Zachary P. Roehrs[1]

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

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[3]Department of Zoology and Physiology, University of Wyoming - Casper

Poster Presentation

Department of Natural Sciences, INBRE *Denver, CO*

Cheyenne, WY

High iron concentrations in Soricinae teeth cause distinct red pigmentation in enamel of the tooth. One hypothesis for this ferrous enamel is for strengthening the tooth against wear and therefore iron availability may be an important aspect to shrew ecology. Previous studies have demonstrated changes in iron availability following forest fires due to changes in pH and solubility. The purpose of this study is to examine potential influences on the iron concentration of shrew teeth including forest fire history. Mandibles of the species *Sorex monticolus*, collected in 2014 from sites affected by the 1988 Yellowstone Fires (n_{burn}=10) and from adjacent unburned control plots ($n_{control}$=10) were examined using scanning electron microscopy and energy dispersive spectroscopy (EDS). EDS spectra were collected from four points on the first molar, two on the first incisor, and one point on the mandible for reference. The highest weight % of iron was 20.27% located on an incisor, while a low of 0% was recoded in multiple tooth locations across different individuals. Mean weight % for iron across all specimens and locations was 5.35%. Using one-way ANOVA, the weight % of iron was compared across the 4 grids (2 burned, 2 control) for each of the 7 EDS points examined. No significant difference in iron concentration between burned and unburned plots was detected. It is proposed that this lack of difference in iron relative to fire history may be due to diminished differences in iron availability over the 26 years since these fires.

Peptidylarginine deiminase (PAD) enzymes are expressed in ewe caruncles at pregnancy day 25 and citrullinate histone H3 arginine residues

Coleman H. Young, Philip Gard, Kelsey E. Quinn, Ryan L. Ashley, Brian D. Cherrington

Peptidylarginine deiminase (PAD) enzymes post-translationally convert positively charged arginine amino acids into neutral citrulline residues. Targets for PAD catalyzed citrullination include arginine residues on histone tails which results in chromatin decondensation and changes in gene expression. There are five PAD isozymes designated PADs 1, 2, 3, 4 and 6 many of which are expressed in female reproductive tissues. For example, PAD expression changes over the course of the estrous cycle with highest expression during estrus. PAD expression has never been examined in ewe placental tissue, but is of interest given the diversity of placental morphology. Immunohistohemistry analysis indicates that PAD 2 and 4 expression localizes to glandular and luminal epithelium in d25 caruncles. Since PAD 2 and 4 have well characterized roles in histone citrullination, we next hypothesized that PADs citrullinate histones in ewe caruncles. To test this, d25 caruncle lysates were examined by western blot and membranes probed with an antibody that recognizes citrullinated histone H3 arginine residues 2, 8, and 17. Our results indicate that high levels of citrullinated histone H3 arginine residues 2, 8, and 17 are present in d25 caruncles. Our results suggest that PAD catalyzed citrullination may be an important post-translational mechanism important for placental/caruncle function.

Baja Design Information and Testing

John Gaudio, Dr. Kevin Kilty
Department of Mechanical Engineering
University of Wyoming

Oral and Poster Presentation

Department of Mechanical Engineering *Littleton, CO*

The SAE Baja is a project undertaken each year by the University of Wyoming for senior mechanical engineering students, in order to test and improve their design and fabrication capabilities. Every year a new group of students starts with a largely blank slate and attempts to build a vehicle to win the competition. My senior design project analyzes three aspects of the Baja vehicle, creating tools to help future teams improve their Baja designs. My project will find detailed weight distribution of the vehicle and create a program to determine the 3-D center of mass based upon vehicle characteristics. Also, the front suspension of the Baja will be analyzed under several conditions, including collision with a vertical wall and a fall from one foot. Finally, the mass effect of the Baja will be calculated by taking into account the net force required to accelerate reciprocating and rotating internal components while driving, allowing more accurate representation of the vehicle's overall acceleration. This project will provide tools, procedures, and information for future Baja design teams, helping them design and fabricate more effective vehicles for future competitions.

Senior Design in Environmental Engineering

Erica Gilrein with assistance from Dr. Bill Bellamy
Civil & Architectural Engineering
University of Wyoming

Oral Presentation

Honors College *Syracuse, NY*

A wastewater treatment plant in Parker, Colorado has reached 75% of its design capacity and flow to the plant is growing rapidly. As required by Colorado law, the treatment plant must begin planning to expand its facility. The plant currently treats 2 million gallons per day (mgd) and must expand to 6 mgd. This project team was hired to research treatment options for the advanced water treatment processes at the plant, phosphorus removal and disinfection. Using a cost-benefit analysis, treatment options for each process were researched and evaluated and the best alternative was chosen. A conceptual design for these operations was prepared as well. The student team included Erica Gilrein, Sierra Johnson, Antolin Barraza, Joey Meier, Shelby Kindsvater, and Megan Varner.

Comparing Sensitivities Between Different Indices and Processing Levels Upon Water Bodies

Ina Goodman with Dr. Ramesh Sivanpillai
Department of Botany
University of Wyoming

Oral Presentation

Wyoming Research Scholars Program *Cody, WY*
WyomingView

Normalized difference water index (NDWI) and modified normalized difference water index (MNDWI) are used for distinguishing water and estimating the surface area of waterbodies. Threshold values are applied to these indices to distinguish image pixels corresponding to waterbodies. The accuracy of these products are influenced by both several natural factors and the level of pre-processing conducted to the raw satellite data. Sun incidence angle is one of the natural factors that changes throughout the year, which influences the reflectance values recorded by satellite sensors, and therefore, can influence the surface area estimates. This research focused on the sensitivity of NDWI and MNDWI to different sun incidence angles and two levels of pre-processing of Landsat data. Landsat images acquired from March through October for Pilot Butte, Keyhole, Fontenelle and Bull Lake reservoirs were analyzed to identify major drop in area estimates for a range of threshold values. NDWI and MNDWI values derived from raw Landsat data did not show any difference in terms of their sensitivity to changes in threshold values. However, MNDWI reflectance values, derived from the top of the atmosphere, were less sensitive to changes in threshold values than the corresponding NDWI values. These results indicate that MNDWI reflectance values, derived from top of the atmosphere, are more stable for deriving water surface areas.

Use of Argon as Tracer Gas in Streams

Ina Goodman with Dr. Robert Hall
Department of Zoology and Physiology
University of Wyoming

Oral Presentation

Wyoming EPSCoR *Cody, WY*

In limnology, scientists need accurately measured gas exchange rates for estimates of metabolism and gas emissions. Gas exchange rates vary depending on stream size, depth, velocity, discharge, temperature, and stream slope. Typical use of sulfur hexafluoride (SF_6) to measure gas exchange rates is problematic because of its uncertainty in scaling gas exchange of CO_2 and O_2 and its intense greenhouse gas properties. We used argon (Ar), a nonreactive gas tracer sharing similar gas exchange properties as oxygen, as a substitute gas for measuring gas exchange. We added Ar to three Wyoming streams and measured dissolved gas samples at set increments downstream of gas injection point. Using a membrane inlet mass spectrometer, we examined the argon to nitrogen ratio ($Ar:N_2$) decline in collected samples corresponding to distance downstream. When testing the concentrations of Ar, Ar showed an exponential decay with increasing distance downstream, similar to what we might expect in previous methods using SF_6. We tested the accuracy of Ar by comparing the gas transfer velocity data collected to the gas transfer velocity calculated when scaling the stream slope and velocity. From the collected gas samples Gold Run Creek showed a gas transfer velocity of 9.29 meters/day, Spring Creek 5.56 meters/day, Blair Creek 1.24 meters/day. These data are consistent with predictions based off the properties of the sampled streams. The gas exchange rates match closely that obtained from modeling diel oxygen curves. Using Ar, we found gas transfer velocities consistent with both stream properties and previous SF_6 gas exchange methods.

Survival of depleted NK cells in *Encephalitozoon cuniculi* infected WT mice

Tyler A. Graham and Dr. Jason P. Gigley
Department of Molecular Biology
University of Wyoming

Poster Presentation

INBRE *Riverton, WY*

Encephalitozoon cuniculi is of particular interest because it causes chronic diarrhea and wasting in patients, and especially in persons with the acquired immune deficiency syndrome (AIDS) are at an increased risk for this parasite. The population at the greatest risk is elderly individuals and teenagers (1). The parasite spores can be passed on via fecal-oral route, water, respiratory, sexual, congenital, and zoonotic transmission. The aim of this study is to record the survival of the experimental wild-type (WT) mice that have been depleted of their Natural Killer cells versus ones that have not been depleted of their NK cells. Ten WT mice were infected orally with *E. cuniculi.* Five mice were injected intraperitoneally with anti-Asialo rabbit antibody every three days to deplete their NK cells. This will demonstrate if Natural Killer cells are crucial for survival against *E. cuniculi.* Our hypothesis is that NK cells are fundamental for the survival of the mice because NK cells help to suppress the spores in the infected cells. Mice will be monitored everyday and their health will be assessed. Nine treatments were scheduled for the experimental group and monitoring was completed until the nine treatments were administered successfully. Once a survival curve is established, further testing can be done with *E. cuniculi* to better understand the role of NK cells in vivo.

ICCE: The Interdisciplinary Climate Change Expedition and Black Carbon Analysis from the Dinwoody Glacier

Alexander Greenwald Lane Tomme Aspen Kentzel Dr.Carl Schmitt Jacki Klancher
EHS Environmental Tech
Central Wyoming College

Oral Presentation and Poster

CC-STEM, EPSCoR, WYCEHG, NASA SPACE GRANT CONSORTIUM
AMERICAN CLIMBER SCIENCE PROGRAM *Lander, Wyoming*

Climate change is a problem of global consequence and significant local environmental impact. Increasing global temperatures have contributed to recession of glaciers worldwide and have resulted in concerns about the availability of future water resources. The intersection of climate induced alpine ice recession, air-borne particulate matter, and subsequent impacts on water resources form the core of the Interdisciplinary Climate Change Expedition (ICCE) black carbon research project. Black carbon (BC) is the most strongly light-absorbing component of particulate matter (PM), and is formed by the incomplete combustion of fossil fuels, biofuels, and biomass. In climatology black carbon is a climate forcing agent. Black carbon warms the Earth by absorbing sunlight, thus heating the atmosphere, and reducing albedo when deposited on snow and ice (direct effects). This particulate has been documented in South America as a contributing factor to accelerated melting of glacial ice from tropical glaciers; however, research on glaciers in North America is incomplete. In August 2014, in conjunction with Dr. Carl Schmitt and the American Climber Science Program, the ICCE black carbon team collected and analyzed fourteen snow samples from the Dinwoody Glacier in the Fitzpatrick Wilderness and Wind River range of Wyoming. August of 2015 saw a return of ICCE to the Dinwoody Glacier for further sampling and analysis. Results from both years indicate a 30ng/g average of BC particulate in snow from the Dinwoody Glacier, a fairly typical North American snowpack value, but potentially high for such an remote area. Further research will be conducted in 2016.

Audit Quality Control: Big Four Global Member Firms and Audit Services

Yiheng Guo, Faculty Mentor: Dr. Linda Kidwell
Department of and Accounting,
University of Wyoming
Oral Presentation

Honors Program *Luoyang, China*

"Big Four" stands for PricewaterhouseCoopers, Deloitte, KPMG, and Ernst & Young, the largest four public accounting firms. They dominate the professional accounting services market and provide high-quality audit services. Each Big Four global member firm is independent and legally separated from each other. Local accounting firms simply borrow the name and reputation of Big Four and become affiliate firms. This organizational structure leads to the variability of the audit quality in different regions, depending on the social, institutional, and cultural influences. Using Hofstede's six dimensions of national cultures and S. J. Gray's model of accounting system values, this paper examines the audit quality of Big Four global member firms in China, Japan, and Eastern Europe. The second half of this paper analyzes the benefits and disadvantages of the Big Four localization and predicts how the Big Four will adjust to cultural influence while they strive to improve audit quality.

Effect of hill position and forest age on tree water use in the Panama Canal Watershed

Jazlynn Hall with Brent Ewers PhD
Department of Botany
University of Wyoming
Oral Presentation

WRSP, EPSCoR, Honors, WyCEHG *Rawlins, WY*

The primary purpose of this project is to quantify the hydraulic conductance of plants within the Panama Canal Watershed between stands with differing tree ages and hill position during wet and dry seasons. Leaf water potentials (ΨL) from selected trees were taken using a pressure chamber from secondary growth stands with 8, 25, and 80 years of regrowth in October, 2015. The 25 year old stand (YOS) was also sampled along a north facing and south facing slope, and additional measurements will be taken in March, 2016. The secondary objective will consist of using electrical resistivity tomography (ERT) to quantify the vegetative use of soil water in the 25 year old stand. Electrodes will be placed 0.5 m apart along three lines and measured 3-5 times a day along with leaf water potentials, and once at 2.5 m apart down the entirety of the hillslope. Preliminary results from wet season measurements indicate that there were differences between the three forests. Average dry season ΨL potential for the old growth forest was -1.41 ± 0.13 MPa, -0.86 ± 0.08 MPa for the 8 YOS, and -0.66 ± 0.09 MPa for the 25 YOS. The preliminary results will be tested for differences in the wet season. Enhancing understanding of the hydrologic processes involved between stand age, aspect, and seasons can improve global applications and management patterns.

Explorations into Monomer-Dimer Tilings of Planar Regions

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

Oral Presentation

EPSCoR *Cheyenne, Wyoming*

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, specifically n by n regions with a prescribed number of monomers. 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.

Effect of CARD9 on adipocyte lipolysis

Samantha E. Haller, Kayla A. Wilson, Matthew R. Peterson, Guanglong He
School of Pharmacy, University of Wyoming

Oral Presentation

INBRE *Cheyenne, WY*

Obesity is highly prevalent and causes diseases such as diabetes. One contributing factor is chronic inflammation. The adaptor protein caspase recruitment domain-containing protein 9 (CARD9) is involved in the innate immune response by activating pro-inflammatory cytokines in obesity. Another contributing factor is basal and stimulated lipolysis. The end product, free fatty acids, accumulate in the body and result in insulin resistance (IR) and diabetes.

From our previous study, it was found that high fat diet (HFD) induces IR. A CARD9$^{-/-}$ animal model on HFD had improved but not completely ameliorated IR suggesting other factors are involved. One hypothesis is that both inflammation and adipocyte lipolysis contribute to IR. The goal of this project is to determine if CARD9 has an effect on adipocyte lipolysis and related lipid toxicity.

C57BL/6 wild-type and CARD9$^{-/-}$ mice were fed on a normal diet (ND) or a HFD for five months. Western immunoblotting analyses were performed on visceral adipose tissue. The data indicates that p-perilipin, perilipin, ATGL, p-JNK, and p62 were down-regulated in HFD, but little difference was seen between wild-type and CARD9$^{-/-}$ groups. LC3BII/I appears to be up-regulated in HFD, with little difference between wild-type and CARD9$^{-/-}$ groups. Preliminary data shows no change for p-HSL p-AKT, or p-ERK.

To date, our conclusion is HFD increases basal and decreases stimulated lipolysis in visceral adipose tissue, but CARD9 does not have a large effect. This indicates that the difference in insulin sensitivity seen in the CARD9$^{-/-}$ model is likely due to adipocyte lipolysis.

Structural System Design for Low Rise Office Building

Shane Halverson, Derek Swanson
Department of Civil and Architectural Engineering
University of Wyoming

Oral Presentation

Honors Program *Orr, MN*

Structural systems are the backbones of buildings. Their key responsibility is to keep the building standing, in all situations, in order to preserve life safety. As an engineer, structural design has several constraints. These include aesthetics, efficiency, and interaction with other systems such as electrical and mechanical. My senior design project focused on designing a structural system, of my choice, for a pre-designed building. This real world setting had numerous challenges; the most notable of these challenges was creating an efficient system within the parameters set by the architect. The building contained several irregularities along with numerous discontinuities among differing floors; for instance there were multiple transfer beams throughout the building. The result was a mix of braced steel frame construction and concrete sheer walls. This combination yielded an efficient solution and utilized readily available materials local contractors are familiar with.

Mining the Mouse Microbiome

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

Oral/Poster Presentation

Wyoming INBRE, EPSCoR *Cheyenne, Wyoming*

The significant impact of the human gut microbiome on our health has been recently discovered. The majority of microbiota reside within the gastrointestinal (GI) tract and provide a wide variety of benefits to the human body1. However, disruptions within the gut microbiome can lead to disastrous conditions. We have been investigating the relationship between disruptions in the gut microbiome 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 significant differences in both the content and diversity of their GI microbes. 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. We also study 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, whereas species of Akkermansia were found mostly in mice displaying severe symptoms of colitis. Staphylococcus was found in both instances. 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 two Staphylococcus species collected from the feces of Ednrb-/- mice.

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

An Analysis of Ice Depth on the Dinwoody Glacier Using Ground Penetrating Radar

Mike Hamrick and Ian McGlynn, Jacki Klancher
Environmental Health & Safety
Central Wyoming College
Oral and Poster Presentation

EPSCoR *Walnutport, PA*
Chicago, IL

Over 80 glaciers reside in the state of Wyoming. The Wind River Range, located in the west-central region of the state, is home to a majority of these frozen reservoirs. As the word "reservoir" suggests, these contribute a significant amount of water to summer and early-fall streamflow. The meltwater from Wyoming's alpine glaciers is critical during the dry months when the snows have melted and precipitation is rare. Previous studies regarding glaciers in the Wind River Range indicate an overall trend of recession since 1850, with only localized periods of growth. One study analyzed surface area change for 42 glaciers in the Wind River Range from 1985 to 2005, indicating significant reductions. 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 sought 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 were compared to two previous studies conducted in 1991, and 2006. Data correlation with previous studies revealed a continuing trend of recession over the past three decades. These findings may affect current understanding of glacial recession rates in the Wind River Range, and expand knowledge of the role of portable 100MHZ GPR antennae for remote alpine glacier studies.

American and French Revolutions Connections Abstract

Michael Hardy with Michael Brose
History
University of Wyoming
Oral Presentation

History Department *Laramie, WY*

This presentation examines the interconnectivity of the American Revolution and the French Revolution and explains how the former influenced aspects of the latter. This examination is a part of a greater exploration into how revolutions inspire additional revolutions across borders and time. Throughout modern history, revolutions have taken place in groupings. The American and French revolutions occurred in close succession; much of South America faced revolutionary situations between the 1950s and the 1980s with the Cuban and Nicaraguan revolutions being the only successful outcomes; the Color Revolution encompassed many ex-Soviet countries; and the countries of the Middle East experienced the Arab Spring in 2011. Understanding the interconnectivity of these revolutions, beginning with the American-French revolutionary connection, can lead to a better understanding of how current or future revolutions will affect their neighboring countries. Since revolutions themselves have recognizable patterns that can be studied, it is rational to believe that the connections between revolutions would have similar observable patterns.

The research of this concept includes in-depth studying of the two revolutions with increased focus on connected goals, people, and outcomes.

Mechanical Design of Teleoperated Rover Pair for NASA competition

Arron Harms, Robert Ressler, James Lamb, Kent Scarince, Cale McCormick, Matthew Love and Dr. Kevin Kilty
Department of Mechanical Engineering
University of Wyoming
Oral and Poster Presentation

Department of Mechanical Engineering, University of Wyoming *Burlington, VT*
Mountain View, WY
Lander, WY
Lewellen, NE
Laramie, WY
Evergreen, CO

The Cowboy Robotics team was selected as one of eight finalists to compete in the 2016 RASC-AL Robo-Ops Rover Design Competition, sponsored by NASA and managed by NIA. The competition asks undergraduate university teams to design a teleoperated rover to collect small, colored rock samples in the competition course at Johnson Space Center, while operated from UW. Our strategy involves using two independent rovers to traverse the difficult terrain and maximize the area covered during the one hour competition run. Our mechanical team has designed a pair of aluminum-framed rovers to fit within the volumetric constraints of 1x0.5x0.5 meters. They feature passive suspension linkages, known as a shrimp suspension, and are driven internally at the wheels. Each wheel is designed to support half of the maximum 45kg weight limit and can traverse sand, rocks, and hills while navigating the course. Samples will be collected by a commercial four-DOF arm, which was selected for its light weight and high lifting capacity. Samples will be acquired either by a custom pneumatic granular gripper or a mechanical claw and stored in an onboard collection bay. To view acquisition and navigation, a camera mast will self-deploy at the start of the competition to obtain a viewpoint greater than the initial 0.5 meter restriction. We believe our rovers will outmaneuver competitors and maximize our sample acquisition rate.

The Cross and the Arquebus: A Look at the German Reformation as a Revolution

Hunter Harp with Dr. Michael Brose
Department of History
University of Wyoming
Oral Presentation

UW Honors Program *Evanston, WY*

The Protestant Reformation, particularly the German Reformation led by Martin Luther, is often thought of as a theological discourse rather than a political revolution. Some of the key modern concepts that govern our lives today came as a direct result of the German Reformation's influence on the political institutions of sixteenth century Europe. Luther's appeal to the German nobility gave rise to the dominance of the nobility over the clergy in most matters regarding the running of the state, paving the way for absolute monarchies and centralized nation-states to dominate the political climate of Europe and subsequentially the world.

I have analyzed the works of Martin Luther, decrees by various political institutions and a number of secondary sources on both the German Reformation and revolutionary theorists to define what a revolution is and how the German Reformation fits that definition. The German Reformation should be considered as a political revolution.

Terrestrial carbon and nitrogen following massive scale beetle-caused forest mortality

Ada Margaret Shibley Harris and Urszula Norton
Plant Sciences
University of Wyoming

Oral

EPSCoR *Portland, OR*

Bark beetle epidemics have decimated at least 12 million hectares of lodgepole pine and Engelmann spruce forests in western North America. As a result, belowground biogeochemical processes are changing from sequestration and retention of carbon (C) and nitrogen (N) in form of tree vegetation biomass, soil and surface litter towards loss through multiple interrelated pathways and re-allocation to the recovering understory vegetation. The main objective was to assess terrestrial C and N in soil and forest vegetation understory four years after the infestation. The research was conducted at the "No Name" watershed in the Snowy Range Mountains in southeastern Wyoming between June and October 2015. The site was selected because of the evidence of partial infestation by beetle that left some of the trees alive. Plots were established in three slope locations (toeslope, footslope and shoulder) and within, in clusters of dead and live trees, all replicated five times. Data included total soil C and N in soil (0-10 cm), surface litter, plant roots and understory vegetation. All values added were termed "terrestrial C and N". In addition, soil pits, overstory tree size and density were described. Initial results showed the greatest differences in terrestrial C and N between dead tree clusters and live tree clusters in the shoulder position of the slope only (32% and 37%, respectively). This was driven mainly by greater accumulation of N rich litter suggesting that the post-beetle forest recovery may take longer at locations that are drier and dominated by lodgepole pine forests.

Atlantic City Pioneer Cemetery Recording Project

Ashley Harris with Professor Todd Guenther
Anthropology
Central Wyoming College

Oral Presentation

Honors/Anthropology CWC *Riverton, WY*

This paper discusses surface mapping of known grave sites in and around the 1860s gold-mining boom town of Atlantic City, Wyoming. The project began as a simple mapping project to define the extent of two pioneer cemeteries, the main cemetery and "The Children's Cemetery," and then developed to include research documenting some of the people buried there. Many of the grave markers and fences have disappeared over time but surface evidence of burials is visible. Several locally prominent people are still buried here, in contrast to the nearby South Pass City cemetery from which the desiccated and well-preserved remains of the most prominent people were removed to the Lander cemetery. The project was a public archaeology volunteer effort by CWC archaeology students whose assistance had been requested by the Atlantic City Historical Society and the BLM-Lander Field Office. The cemeteries are in the process of being fenced and public access granted by private land-owners.

PhotoHound: Using Geographic Location, Pictures, and Adventure to Create a New Application for Social Media

Keegan Haukaas, with Ruben Gamboa
Honors Program
University of Wyoming
Oral Presentation

Honors Program *Evanston, WY*

Social media applications have become ubiquitous and they can take up huge chunks of our time. Most social media apps are used at home and can sometimes keep people from venturing outside. Our app aims to give people the fun of social media while also giving them the excitement of discovering a new place. The app will allow users to create *PhotoCaches*, photos with geo-location information that other users can "complete". These PhotoCaches will be viewable and can be added to a to-do list. With this app, users will have to explore the location where the original PhotoCache was taken in order to complete said PhotoCache and receive the reward for completing it. Completing a PhotoCache involves discovering the location and position where the original photo was taken, and taking a similar photo. The new photo is evaluated through geographic location and orientation of the phone to determine if the photo is similar enough to the original. PhotoCaches are organized into separate, easily navigated streams. These streams include PhotoCaches near the user, popular PhotoCaches around the world, and PhotoCaches that pertain to interests the user has listed in their profile. With all the included features, we hope to produce an enjoyable user experience that will create a vibrant crowd-sourced game.

Removing Harmonic Noise from Geophysical Surface Nuclear Magnetic Resonance Measurements

Annette Hein with Dr. Andrew Parsekian
Department of Geology and Geophysics
University of Wyoming
Oral and Poster presentation

EPSCoR Community College Transition Program *Casper, WY*

Surface nuclear magnetic resonance (NMR) is a unique geophysical method due to its direct sensitivity to water. An NMR measurement produces a sounding that shows volumetric water content as a function of depth, which is useful for hydrogeology. A key limitation to overcome is the difficulty of obtaining usable data from surface NMR measurements in environments with anthropogenic electromagnetic noise, particularly constant frequency sources such as powerlines. Noise from these sources is typically much larger in magnitude than the desired NMR water signals, and it significantly corrupts the data. Previous research has explored a variety of methods for removing the noise, usually based on prior knowledge of the noise sources. Here, I take a different approach based on prior knowledge of the NMR water signal, which has a well-defined mathematical form. This form can be exploited to identify and remove noise from the data. I present a method of removing certain types of noise by utilizing frequency domain symmetry of surface NMR signals to reconstruct portions of the spectrum corrupted by frequency-domain peaks. This procedure is simple, does not introduce errors into the dataset, and requires no prior knowledge about the noise source. Modeling and field examples show that the noise-reduction procedure decreases the effects of powerline harmonics on the water content inversion and makes the inversion more accurate than before.

A pipeline for functional data analyses of bird vocalizations

Lewis W. Hein and Dr. Hayley C. Lanier
Department of Zoology and Physiology, University of Wyoming – Casper

Poster Presentation

Wyoming INBRE *Casper, WY*

Traditional methods of bird song analysis rely on segmenting the calls into distinct phrases and searching for the presence or absence of these phrases in different songs, or simply listening to the calls and anecdotally noting differences. Although these methods remain central to the analysis of bird vocalization, the advent of powerful computers in recent decades has enabled the use of newer methods such as functional data analysis (FDA). FDA extends many of the classical tests and descriptive statistics designed for random variables, including ANOVA, PCA, and CCA, to operate on functions. For this project we focused on building a computational pipeline for bird song analyses, from sound file management through extraction of relevant information from bird songs, alignment of song characteristics between individuals, smoothing methods, and statistical tests. We also examined ways to analyze and quantify differences in sound transmission between different environments. This methodology provides new ways of looking at bird call data, including standard statistical tests for multiple groups and analyses of correlation with other functional data, such as sound transmission measurements.

Assessing the drivers of spatial variation in house wren song

Lewis W. Hein and Dr. Hayley C. Lanier
Department of Zoology and Physiology, University of Wyoming – Casper

Oral Presentation

Wyoming INBRE *Casper, WY*

Birdsong is known to be variable geographically in many species but the underlying drivers of song divergence are not well understood. We have anecdotally observed this effect in Wyoming populations of the House Wren (*Troglodytes aedon*). For example, variation in songs may be due to gradual divergence of dialects between geographically distinct breeding populations, accumulation of genetic differences among populations, or habitat-driven differentiation based on sound transmission properties of the environment. In this project, we tested the similarity of various acoustic environments and evaluated House Wren (*Troglodytes aedon*) call similarity against distance and acoustic environment type using functional 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. These findings may help answer important questions about population diversity, boundaries for mating, and migration patterns.

American Indian Cultural Identity and Resiliency: Contributing Roles of Specific Values and Value Orientation

Jordan Hemingway and Dr. Walter Scott
Psychology Department, Honors Program
University of Wyoming

Oral Presentation

Honors Program *Eagle Butte, South Dakota*

A strong American Indian (AI) cultural identity is associated with fewer depressive symptoms (Rieckmann, Wadsworth, & Deyhle, 2004; Hamill, Scott, Dearing & Pepper, 2009). However, the meaning of possessing a strong AI cultural identity is unclear; further, the mechanisms by which it may promote fewer depressive symptoms remain unknown. This study investigates the relationship between AI cultural identity, individual values (i.e., traditional, power/materialism, security/hedonism) and value orientation (individualistic vs. collectivistic) as well as their relationship to depression symptoms. We predict that AI youth who endorse a stronger American Indian cultural identity will also endorse more traditional individual values and a more collectivistic value orientation. Further, we expect that the relationship between AI cultural identity and depressive experiences will be mediated by both individual traditional values and a collectivistic value orientation.

Approximately 200 youth attending elementary and high school (grades 4-8 and 9-12) on a North American Plains Reservation completed questionnaires assessing AI cultural identity (Oetting & Beauvais, 1990-1991), individual values (Mousseau, Scott, & Estes, in press) and individualistic and collectivistic value orientations (Triandis, 1996), as well as depressive experience (Children's Depression Inventory; Kovacs, 1992). Our hypotheses were examined by conducting correlational and path analyses. Best fit models for our data show that individual traditional values mediate some of the correlation between high cultural identity and lower depressive symptoms. High cultural identity also correlates with reduced depressive symptoms independently. Future directions and limitations are discussed.

Droplet Phase Ion-Ion Chemistry

Joshua Henry, Chemistry Undergraduate Student, Franco Basile Research Lab

The purpose of the research performed this semester was to replicate the results of a study undertaken by Cotham et al. and to change the method used to improve the measurement of the amino acid sequence of a peptide by Mass Spectromtery. The study in question used Collision Induced Dissociation (CID) to initiate a droplet phase ion/ion Schiff's base reaction followed by photodissociation with UV light. The reaction involved protonated peptides and a the reagent 4-formyl-1,3-benzenedisulfonic acid (FBDSA). The two solutions were brought together in the droplet phase via positive (peptide) and negative (FBDSA) electrospray. We are testing whether collision induced dissociation achieved via the quadrupole ion trap Mass Spectrometer's (our detector) MS/MS/MS capacity can be used in place of the two step CID plus photodissociation with UV light process. The expected outcome of our research is to determine the effectiveness of our approach in obtaining the peptide sequence while at the same time increasing the reaction rate to increase compatibility with an LC separation time frame.. An underlying goal is potentially find a way to sequence peptides that are produced by digestion methods other that trypsin. If this was successful it could facilitate viewing of larger peptides and decrease the analysis time for protein identification by MS.

Controlled Growth of Copper Oxide Nano-Wires through Direct Oxidation

JOANN HILMAN, RAVI NEUPANE, ANDREW J. YOST, TEYU CHIEN
Department of Physics and Astronomy
University of Wyoming

Oral and Poster presentation

Wyoming NASA Space Grant Consortium *Laramie, Wy*

Copper oxides, both Cu2O and CuO, have many applications in solar cells, sensors, and nano-electronics. The properties of the copper oxides are further influenced by the dimension of the materials, especially when made in nanoscale. In particular, the properties of the copper oxide nanowires could be tuned by their structures, lengths, and widths. While several methods have been reported to grow nanowires, direct oxidation is arguably the most economical one. This research examines the effects of oxidization duration and temperature in dry air environment on the development of copper oxide nanowires in order to achieve cost effective controllable growth. Using the direct oxidation method in dry air we have demonstrated growth of CuO nano-wires at temperatures as low as 300 C and as short as 1hr. Furthermore we have observed that the lengths and diameters of the CuO NWs can be controlled by the duration and temperature of the oxidation process.

The motivation for political attitudes: The relationship between behavioral approach and inhibition systems and political orientation

Theresa Holmes and Dr. Meredith Minear
Psychology
University of Wyoming

Oral and poster presentation

Honors *Laramie, Wyoming*

Issues surrounding the upcoming presidential election season highlight the need for a better understanding of the relationship between human motivation and political orientation. The neurophysiological trait systems of approach (BAS) and avoidance (BIS) are crucial to understanding human motivation (Gable, Mechin, Hicks, and Adams, 2015). The behavioral inhibition system (BIS) is sensitivity to punishment, non-reward, and unusual stimuli (Gray, 1994). The behavioral activation system (BAS) is motivated by positive and negative reinforcement, and higher positive affectivity. In this two-part study, undergraduate students from the University of Wyoming (n=317) were measured on approach/avoidance tendencies and political orientation. BAS-drive was scored separately for the purpose of this study. Across both studies, BAS-drive was positively correlated with conservatism. BIS was not significantly correlated with BIS or BAS. BAS was only correlated with conservatism in the second study when the moral motive items of self-reliance and self-restraint were controlled. Implications about moral motives and politics are discussed.

Enhanced Oil Recovery Planning

Brennan Holowaty, Bryson Jones, Trent Kostenuk,
Quentin Stronski, Tyson Trail and Ryan Zuchetto
Dr. Brian Toelle
Department of Petroleum Engineering
University of Wyoming

Oral Presentation

Department of Petroleum Engineering *Calgary, AB*

When a virgin oil field is first produced, driving forces such as water drive, gas cap expansion or solution gas drive mechanisms will naturally produce the reservoir for some time. However, once this driving force is exhausted, other means are necessary to maximize the project's economics. At this juncture, secondary recovery and enhanced oil recovery (EOR) methods are considered. This project is focused on utilizing petroleum engineering software in developing static and dynamic reservoir models and exploring various possibilities for secondary recovery and EOR scenarios. The project team will use the modelling results to recommend detailed EOR planning initiatives focused on productivity and economics for the "Candy Draw" field in Northeastern Wyoming.

Assessing Toddler Communication Using the CFCS and FOCUS

Ashley Hopkin with Dr. Mary Jo Cooley Hidecker
Division of Communication Disorders
University of Wyoming

Oral Presentation

Honors Program *Greybull, WY*

The Communication Function Classification System (CFCS) and the Focus on the Outcomes of Communication Under Six (FOCUS) are two instruments that look at the communication effectiveness in all forms. The CFCS consists of five levels of communication performance with familiar and unfamiliar partners, from Level I (most functional) to Level V (least functional). FOCUS is a questionnaire which uses a seven-point categorical response scale to measure changes in young children's communication. In pilot data of 32 children, ages 24 to 60 months, communication performance of children older than 31 months were generally classified as CFCS Level I. However, the relationship between CFCS levels, FOCUS scores, and age needs further study. The purpose of the study is to determine the age range and FOCUS outcomes of typically-developing toddlers at each CFCS level. Two researchers observed 37 toddlers, ages 12 to 45 months, interacting with familiar and unfamiliar communication partners (e.g., teachers, peers) in 30 minute observations. In five-minute intervals, research team members individually rated the child's communication performance and overall CFCS level. A parent and a teacher of each child were asked to complete the CFCS and the FOCUS questionnaire. The results for this study showed a positive correlation between toddler age and CFCS Level. At 36 months 80% of children communicated at CFCS Level I and 90% of children communicated at CFCS Level I or Level II. Inter-rater reliability was excellent with a weighted kappa of .92. FOCUS results are currently being analyzed for score and topic responses.

Exercise to Energy: A Bicycle-Powered Charger

Alexandra Howell
Partners: Daylon Roistch and Taylor Wollert
Adviser: Dr. Kevin Kilty
Department of Mechanical and Energy Systems Engineering
Honors Program
University of Wyoming

Oral Presentation

Bicycles offer effective means of exercise and are popular forms of transportation. One fault of the current use of bicycles is that the mechanical energy generated by a moving bicycle is often wasted in the form of friction and expended heat. This is troubling in the modern world since energy is deeply integrated into peoples' everyday lives – one of the most common energy consumers being small electrical devices such as cellphones and iPods. Our senior design project addresses this issue via a bicycle-powered charging system designed to operate similar to a normal commercial bicycle trainer. The charging system will be composed of a trainer and charging system. The trainer will be based on a standard retail bicycle trainer to enable easy transition from road use for transportation and recreation to stationary use for exercise. The charging system will be capable of charging a 12 V battery pack, which will then be able to charge multiple 5 V devices simultaneously. For the final product, the ATV generator will be connected to a removable battery pack capable of charging during system operation and storage for use after operation. The prototype we create will utilize a purchased trainer for design, but, since this prototype is intended to evolve into a commercial product that is premade and easy to self-install, we also will complete the design and cost estimation of a commercial frame. For this presentation, I will expound on my individual contributions, knowledge and learning experienced during the completion of this engineering senior design group project.

Exercise to Energy: A Bicycle-Powered Charger

Alex Howell, Daylon Roitsch, and Taylor Wollert with Dr. Kevin Kilty
Department of Mechanical Engineering
University of Wyoming

Oral and Poster Presentation

Department of Mechanical Engineering *Colorado Springs, CO*
Morril, NE
Lingle, WY

Bicycles offer effective means of exercise and are popular forms of transportation. One fault of the current use of bicycles is that the mechanical energy generated by a moving bicycle is often wasted in the form of friction and expended heat. This is troubling in the modern world since energy is deeply integrated into peoples' everyday lives – one of the most common energy consumers being small electrical devices such as cellphones. Our senior design project addresses this issue via a bicycle-powered charging system designed to operate similar to a normal commercial bicycle trainer. Our system is composed of a trainer and charging system. The trainer is based on a standard retail bicycle trainer to enable easy transition from road use to stationary use. The charging system will be capable of charging a 12 V battery pack, which will then be able to charge multiple 5 V devices simultaneously. The entire system is mounted onto a bicycle trainer frame. The bicycle wheel then connects to a generator (a permanent magnet ATV magneto). This AC generator and the variable output of the cyclist will pass through a bridge rectifier and a buck-boost power inverter, which connects to a removable battery pack capable of charging during system operation and stores charge for use after operation. The prototype we create will utilize a purchased trainer for design, but, this prototype is intended to evolve into a commercial product. We will discuss our design and estimate cost of a commercial product.

Methods for Obtaining High Frequency $^{13}CO_2$ measurements

Bridger Huhn, Dr. Brent Ewers
Department of Botany
University of Wyoming
Oral Presentation

The Experimental Program to Stimulate Competitive Research *Laramie, WY*
Wyoming Center for Environmental Hydrology and Geophysics *Laramie, WY*

The goal for this research project is to understand how plants control water use. This is crucial when accounting for the water availability of a plant and drought analysis. A plants ability to assimilate mass in comparison to how much water it uses is known as water use efficiency (WUE). A current method of determining WUE measures heavy carbon (^{13}C) to light carbon (^{12}C) ratios ($\delta^{13}C$) that come out of a plant in the form of carbon dioxide. However this method doesn't account for some metabolic processes that may affect $\delta^{13}C$. Accurate WUE data is important in understanding local and global carbon cycles and watersheds. Our study differs from other studies on this topic by accounting for all the carbon in a plant by using a hydroponic method I developed to grow the plants. We will use hydroponic plant chamber and controlled air sources to grow *Brassica rapa* (a small herbaceous plant) and measure $\delta^{13}C$ values. This system will also allow us to conduct a complete carbon budget of this plant. This experiment will improve our understanding of mountain front hydrology, as well as how disturbances affect plants that affect water flux. It can also improve integrated modeling of the fate and transport of water.

The Effects of Exercise on Diabetes Mellitus Type 2

Kayla Hungerford, Dr. Pamela Langer
Department of Zoology and Physiology
University of Wyoming
Oral Presentation

Department of Zoology and Physiology *Laramie, WY*

Diagnosis of diabetes mellitus type 2 is slowly rising in the United States, with poor eating habits and sedentary lifestyles increase the number of incidences. Medications are used to treat individual symptoms of diabetes. Society ignores the positive effect exercise has on all aspects of the disease and improving quality of life. Research previously completed demonstrates: exercise decreases blood pressure, adipose tissue levels, resting blood glucose, insulin resistance, immune responses, and inflammatory factors. These changes in physiology have a direct link to alleviating symptoms and complications diabetes mellitus type 2. While medications and exercise both aim to treat this disease, exercise is a lifestyle change that the body does not become resistant to. This gathering of previous research aims to influence the increase of exercise and nutrition as a viable prescription for the management and cure of diabetes mellitus type 2.

Environmental sources of novel antibiotic-producing bacteria

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

INBRE *Powell, WY*

The ability of pathogenic bacteria to be selected for antibiotic-resistant traits, as demonstrated by strains of methicillin-resistant *Staphylococcus aureus* and carbepenem-resistant *Enterobacteriaceae*, is concerning in the medical field. Several reasons, including economic factors, have led to the paucity of new antibiotics, which nonetheless remain an important treatment option for health care providers. We have focused our investigation of possible antibiotic-producing microbes on two main environmental sources – marshland soil and water and compost piles, two of the latter hosting a variety of pathogen-inhibiting facultative thermophiles that grew robustly at 60^0C and weakly at 37^0C. Identification of these facultative thermophiles is ongoing using PCR amplification of the 16S ribosomal RNA gene. Additionally, using organic chemistry techniques, we have isolated a pure prodigiosin-like compound from *Serratia plymuthica* grown from the pond water, which inhibits *S. aureus*. Further characterization of the inhibitory isolate is ongoing using chemical spectroscopy techniques including IR spectroscopy and NMR.

Reactions of Atomic Hydrogen with Isotopes of Nitric Oxide in Solid Parahydrogen

Manford Hurley and Dr. David T. Anderson
Department of Chemistry
University of Wyoming

Oral Presentation

Honors *Casper, Wyoming*

Cold chemistry is becoming a hot area of research as a way to test fundamental principles about chemical reactions governed by quantum mechanics. Typically chemists think of molecules with ball and stick models, but at extremely low temperatures molecules can start to behave like waves. Molecules at very low temperatures (2-4 K) do not have much energy with which to react. Classically, at these low temperatures, only reactions with no barrier to reaction should take place. However, recent experiments in the Anderson group have shown that the reaction of hydrogen atoms (H) with nitric oxide (NO) can produce both HNO and NOH. This is surprising because the reaction to form HNO is barrierless, whereas the reaction that forms NOH has a significant barrier. The fact that NOH is produced in these low temperature reactions is due to quantum mechanical effects or the H atoms behaving as matter waves. I am helping analyze the Fourier Transform Infrared (FTIR) spectra that are used to follow the kinetics (how fast reactions occur) of these reactions. I am also analyzing the FTIR spectra of different isotopes of nitric oxide (^{14}NO and ^{15}NO) to better characterize the rotational dynamics of the NO reagent. In the Born-Oppenheimer approximation, both of these isotopes of NO should react similarly at low temperature and I am helping to analyze the FTIR spectra to determine if this is true.

Synthesis of New Nickel Catalyst for use in Polymerization Reactions

Matthew Hurlock, Dr. Dean Roddick
Department of Chemistry
University of Wyoming
Oral Presentation

University of Wyoming Honors Program *Laramie, WY*

It is undeniable the effect that plastics have had on the world and polymerization reactions make this all possible. Polymerization reactions are some of the most useful reactions conducted today**.** A polymerization reaction is a process that takes many small molecules and combines them into long repeating chains or branching networks called polymers. Such reactions are used commercially to synthesize many polymers used in the manufacturing of plastics. These reactions can be done through different methods, one of which is through the use of a catalyst. These catalysts reduced the energy and temperatures required to make polymers and can increase the speed of synthesis. The types of catalysts generally used for polymerization reaction contain metals which is a huge source of their catalytic abilities. These metals tend to be Titanium and Vanadium, which have high costs. Additional functional groups can change the reactivity of the compounds. Understanding and controlling catalyst reactivity is very important. My research focused on the synthesis of Nickel containing catalyst compounds with fluoro alkyl phosphine groups. The synthesis of the catalyst has proved to be the most challenging step. I have synthesized the desired nickel compound and currently in the process of conducting the reaction to add the fluoro alkyl phosphine groups to it. If this can be achieved then I will test the reactivity of the compounds and its usefulness in polymerization reactions.

Understanding Cell Polarity in *Agrobacterium Fabrum*

Rebecca Iacovetto with Dr. Grant Bowman
Department of Molecular Biology
University of Wyoming
Poster Presentation

I.N.B.R.E *Laramie, Wy*

In *Alphaproteobateria,* the cell poles are sites of accumulation for many proteins, including cell cycle regulators and factors that are associated with chromosomal origins of replication. Nearly all *Alphaproteobacteria* express a polar organizing protein called PopZ, which is necessary for anchoring the replication origins to the poles and recruiting some regulatory proteins that control gene expression. Without PopZ, chromosome segregation is impaired and cell division is abnormal. Time-lapse fluorescence microscopy in *Agrobacterium fabrum* has showed that PopZ accumulation undergoes a cell-cycle dependent transition from old pole to new pole immediately following cell division. This is followed by the appearance of at least two regulatory histidine kinases at the old pole. We are comparing these cell-cycle dependent localization patterns to a D*popZ* knockout strain. Our experiments are providing insight on the sub-cellular organization of cell cycle regulators in the *Agrobacterium* cell cycle, and also informing us about the role of the polar organizing protein PopZ.

Growth of EuO films on Si using Pulsed Laser Deposition

Vivek S. Jain and Dr. Jinke Tang
Department of Physics & Astronomy
University of Wyoming

Oral & Poster Presentation

Honors, EPSCoR, WRSP, Department of Physics & Astronomy *Bangalore, India*

Epitaxial monolayers of europium monoxide (EuO) deposited on silicon (Si) wafers are suited for spintronic applications such as adding spin filter tunneling and spin current to Si technology, and for probing phenomena like Anomalous Hall effect and Topological Hall effect. However, the innate chemical reactivity of europium (Eu) and Si prevents a direct synthesis of EuO by pulsed laser deposition technique, without significant contamination of the EuO/Si interface and degradation of the EuO thin film. Silicon oxides (SiO_2) on the surface of Si substrates, partial pressure of oxygen (O_2) gas and water vapors in the vacuum chamber act as contaminants. Techniques like standard wet etching process, thermal annealing, and decomposition of (SiO_2) by the bombardment of metal ions, and their effectiveness is studied using the X-Ray diffraction (XRD) system. Our goal is one-process in situ integration of spin-functional magnetic oxides seamless on Si wafers. Also the mechanism for the ferromagnetic order in oxygen-deficient europium monoxide (EuO_{1-x}) at temperatures higher than 69K (the Curie temperature of stoichiometric EuO remains controversial. We have investigated the magnetization of thin (EuO_{1-x}) films prepared via PLD as a function of (emu) vs (K).

Understanding overwinter food-cache architecture in a montane mammal

Rhiannon Jakopak[1], Embere Hall[2], Dr. Anna Chalfoun[3]
[1]Department of Zoology and Physiology, [2] Wyoming Cooperative Fish and Wildlife Research Unit, Department of Zoology and Physiology, [3]U.S. Geological Survey, Wyoming Cooperative Fish and Wildlife Research Unit, & Department of Zoology and Physiology
University of Wyoming

Oral Presentation

EPSCoR *Scotland, SD*

Many animals store food to combat future times of reduced food availability. Careful arrangement of food within stores may facilitate physical integrity of the cache, improve food preservation, or ensure that cached resources meet future nutritional demands. Although many studies have addressed food caching as an energy-management strategy, few have explored whether a systematic arrangement exists within individual food stores. We used the American pika (*Ochotona princeps*), a food-caching, montane mammal to evaluate the influence of individual and environmental factors on variation in haypile (cache) structure. We tested hypotheses regarding factors that influence cache structure, including total haypile volume, number of haypiles per individual, and available vegetation. Since higher quality food caches may facilitate increased overwinter survival, we also evaluated the nutritional content of cached vegetation. We defined structure as the presence of horizontal layers composed of homogeneous plant functional-groups. Fifty three percent of the 62 caches we sampled showed evidence of within-cache layering. We observed a positive relationship between haypile volume and the probability of layering. The number of haypiles per individual and the amount of available vegetation were non-significant. Haypiles that contained layers were of higher nutritional quality, suggesting that specific structural arrangements may provide individuals with enhanced food stores. Our study is the first to document a specific architectural configuration in mammalian food caches, in conjunction with metrics of cache quality. Understanding the extent to which animals organize caches may provide insight to the complexity of food-caching strategies employed in variable environments.

Assessing a critical assumption and providing context to remotely sensed data for ecological studies

Rhiannon Jakopak[1], Ellen Aikens[2], Dr. Kevin Monteith[3]
[1]Department of Zoology and Physiology, [2]Wyoming Cooperative Fish and Wildlife Research Unit & Department of Zoology and Physiology, [3]Haub School of Environment and Natural Resources, Wyoming Cooperative Fish & Wildlife Research Unit, Department of Zoology and Physiology
University of Wyoming

Oral presentation

Wyoming Research Scholars Program *Scotland, SD*

Remotely sensed data have allowed researchers to examine ecological processes at a variety of spatial and temporal scales that otherwise would be prohibitively expensive via traditional on-the-ground studies. Ecological processes such as ungulate migration, plant phenology, and factors that underpin animal movement can be examined using remotely sensed data, such as the Normalized Difference Vegetation Index (NDVI). Using NDVI as a proxy for vegetation biomass and plant phenology, however, hinges on the rarely verified assumption that remotely sensed data accurately represent on-the-ground vegetation. We addressed this knowledge gap by comparing vegetation biomass calculated from both large-scale NDVI (acquired via satellite-derived remote sensing) and fine-scale NDVI (acquired from modified point-and-shoot cameras) with measures of on-the-ground vegetation biomass in multiple habitat types. Habitat types included conifer forests, deciduous forests, grass-, forb-, and shrub-dominated areas across mule deer (*Odocoileus hemionus*) summer ranges and stopover sites in the Wyoming Range, western Wyoming, USA. Preliminary analyses indicate that the relationship between on-the-ground-biomass and camera-derived biomass estimates varies between habitat type and individual site. The observed variation highlights the importance of calibrating relationships between remotely sensed and on-the-ground data in a specific study area. Verifying the assumptions of remotely sensed data in ecological studies will strengthen research intended to guide management efforts for species affected by climate, anthropogenic influences and variation in phenological patterns.

Evaluating the spectral separability of crop classes in multi-temporal Landsat imagery

Rhiannon Jakopak[1], Dr. Ramesh Sivanpillai[2]
[1] Department of Zoology and Physiology, [2]Department of Botany & WyGISC
University of Wyoming

Oral presentation

WyomingView *Scotland, SD*

Remotely sensed data are used to identify patterns and land cover type over broad temporal and spatial scales, often at relatively low cost. Annual crop maps are one of the land cover products of importance. Mapping forage crop types in Wyoming is challenging because of inter- and intra-annual variability caused by differences in precipitation, temperature, and timing of within-season harvests. This variability results in spectral overlap between forage crops, thereby decreasing the accuracy of the crop maps. In this study, the spectral separability of corn and alfalfa hay fields in Torrington, Wyoming, USA, were analyzed using Landsat 8 data acquired from 2013 – 2015 growing seasons. Spectral reflectance values for each crop were obtained from Landsat images. Cluster analyses, widely used multivariate statistics, were used to determine whether these crops can be separated based on their spectral reflectance values. Results from this study will provide insights about the optimal time of the imagery employed to distinguish these forage crops, which could improve the accuracy of crop maps produced for Wyoming.

Lost Dome Enhanced Oil Recovery Planning

Evan Jeannotte, Xiaotian Jia, Alex Powers, Kurtis Raber and Jason Webb, Dr. Brian Toelle
Department of Petroleum Engineering
University of Wyoming

Oral Presentation

Department of Petroleum Engineering

Fort St. John, BC
Dongying, China
Greybull, WY
Belle Fourche, SD

Our senior design project consisted of selecting a field from the Enhanced Oil Recovery Institute (EORI) database and performing a reservoir characterization and simulation in order to develop an optimal enhanced oil recovery (EOR) scenario. Thus, the Lost Dome Field was selected for analysis. The Lost Dome Field is located in the Wind River Basin in central Wyoming and contains six producing oil wells. A large focus was given to project planning and was accomplished through the use of workflow diagrams, Gantt charts, and risk analyses. The data from the EORI was reviewed, interpreted, and inputted into reservoir modeling software programs. These processes allowed our team to correctly characterize the Lost Dome Field, perform a reservoir simulation, and ultimately recommend the best enhanced oil recovery scenario. The progression of the senior design course provided our team with real-world project planning experience and execution while being introduced to new ideas and practices.

SAE Baja Suspension

Trey Jebens and Kelby Walker, Dr. Robert Erikson
Department of Mechanical Engineering
University of Wyoming

Oral and Poster Presentation

SAE Collegiate Design Series and Department of Mechanical Engineering *Laramie, Wyoming*

Each year the University of Wyoming Mechanical Engineering students are given the opportunity to participate in the SAE Baja design competition as a senior design project. Our group has been tasked with the job of designing the front and rear suspension. In order to succeed at competition, the suspension needs to be able to function over many different terrains while being light weight, robust, and safe. Our senior design project focused on substantially improving the functionality of the previous year's design. Research on aspects of the suspension such as; camber, caster, toe, dynamic articulation, and stress/force analysis of each component lead us to design a suspension that is readily adjustable and structurally sound. Our objectives consisted of increasing the vehicle's ground clearance and range of travel, while improving traction and stability. Thus, allowing the vehicle to have optimal performance on every type of terrain. Optimal suspension performance is crucial to the success of the University of Wyoming's Baja at the SAE International competition.

The First Measurements of Atmospheric Stability above the Wyoming Infrared Observatory

Logan Jensen and Gabriel Miller, Dr. Henry Kobulnicky
Department of Physics and Astronomy
University of Wyoming

Oral Presentation

EPSCoR and the Wyoming Space Grant Consortium *Greybull, WY*
Casper, WY

Irregularities in the atmosphere (i.e. turbulence) pose a challenge to ground-based observational astronomy. The effects of these conditions are colloquially referred to as "seeing". When the seeing conditions are good, a telescope produces bright, sharp images, but when seeing is poor images can appear blurred and distorted. In order to ensure the most accurate data, it is crucial to quantify these effects and compensate for them. The Differential Image Motion Monitor (DIMM) is a modified telescope that takes images with very short exposure times to capture the apparent motion of an object due to atmospheric turbulence. From these images, a seeing value can be calculated. With these data, corrections can be made in order to produce greater accuracy and resolution in astronomical images.

We have constructed a DIMM and utilized it to collect 20 nights of seeing data from September to October 2015 at the Wyoming Infrared Observatory (WIRO). These data will be compared to measurements made by the observatory telescope itself. From this data we will measure the quality of seeing at WIRO and quantify other factors that may be limiting its capabilities. These are the first measurements of their kind for the WIRO/Mt. Jelm region, and are a prerequisite to the future installation of an adaptive optics system at WIRO capable of correcting for atmospheric irregularities automatically, or inform the design of an entirely new observatory. The DIMM can be permanently installed on site to continue collecting seeing data into the future.

The functional characterization of ApAFP752, an insect antifreeze protein

Hannah L Jernigan, Colleen J. Ricci, K. Wade Elliott, Shelby E. Follett, Krisztina Varga
Department of Chemistry
University of Wyoming

Poster

Wyoming INBRE *Cheyenne, WY*

Antifreeze proteins are a type of ice structuring protein found in arctic fish, insects, bacteria, and plants. These proteins function by binding to an ice crystal and restricting its growth. This phenomena is called thermal hysteresis. Antifreeze proteins have potential in a variety of applications concerning cryoprotection and cryopreservation. ApAFP752 is a 9.4-kDa hyperactive insect antifreeze protein that is found in the desert beetle *Anatolica polita.* We are optimizing some of the expression and purification conditions of ApAFP752 and investigating its potential in cryopreservation.

Propaganda and the Youth during the Chinese Revolution

Coty Johnson, Dr. Michael Brose
Department of History
University of Wyoming

Oral Presentation

Department of History *Mobridge, SD*

Chinese youth were greatly influenced by the revolutionary images presented by Mao Zedong during the Chinese Revolution of 1966. My research aims to evaluate the different types of propaganda used by Mao Zedong and his constituents, such as posters, songs, and the infamous Little Red Book, in order to understand how it contributed to the mass movement of millions of Chinese youth during the Chinese Revolution. Further, I will attempt to demonstrate how the use of educational propaganda fueled the actions of the Red Guards by encouraging the removal of Western influence and the violent attacks on China's intellectual citizens. This paper will also explore the various interpretations of Maoist propaganda and develop an interpretation as to why the revolutionary movement made such an impact on the youth of the time. By examining the various propaganda methods implemented during this period, I hope to gain an understanding of its use as a strategy to recruit a large portion of the population in the revolutionary movements.

I Own You: Attitudes About Women, Property, and Rape

Jamie Johnson: Dr. Dana Pertermann
Department of Anthropology
Western Wyoming Community College

Oral

Honors *Lyman, Wyoming*

In an online article posted in 2015, a solution to rape was proposed: make rape legal on private property. Numerous people have spoken out negatively about his comments, however, he has some supporters. The goal of this research project is to investigate the attitudes and opinions held by people on their beliefs on rape and sexual activity. An anonymous survey will be shared to as many people as possible, to gain multiple insights from as many people as possible. The survey will be distributed through sections of science students at Western Wyoming Community College. The survey asks general questions about rape, provides the FBI's definition of rape, and asks the survey taker's age and area that they live in. These results will be interpreted and a conclusions will be drawn as to attitudes about women, property, and sex. This research project will attempt to show a correlation between men and women's opinion of rape, their gender, and location.

Basic Analysis of the Baraćeve Šplije Human Remains

Fallon Judkins, Dr. Rick Weathermon
Department of Anthropology
University of Wyoming

Oral Presentation

Department of Anthropology *Casper, WY*

Baraćeve Šplije are a set of caves located in the Rakovica reigon of Croatia that house a large assortment of human remains. There is a story among locals of this area that says a village living in the valley closest to the caves would sometimes take refuge in them from Ottoman raiders, however at one point they were discovered and the soldiers massacred all inside the cave. In recent years locals have also developed a theory that perhaps the cave was used for funerary purposes and was not a massacre site. No evidence has been found to support either of these stories, however 368 individual bones where excavated from the cave in 2015 by the University of Wyoming in cooperation with Karlovac archaeologists and speleologists which where then sent back to the University of Wyoming for a basic analysis to be completed.

Zar Spirit Possession: Muslim Women in Ancient and Modern History

Katherine Kasckow, Dr. Marianne Kamp
Department of History
University of Wyoming

Oral

Department of History *Bonner Springs, KS*

Hearing the word "spirit" in western culture leads the reader to associate the word with fictitious thoughts flitting through the human mind due to the western belief that spirits are part of the fabled supernatural and thus not part of the rational world. This is not true in some cultures, especially in Zar culture where spirit possession is seen as a frequent occurrence and the goal is to relieve the possessed through acts of dancing and feasting. Zar is seen in many regions where Islam is the dominant religion, where the existence of spirits is even noted in many of the religious texts including the Qur'an and the Hadith. Zar possession is not the same as malevolent spirits found within the Quran and is not tied exclusively to Islam, rather it offers an alternative worship to women who are not welcomed in masculine forms of worship such as mosques. In this paper, I will analyze Zar culture throughout regions where Islam is the dominant religion and examine that due to women's exclusion from the traditional mode of spiritual guidance from mosques and other male dominated spheres, the alternative action of Zar spirit possession and group healing is used to form communities that uplift women's confidence, cure illnesses of the mind, and offer support for the women excluded from a male dominated environment.

MAX Phase Metal Carbides

Sean Kasprisin, Prof. Brian Leonard
Department of Chemistry
University of Wyoming

Oral Presentation

EPSCoR *Lino Lakes, Minnesota*

MAX Phase metal carbides are metal carbides with an additional element such as Aluminum or Silicon. The structure of MAX Phase metal carbides is similar to that of graphene with a layered structure of the metal carbide and the additional element. Metal Carbides in general have been researched as an alternative catalyst source for the reduction of oxygen in the hydrogen/oxygen reduction/oxidation reaction. Currently the best catalyst for the reduction of oxygen is platinum which is expense and not in abundant amounts. The research I have conducted under the supervision of Professor Brian Leonard was to synthesis clean samples of Titanium Aluminum Carbide by annealing the starting materials along with a salt solution with a low eutectic point in order to find a simple manner in which to synthesis the MAX phase metal carbide. Once a MAX phase metal carbide is synthesized, the additional element can be removed to create a two-dimensional structure to increase the surface area of the metal carbide and possibly increase the catalytic abilities of the metal carbide.

Fully Virtual Multiplayer Survival Game

Sabrina Kaufman, Graham Marousek, Todd Tingey, Chris Plasencio, Alanna Larson
Mentor: Ruben Gamboa
Department of Computer Science
University of Wyoming

Oral and Poster Presentation

Department of Computer Science *Laramie, WY*
Rock Springs, WY
Jackson Hole, WY
Wheatland, WY
Ely, MN

Virtual Reality has recently become more readily available for developers to use their critical thinking and creativity to design a project themselves. This project's goals were to change the rules of how games are played, and give the player more choices with their controllers than just a computer screen and a handheld controller. Instead, we wanted to use the Oculus DK2, the Leap Motion controller, and the Xbox Kinect V2 controller to create a game that allowed the gamer to fully immerse themselves in a game of our own design. This project focused on using the Leap Motion controller most of all, so we developed several gestures using the fine motor controls that the Leap Motion registers. Our project has the capability of accurately tracking the users' hands as controls in a fully virtual environment over a local network against friends. Players can damage and 'kill' each other's avatars, all in the scope of a virtual world. Our project has expanded the ways that users can interact with a virtual world. We hope that it may pave the way for further expansion and that more detailed, professionally made games can be produced with our work. Hopefully echoes of our project will be present in virtual reality games of the future.

Persnickety Parents: How Parental Care Behavior affects Songbird Nest Success

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

Poster Presentation

EPSCoR *Cody, WY*

Nest attentiveness during incubation 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. Previous work with another sagebrush obligate songbird (Brewer's Sparrow, *Spizella breweri*) has shown that this species can adjust their parental care behavior following failed nesting attempts. We expect that Sage Thrasher (*Oreoscoptes montanus*) nest survival may be affected by parental care behaviors as well. Specifically, we predict that birds with successful broods will take fewer trips to the nest and have longer bout lengths, thus reducing the likelihood that their nest will be discovered by predators. We analyzed parental care videos from Sage Thrasher nests during the third trimester of incubation to assess differences in parental behaviors between successful and unsuccessful nesting attempts. We assessed on and off bout length and total nest attentiveness, as well as number of parental switches per hour. Videos were recorded from May-August 2015 at sites in the Upper Green River Basin, WY as part of a larger study of sagebrush obligate songbird nest success. Identifying the abilities of sagebrush obligate songbirds such as Sage Thrashers to mitigate predation risk with their behavior will allow us to better understand how these species respond to ongoing human disturbance, such as energy development, which alters their available habitat and predator communities.

BTEXterminator

Juliet Kiyai-Bartlett , Cody Sackett, Christine Munoz, Dr. Karen Wawrousek
Chemical Engineering, College of Engineering & Applied Science
University of Wyoming

Oral

Department of Chemical *Newcastle, WY / Green River, WY / Eldoret, Kenya*

During oil and gas operations, millions of barrels of water are forced to the surface; this water is called produced water. Produced water contains many compounds, namely BTEX (benzene, toluene, ethylbenzene, and xylene). BTEXterminator is a co-culture of two *Pseudomonas putida* strains that have been genetically modified to degrade BTEX, as well as their respective isomers. This bioremediation product is unique in its ability to perform in unaltered produced water, which is incredibly challenging for a majority of organisms due to the harsh conditions. A simple preliminary genetic modification step is done to both pure *P. putida* strains before introducing them to each other in a co-culture to increase efficiency of BTEX degradation. The metabolic pathways responsible for breaking down the organic carbon compounds in BTEX are known as the TOL and TOD pathways. Individually, neither of the pathways can degrade all of the components BTEX, but together, they are complementary in degrading all components of BTEX. Each individual strain naturally contains one of the pathways. A plasmid is inserted into each strain in order to force both organisms to actively express both pathways. After successful modification is achieved, the co-culture will be established and cultivated up to scale via free cellular suspension. The product may then be transplanted into a reactor where it will be ready to treat produced water.

Disaggregation of Catchment Runoff Isotopic Data to Determine Water Source Ratios and Characteristics within the Snowy Mountain Range

Phillip H. Klebba-Dr. Scott N. Miller
Ecosystem Science and Management
University of Wyoming

Oral Presentation

EPSCoR Research Program, *Sheridan, WY*

Traditionally, separation of streamflow into its component parts, i.e. base flow, snow-water, surface water, and rain-water has relied upon mechanical separation of the hydrograph based on base flow amount prior to and post snowmelt. Generally a line between base flow amounts before and after snowmelt is constructed upon the hydrograph and utilized to quantify base flow during the snowmelt time period. Such an approach is entirely theoretical and cannot be relied solely upon to determine the respective contributions of base flow and snowmelt to stream runoff. Isotope data is one empirical method to check the oft-made assumption of hydrograph separation. Oxygen and hydrogen isotopes are naturally occurring and can be quantified via isotopic analysis. These isotopes can be utilized to separate streamflow into the individual source water ratios due to fractionation, a process wherein environmental conditions affect isotopic concentration resulting in distinct signals. This project utilizes biweekly sampling of streamflow at ten sites in the Snowy Mountain Range coupled with streamflow hydrograph data for each site in order to check the standard method of hydrograph separation widely employed. Furthermore, the project provides information about isotopic characteristics based upon environmental factors and the amount of fractionation of streamflow at each sampling site.

Ni Doped Lead Iodide Organometallic Perovskites

Justus Kornkven Adviser: Dr. TeYu Chien
Physics Department
University of Wyoming

(Oral)

EPSCoR *Fairbanks, Alaska*

Multiferroic phase (ferroelectric and ferromagnetic phases simultaneously exist) is rare mainly due to their conventional competing nature – one favors empty d orbitals while the other favors partially filled d orbital. One approach to achieve multiferroic materials is to separate the origin of the ferroelectric and ferromagnetic phases. Organometallic halide perovskites showed ferroelectric phase in low temperature due to the electric dipole nature of the CH3NH3+ molecules in the crystals. Here, the organometallic halide perovskites were doped with magnetic elements to induce the ferromagnetism. In particular, MA lead iodide perovskite thin film doped with nickel in varying concentrations were synthesized by a single step deposition method. The crystal structure and the ferromagnetism were characterized with physical property measurement system (PPMS) and x-ray diffractometer (XRD); while the film thickness and the elemental composition were analyzed by SEM. Preliminary results indicate that the ferromagnetism is induced by the Ni dopants.

SMAW Auto Feed Stinger

Jacob Kroupa and Wesley Spalding
Department of Mechanical Engineering
University of Wyoming

Oral and Poster Presentation

Department of Mechanical Engineering *Green River, WY*

Shielded Metal Arc Welding (SMAW) is a manual welding process that utilizes a flux coated consumable metal electrode and alternating or direct current to join metals. This process is one of the most common welding methods utilized because it is inexpensive and works with any thickness material and in any position. While welding with the SMAW process the welder must control the electrode with the stinger from an extended distance from the work piece, up to 14 inches depending on the length of the electrode. This extended distance increases the difficulty of controlling the electrode and molten pool, which diminishes the weld quality. The purpose of this design project is to create a SMAW stinger that will allow for more precise control of the electrode by lowering the point at which the electrode is manipulated, while also providing similar functionality as a typical SMAW stinger. This device is capable of accepting different sizes of welding electrode and feed them out at a constant speed while welding. The feed speed is controlled with a pulse width modulator and is activated by a trigger. This device greatly increases the ease of using the SMAW welding process and increases weld quality.

Determining the realistic toxicity of imidacloprid for bumblebee (*Bombus impatiens)* workers

Annie J. Krueger and Michael E. Dillon
Department of Ecology
University of Wyoming

Oral Presentation

NASA Space Grant, WRSP, EPSCoR, INBRE, *Stevensville, MD*
College of Arts and Sciences Summer Fellowship,
Zoology Department Clements Scholarship

The agriculture industry relies on pesticides for crop production, but growing evidence suggests that sublethal effects of pesticides may contribute to the decline of insect pollinators. Neonicotinoids are a widely-used, advanced class of insecticides that are incredibly effective for crop protection but, at low levels, can have pronounced sub-lethal effects on bees. Our understanding of bee to*xicology comes primarily from studies on honeybees, and the few studies on bumblebees (genus Bombus*) have assessed toxicity on a colony level. We investigated how imidacloprid, a first generation neonicotinoid, affects the diet consumption, long term survival, and activity of individual bumblebees (*Bombus impatiens)* under different exposure scenarios and at different temperatures. We saw no significant effects when continuously fed 10 ppb imidacloprid in nectar but at 32 ppb, we saw a significant effect on diet consumption, long term survival ($\chi 2=6.042$, $p<0.05$), and activity ($\chi 2=13.89$, $p<0.001$). In a separate experiment, when exposed to an alternated dose of 20 ppb imidacloprid we saw a slight recovery in diet consumption and activity after the first day of clean nectar, however, after a second day on 20 ppb imidacloprid, we no longer saw this recovery. From this work, we looked into the effects of thermal stress at 30°C and 16°C on the effects at 2 and 20 ppb imidacloprid. Importantly, all of the effects we document would be overlooked with current Tier 1 testing protocols, suggesting that it will be critical to consider sub-lethal effects to better regulate agrochemicals and protect insect pollinators.

A Physics-Based Fatigue Life Prediction for Composite Delamination Subject to Mode I Loading

Kyle Kuhn, Dr. Ray Fertig
Department of Mechanical Engineering
University of Wyoming

Oral Presentation

Department of Mechanical Engineering *Laramie, WY*

One of the most prominent concerns for aerospace manufacturers is the long term behavior of composite materials, more specifically their fatigue behavior. Traditional approaches to composite fatigue life prediction have concentrated on either empirical models or models based on metal fatigue. However, composite materials manufactured with a polymer matrix exhibit dissimilar fatigue mechanisms. Moreover, empirical fatigue life prediction models fail to capture the effects of various loading and environmental conditions encountered in service. Therefore, a fatigue life prediction approach must be physics-based to effectively account for various loading history and effects due to temperature and moisture absorption.

Fatigue failure in composites is understood to be a matrix dominated event. The repeated loading from fatigue is treated as a thermally activated process which causes the polymer matrix to form micro cracks that accumulate in early cycles of fatigue life which amalgamate to form large scale matrix cracks, leading to ultimate failure. The model used to describe this phenomenon is the Kinetic Theory of Fracture (KTF). Composite delamination is modeled with cohesive zone elements which represent the region of polymer matrix between plies, governed by a traction-separation law illustrated in Figure 1. The stresses of the cohesive elements are coupled with KTF to predict microscopic fatigue. Lastly, microscopic matrix cracks are related to macroscopic matrix damage through a damage variable relating the percentage of polymer microcrack density to the critical microcrack density at macroscopic failure. Upon fatigue failure, the cohesive element experiences stiffness degradation in which the applied load is redistributed to the surrounding material. This delamination fatigue model is to be implemented as a user defined material (UMAT) in the finite element analysis software Abaqus. The subroutine will be implemented into a model of a double cantilever beam fatigue experiment. The final task is to validate the model with published experimental data.

University of Wyoming 2016 E-Baja

Garrett Laney, Kyle Plastino, Andrew Meyer, Chase Roullier, Dr. Jerry Hamann
Department of Mechanical Engineering
University of Wyoming

Oral Presentation

Department of Mechanical Engineering *Lakewood, CO*
Sheridan, WY
Paxton, NE
Savage, MN

The E-Baja is a continuing senior design project at the University of Wyoming, similar in scope to the gasoline powered Baja used for SAE competitions, but not subject to the restrictions imposed from being entered into a formal contest. The 2015-2016 E-Baja design group sought to increase the ease with which a full battery change-out could be accomplished with the E-Baja. The secondary objective of the project was to improve and install a CAN bus system on the vehicle to control accessories and connect sensors. Previously, power connections on were made manually with connectors that required mating forces in excess of 50lbs. There was additionally the possibility that incorrect connections could be made, causing irreparable damage to the batteries, an approximately $3200 investment. Over the past two semesters, Improvements were made on the system by making the power connections occur automatically as the batteries are slid into place. The mating forces are now around 6lbs, and the system has been designed so that it is no longer physically possible to make an incorrect connection.

Bacterial Expression of ABO like antigens

Sarah Lees and Bernardino Madsen
MLTK
Casper College

Poster

INBRE *Casper,Wyoming*

The human ABO blood system is a moderately complex system that is based of carbohydrate structures that are biosynthesized by A and B antigens expressed on the erythrocytes. In the human ABO blood system an opposite antibody is produced to the corresponding antigen in a lock and key type mechanism. There is reason to believe that enteric bacteria such as *E.Coli* may express ABO like antigens. We will further explore this idea by using ABO primers, extracting the DNA of the *E.Coli* Bacteria, and utilizing PCR to amplify that bacteria's DNA. Then we will be able to determine if there is a similarity in the nucleotide sequencing.

Detailed Remote Sensing of Epiphytes Via UAV Platform

Matthew Lehmitz with Dr. Gregory Brown
Department of Botany
University of Wyoming
Presenting both orally and via poster

Wyoming Research Scholars Program *Laramie, WY*

This project involved testing for close-up remote sensing of plant species growing in natural, inaccessible, high-canopy or high-geologic habitats using lightweight, precision UAV, or drone technology. The work here represents proof-of-concept work, and the results are included. These results demonstrate that use of this technology will have a major, positive impact on the ability of field scientists to examine and document hard to reach species *in situ*, in these habitats. It is anticipated that the protocols and techniques developed in this proposed project will also stimulate research in close-up remote sensing of a range of other applications.

Bacterial Strains that Exhibit Ligninolytic Potential

Sawyer Letourneau with Dr. Wawrousek
Chemical Engineering Department
University of Wyoming
Poster Presentation

Chemical Engineering Department *Fairfield, Maine*

Lignin, a complex organic polymer that forms structural materials within plants and some algae, is one of the most difficult aspects of biomass to break down, and requires a high input of energy. There are many known strains of fungi that have been found to naturally degrade lignin through the use of enzymatic degradation, but not many bacterial strains have been tested for their ligninolytic abilities. To asses which bacterial and fungal strains may degrade different structures and potentially provide an optimal degradation of lignin, we provided various cyclical carbon compounds that closely mimic parts of the large lignin structure for the bacterial strains to degrade. Seven strains of bacteria that have known ability for degrading cyclical carbon compounds have been taken and grown on a set of agar plates containing Lysogeny Broth and a specific type of dye. These dyes contain the smaller cyclical carbon compounds which mimic the different parts of the large lignin structure as aforementioned. A microorganism's ability to degrade the different cyclical carbon compounds within these dyes was assessed by the occurrence of zones of clearing. If degradation occurred, around the bacteria would appear an area of clear agar without the coloring from the dye. These tests have been conducted to see if any of the bacterial strains can potentially be used on a large scale to pretreat biomass prior to being used in fermentation or pyrolysis for the production of downstream products, such as various oils.

Developing Strategies for Artificially Breeding Captive Wild Bird Species to Facilitate Studies of Learning and Memory

Jaycey Lindsey/ Jonathan Prather
Department of Zoology and Physiology
University of Wyoming

Oral and Poster Presentation

EPSCoR *Wright, Wyoming*

A valuable approach to understanding how the brain works is to investigate how it learns. The effects of learning are most apparent during an organism's "early years", which are characterized by sensitive periods during which learning occurs much more quickly than in adults. For humans, that time is between birth and three years of age. During this time, children experience events that influence the structure and function of their brain for the rest of their lives. Many labs, including our own, are interested in studying the brain as learning occurs. A challenge in those studies is that we must investigate our subjects during a small window of juvenile development (and perhaps again during adulthood in order to detect the behavioral consequences of juvenile experience). To do that, we need steady access to juvenile organisms. The proposed experiments seek to develop new tools to facilitate breeding and thus ensure steady access to juvenile organisms. Presently, it is challenging for us to breed the species that we use most often in our research (zebra finches). This may be due to a number of factors (altitude, low humidity, highly variable temperature, etc.), but regardless of its cause, this lack of breeding has been a major impediment to our research process. A possible solution that could be very effective is artificial insemination. The specific goal of the experiment is to test whether the tools of artificial insemination that have already been developed and normalized by the poultry industry can be adopted for use in populations of captive songbirds. The hypothesis of the experiment is that artificial insemination is an effective process to breed captive songbirds.

Space use and home range overlap of least chipmunks in the Laramie Range

Sara Locker[1], Garrett Smith[2], and Merav Ben-David
Department of Zoology and Physiology
University of Wyoming

Oral presentation

UW Research Office and Department of Zoology and Physiology *[1]Green River, Wyoming*
[2]Parachute, Colorado

Body mass, which represents the energy demands of animals, has been identified as an important predictor of home range size in many terrestrial and marine mammals. In most studies, only interspecific effects of body size have been explored but few addressed the effects of sexual dimorphism within species. Female-biased sexual size dimorphism is typical in most chipmunk species, including the least chipmunk (*Tamias minimus*). In September 2015, we radio collared 23 chipmunks (14 males and 9 females) in two forest and two sagebrush grids and tracked them daily. Tracking lasted from 5-31 days. Using kernel density estimators of repeated relocations we found that despite differences in body mass, male and female home ranges were similar in size. Similarly there was no sex-related difference in maximum daily distance moved. There was little overlap of home ranges at the 50% contour among all chipmunks, but while females showed little overlap with other females at the 95% contours, there was substantial overlap between males and females as well as males and males. We also found that several pairs of chipmunks which exhibited high overlap in home range shared hibernacula, and many sagebrush chipmunks established hibernacula in forested stands. Our results suggest that body size had no effect on space use of chipmunks and that while females may be territorial, males are not. Relatedness among individuals that exhibit home range overlap and those that share hibernacula should be investigated in future studies.

RNA sequencing analysis reveals the GnRH induced citrullinome

Michelle A. Londe[1], Shaihla A. Khan[2], Brian S. Edwards[2], Paul R. Thompson[3], John Diller[4], Kenneth L. Jones[4], Kenneth G. Gerow[1], Brian D. Cherrington[2], Amy M. Navratil[2]

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Oral Presentation

Honors Program *Cheyenne, WY*

Peptidylarginine deiminases (PADs) are a family of Ca^{2+} dependent enzymes that post-translationally convert positively charged arginine into neutral citrulline on histone tales to decondense chromatin and change gene expression. Our past work has established that gonadotropin releasing hormone (GnRH) stimulates PAD catalyzed citrullination of histones in gonadotropes, yet the physiological consequence of this on reproductive function are unknown. To address this, we sought to identity of the full cohort of genes regulated by citrullintation in gonadotrope cells. First, the gonadotrope derived LβT2 cell line was were pre-treated with either vehicle or the PAD inhibitor biphenyl-benzimidazole-Cl-amidine (BB-ClA) followed by treatment with vehicle or GnRH for 180 minutes. Utilizing this paradigm, we significantly blunted GnRH induced histone citrullination, validating the efficacy of our PAD inhibitor. Following the same approach, RNA was then purified and subjected to NextGen RNA sequencing. Two different methods to analyze the data were used: exploring ratio of the means and means of the ratio. From the original data sets, meaningful subsets of key gene networks were identified that are critical in maintaining gonadotrope function. Collectively, our RNA-seq data demonstrates that GnRH citrullination of histones regulates the expression of luteinizing hormone (LH) β, endoplasmic reticulum (ER) processing and golgi vesicle trafficking gene networks.

CRACKING OF A WOVEN COMPOSITE USING EXTENDED FINITE ELEMENT ANALYSIS

Matthew Love, Dr. Ray Fertig

Mechanical Engineering

University of Wyoming

Oral Presentation

Crack formation and propagation in woven composites is not well understood, inhibiting the development of the full potential of these light but strong materials. In this study, the eXtended Finite Element Method (XFEM) was used in Abaqus to model crack initiation and propagation in a Representative Volume Element (RVE) of a woven composite composed of carbon fiber tows in an epoxy matrix. The cracking criterion selected was the maximum principal stress criterion, in which the composite cracked when its maximum principal stress was exceeded. XFEM cracking was successfully modeled in a block of neat (or pure) epoxy as well as in the RVE of epoxy with carbon fiber tows, with results that resembled the crack propagation mechanics observed in physical test specimen. Towards the end of the study, the XFEM method was then used simultaneously with Autodesk Simulation Composite Analysis (ASCA) 2015's progressive failure analysis, wherein Abaqus modelled cracking in the epoxy matrix using XFEM while ASCA modelled failure in the fiber tows. Progress was made toward successfully utilizing the two programs simultaneously to model progressive failure, though the research period came to an end before substantial results were obtained.

Synthesis and Properties of Carbide Buckypaper

Kenneth Madsen, Dr. Brian Leonard
Department of Chemistry
University of Wyoming

Oral Presentation

Wyoming Research Scholars Program Cheyenne, Wy

Metal carbon complexes, known as metal carbides, have long been known to possess interesting electrical, and catalytic properties, as well as exceptional physical properties. Recent research on the synthesis of metal carbide powders typically focuses on carbides derived from an amorphous powdered carbon source, however very little research has been conducted on the use of different carbon sources. This project seeks to investigate the utility of producing metallic carbides from a type of carbon paper known as buckypaper. Difficulties in the synthesis of more structured carbides generally arise from the poor mobility of the reactants as the reaction occurs in the solid state. This difficulty has been circumvented through a novel synthetic method. This synthetic method and the physical properties of the new materials are the subjects of this investigation.

Components of a Proper Warm-up For Active Adolescents

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Department of Kinesiology and Health
University of Wyoming

Oral Presentation

Honors Program *Douglas, WY*

Through a previous project my goal was to research and understand cultural identity. Through that project I found I wanted to help as many people as I can and it became a goal to research the adolescent age group. The purpose of this project was to review existing literature and come to a conclusion about proper warm-up components and techniques in adolescent sports and physical activity that help lower the chance of injuries. The leading cause of injury in adolescents is sports, so the focus is to help decrease the amount of injuries in adolescent sports. Articles used in this review include those with both females and males participating in diverse sports, recreational and intermediate level sports, as well as physical education class level of activity. A structured dynamic warm-up led by an adult is the most beneficial warm-up for preventing adolescent injuries. The warm-up should consist of stretching, strengthening, balance, sport-specific agility, and landing techniques. This will prepare the body for the specific sport or exercise. The literature on this topic is a good foundation but much more research focused on gender differences and different level of competition still needs to be completed.

Metabocin™ protects mice from high fat diet-induced hyperlipidemia, hyperglycemia, and hypertension by activating TRPV1 protein

Laurel Markert, with Padmamalini Baskaran and Baskaran Thyagarajan
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Oral Presentation

INBRE *Cody, Wyoming*

Obesity is a metabolic disease caused by an imbalance between energy intake and expenditure. Decreased physical activity and excessive calorie intake result in obesity and its comorbidities. The temptation for eating fatty food overpowers many dietary restrictions. When consumption of energy exceeds the combustion of calories, the excess fat is stored in adipose tissue leading to obesity. Currently, one third of world's population is obese or overweight. In the USA, nearly 35% of the total population is obese. Wyoming now has the 27th highest adult obesity rate in the nation and its adult obesity rate is currently 29.5%. Obesity is often associated with vascular complications, hyperlipidemia, impairment of glucose handling and hypertension, which are all becoming increasingly prevalent across the globe. In this research, we show that high fat diet feeding resulted in obesity in mouse models. The mice also showed an impairment of glucose handling, hypertension and hypercholesterolemia. Supplementation of Metabocin™ in the diet significantly suppressed high fat diet-induced weight gain and hyperglycemia. Further, Metabocin™ protected mice from impaired glucose tolerance and hypertension. Metabocin™ neither altered the food and water intake in wild type and TRPV1$^{-/-}$ mice nor protected TRPV1$^{-/-}$ mice (that genetically lack TRPV1 protein) from the effects of high fat diet. Our data suggest that Metabocin™, which activates TRPV1, is an effective dietary supplement to combat obesity and its comorbidities.

Personality and Problem Solving in Zebra Finches

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Oral Presentation

INBRE *Laramie, WY*

Zebra finches (*Taeniopygia guttata*) are native to Australia. Because these birds are easily kept in captivity and readily form mated pair bonds, they are well-suited for captive tests of behavior. Zebra finches are often used in studies of social learning, personality, and communication. However, few studies have addressed the potential influence of personality on cognition or pair bond success. We began addressing this idea in behavior research by assessing personality in zebra finches. To evaluate an individual's personality, we measured six different behavioral traits. These traits include: dominance, neophobia, aggressiveness, fearfulness, obstinacy, and exploratory tendency. Personality traits were tested individually and across multiple trials. Future work will aim to address whether pairs of mates with similar personalities perform better than pairs of mates with dissimilar personalities on a maze task. We seek to investigate the potential relationship among a pair bond's personality composition, its level of communication, and its ability to solve a coordinated skill-pooling task.

EBTAX: The Conversion of Ethane to Aromatics via Catalytic Conversion

Bridger Martin, Mentor: Dr. David Bell
Department of Chemical Engineering
University of Wyoming

Oral Presentation

University Honors Program *Casper, Wyoming*

Over the semester, the goal of team EBTAX was to create an economically viable process for the conversion of ethane to various valuable aromatics, specifically benzene, toluene, and xylene, commonly referred to as BTX. A recent oversupply of natural gas in the United States has caused a significant price drop in the national market. This creates an economic opportunity to use natural gas, specifically ethane, as a feedstock to create valuable chemical products. A recent patent, US8772563, describes a platinum-germanium zeolite catalyst which converts ethane to BTX with high selectivity. Using this catalyst, a system of two reactors was designed to produce 700 million pounds per year (MMlb/yr) of BTX from ethane. Large amounts of hydrogen is also produced in the reactor, which can be sold in addition to the primary BTX products. In the design, a full complementary separation system was devised with industry standards and precedents to maximize product quality and profits. Preliminary economic analyses show high profit potential, and EBTAX recommends moving forward to a pilot plant to verify key assumptions made in the design phase.

Increased Durability of Proton Exchange Membrane Fuel Cell (PEMFC) Membrane Electrode Assembly Through Self-polymerization of Dopamine onto a Nafion 212 Membrane

Bridger Martin, Mentor: Dr. Dongmei Li
Department of Chemical Engineering
University of Wyoming

Oral Presentation

Department of Chemical Engineering, EPSCoR *Casper, WY*

The durability and lifetime of proton exchange membrane fuel cells (PEMFC) can be enhanced via the application of a polydopamine coating to the electrolyte membrane. We propose a simple immersion technique to coat the Nafion membrane in a self-polymerizing dopamine film. This modification reduces hydrogen fuel crossover by creating a barrier, reducing access to membrane cracks and holes. The dopamine layer also improves membrane adhesion to the catalyst and gas diffusion layer (GDL). This reduces catalyst aggregation and provides additional membrane support to resist mechanical stresses. By resisting mechanical stress and decreasing catalyst defects, dopamine coated membranes provide increased durability and life in PEMFCs. To determine the effects of the dopamine coating, accelerated stress tests utilizing relative humidity (RH) cycling and load cycling were performed to target mechanical and catalyst durability. Linear sweep voltammetery (LSV), cyclic voltammetry (CV), and current sweep performance tests were used to characterize the fuel cell in terms of performance, gas crossover, and electrochemical surface area (ECSA) every 24 hours until device failure.

How Neural Activity Shapes Decision Making:
An Optogenetic Investigation of the Neural Basis of Mate Choice in Female Songbirds

Sarah Maze
INBRE Grant recipient
Honors Program

The intent of this project is to understand the neural circuitry that underlies decision making through understanding the connection between sensory perception and motor action. This investigation seeks to identify the decisions underlying mate choice and whether optogenetic manipulation of neurons implicated in mate preference results in a change in mate choice. The end goal of defining this connection is to combat deleterious decision making behavior in humans, such as drug addiction. Female Bengalese finches (BFs) provide an accessible model in which to investigate the neural mechanisms of behavior, and are ideal for study due to their ability to perform complex behaviors and thrive in a laboratory setting. Previous studies have revealed that activity in a specific region of the female BF brain, the caudal portion of the mesopallium (CM), may play an important role in mate preference in female songbirds. We hypothesize that increased activity in CM will increase female preference for male song. To test this, it is necessary to manipulate neural activity, which we achieved through viral-mediated expression of light-sensitive channels within CM. In preliminary behavioral assessments, we used a well-established protocol (Dunning et al 2014) to identify each female's baseline mate preference. Then, we injected BFs with an adeno-associated virus to induce neurons to express trans-membrane, light-sensitive opsin proteins. When illuminated with blue light, this opsin allows positive charges to flow into CM neurons, resulting in generation of action potentials. After verifying successful expression of this protein, BFs will undergo behavioral testing again with optogenetic manipulation. Results will then be compared to the baseline preference, and it is expected that increased activity in CM through light stimulation will result in increased preference for songs with which the light was paired. Presently, we have developed all aspects of our approach and behavioral assessments are underway. The anticipated results will identify or exclude CM as a major contributor to the decision making pathway that underlies mate preference. Once this pathway is identified, parallels may be drawn in the human nervous system, and these pathways may be targeted with specific pharmaceutical therapies to treat behavioral anomalies.

Cokeville's Real Miracle: Reconciling Traumatic Memory

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

Poster Presentation

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

As the explosion filled the classroom with smoke, third-grade student Jamie King curled up in a corner and awaited death. Out of nowhere, she recalls, someone picked her up and threw her out of the burning schoolhouse, then an ambulance rushed her to a hospital. Her physical injuries consisted of a 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. At least until the day a friend pointed out that, by not moving on, Jamie had died in that school all those years ago. This honesty allowed Jamie to reconcile the fact she had avoided her traumatic memories, and inspired her to turn to God. While she continued to struggle with issues of mistrust, her newly rekindled faith provided her the strength to survive.

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 (henceforth referred to as LDS or Mormon) 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.

The Effect of Dietary Sodium Levels on Consumer Appeal

Kailin McClung, Dr. Rhoda Schantz
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University of Wyoming

Oral Presentation

Honors Program *Big Springs, NE*

Literature supports the theory that high dietary salt intake is associated with increased blood pressure and increased risk of cardiovascular disease. However, there is no research that specifically examines the flavor difference between high sodium and low sodium variations where the only difference between identical recipes is the amount of salt used. Is there a flavor difference between low sodium and high sodium recipes? If there is a difference in flavor between low sodium and high sodium recipes, is that difference enough to outweigh the health benefits associated with the low sodium variation? Is the perceived flavor advantage in the high sodium variation worth the risk of increased blood pressure and increased risk of cardiovascular disease? This research evaluated different levels of sodium in guacamole and its consumer appeal.

The Environmental Sociology of American Buddhism

Dylan McCurdy, Dr. Matthew Painter
University of Wyoming

Oral Presentation

McNair Program *Laramie, Wyoming*

This study investigates the environmental perception of a single Buddhist in Laramie, Wyoming. Using intensive interviews, axial coding, and grounded theory, the relationship between three Buddhist themes (awareness, compassion, and oneness) and the perception of the environment was observed. Despite ecological consciousness, and the concepts of oneness, awareness, and compassion arising from the Buddhism, the interaction of the environment had little impact from Buddhism; instead Buddhism justified the actions that led to environmental consciousness, exhibiting a spiritual bricolage with other religious and meaning systems. This study could be used to understand themes that encourage environmental consciousness, and thereby further understanding in the implementation of sustainable development systems.

Recombinant production of chimeric flagelliform-dragline silk-like proteins for biomaterial generation.

Hunter McCurdy with Florence Teulé-Finley
University of Wyoming at Casper

Poster Presentation

Wyoming INBRE- Collaborative Grant Program *Casper, Wyoming*

The wide range of mechanical properties of spider silks lends them to diverse applications. Large-scale production of spider silks using spiders is impossible due to their cannibalistic nature. Fortunately, the repetitive and modular nature of spider silk proteins enables their genetic engineering and recombinant production. One of the many applications of these recombinant spider silk-like protein (SSLP) versions that are electrospun into nanofiber mats is their use as a new generation of customized silk-like protein-based wound dressings. A 60 kDa chimeric flagelliform-dragline silk protein variant was produced recombinantly in *Escherichia coli*. Recombinant silk clone cells were harvested after silk gene induction (using isopropyl-ß-D-1 thiogalactopyranoside (IPTG) and were lysed to recover the total protein fraction. The SSLPs were then purified through immobilized nickel affinity chromatography (IMAC) and subjected to SDS-PAGE analyses followed by Coomassie staining or Western Blot analyses. After dialysis, the purified SSLPs will be lyophilized to provide the starting material for biomaterial generation through electrospinning processes. The chemical and mechanical properties of the electrospun SSLP mats will be tested. The interaction between these nanofiber mats and mammalian cell lines will be measured to determine the suitability of these SSLP nanofiber mats for use as wound dressings.

Evolving Meanings and Functions of Hijab for American Muslim Women

Taylor McInerney with Dr. Marianne Kamp
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University of Wyoming
Oral Presentation

Department of History *Gillette, WY*

Islam has become a growing piece of the American cultural landscape, and the hijab, or veil, has become its most visible identifier. American women are wearing hijab in increasing numbers, regardless of growing stereotypes and discrimination in American society, and this project seeks to understand why. Understanding this requires a look at how the meanings and functions of hijab have evolved over time in the United States. Beginning with the 1980s, the evolution of the American Muslim identity has affected and been affected by the meanings and functions of hijab.

Patterns in mainstream American society have driven Muslim women to create an autonomous space for themselves by redefining hijab and creating new functions for it. Before the 1990s, hijab seemed to be way of strongly expressing religious identity and going against the grain of assimilation into American culture. During the 1990s, however, a shift began to take place, and young, second-generation American Muslim women began to carve out their own space in American culture, using hijab to identify with Islam in response to perceived "American oppression," not only of Muslim women, but of women general. Hijab has become a symbol of Islam in a specifically American context. It has become a part of defining American Islam through the use of female autonomy to re-discover religious identity, reject American patriarchal patterns, adopt American Islamic social trends, and actively challenge American stereotypes of Islamic oppression of women.

The Effect of a Secondary Cognitive Task on Lower Extremity Biomechanics during Landing

Elizabeth Meyer, Dr. Boyi Dai
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Oral Presentation

Honors, INBRE *Casper, WY*

Background: The purpose of this study was to examine the effect of a cognitive task on jump-landing biomechanics and performance. **Methods:** 31 recreational athletes participated in the study. Participants jumped forward off of a 30cm box a distance equal to one half of their body height, then immediately performed a countermovement jump. This movement was performed in a control condition, while counting backwards by intervals of 1, and by intervals of 7. Initial knee flexion, knee range of motion, peak vertical ground reaction force (PVGRF), stance time, and jump height were calculated. **Results:** There were statistically significant differences in initial knee flexion ($p = 0.0004$), PVGRF ($p = 0.031$), and stance time (0.038) between the control and counting by 1 condition. There were also significant differences in knee range of motion ($p = 0.049$, $p = 0.012$) and jump height ($p = 0.001$, $p = 0.0002$) between the control and both the 1 and 7 conditions. **Conclusion:** This study demonstrated that the addition of a cognitive task did alter both landing biomechanics and performance. These results have implications for developing new ACL injury screening procedures to more realistically imitate a sport environment.

Development and Evaluation of Real Time PCR for Detection and Differentiation of *Brucella abortus* and Vaccine Strains

Jonathan Miller with Brant Schumaker and Noah Hull
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University of Wyoming

Poster Presentation

Wyoming NASA Space Grant Consortium *Laramie, WY*

Brucellosis is a disease of bacterial origin that amasses an estimated 5,000,000 human cases annually. Current diagnostic testing to identify infected individuals is costly, time intensive, and carries a high risk to laboratory personnel. In addition, upon preliminary testing, if the animal tests positive it is slaughtered in order to carry out definitive testing by bacterial culture. Development of an assay utilizing polymerase chain reaction (PCR) has been proposed as a faster method that can potentially be more sensitive and specific. A PCR assay also has the potential to differentiate between field strains and closely related vaccine strains. In this study, 95 whole genome sequences of *Brucella abortus* and its respective vaccine strains were included in an *in-silico* analysis. Based on single nucleotide polymorphisms, two primer sets were developed for PCRs that can successfully differentiate infection with *B. abortus* field strains from the vaccine strains *B. abortus* RB51 and *B. abortus* S19. Primer sets were tested against RB51 and S19 culture strains and on cattle infected tissues with *B. abortus* field strains.

The Lord of the Winds:
The Untold Story of Finis Mitchell

Savannah Mitchell, Dr. Jess Clark
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Western Wyoming Community College

Oral Presentation

Sweet Memories Historical Research Group *Pinedale, Wyoming*

On November 23, 1991, a week after turning 90, Finis Mitchell, along with his wife Emma (Nelson), met their new great-granddaughter, Miranda Mitchell. Fortunately, for the Mitchells, another family member captured this moment on film. A photograph reveals the pride and joy Miranda brought to both her father, Alvin Mitchell, and great-grandfather. Love radiates through the eyes of all present, from Emma in the background to Alvin and Finis in the foreground. Despite Mitchell's rough exterior, from his flannel shirt to his worn coveralls to his thick framed glasses, he wears his tenderness and love with pride. Miranda must have felt this love as she appears swaddled in a blanket, none too fussy in the safety of his arms. The smile Mitchell shares with his family is not that of a mountaineer, but of a great-grandfather.

Recreated from a photograph this image of Finis Mitchell, reveals the complexity of a Wyoming mountaineer. He was more than a rugged outdoorsman, he was a husband, father, and grandfather. Family folklore and memories suggest that tender moments, such as the one depicted above, were not rare or uncommon they were just socially or publically unknown. Given that museums, newspapers, and public ceremonies, have largely created the story of Finis Mitchell, it is not surprising that they focused primarily on his public identity. Indeed, this collective memory identifies him as being the *Lord of the Winds*, for his outstanding work and love for the Wind River Range. Yet, an examination of the family documents, from photographs to oral histories, reveals there is more to his identity, and therefore more to this story. This new, more complex, story arises, because the collective memory of Finis Mitchell paints him solely as a Wyoming mountaineer and legislator, at the expense of his personal narrative and family folklore.

Native American Remedies used as Modern Antibiotics

Kenneth Moncur with Eric C. Atkinson
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Northwest College

Oral Presentation

INBRE *Lovell, WY*

Native Americans have been using the plant life of the Big Horn Basin for medicinal purposes for hundreds of years. Investigation of plant species used by local Native American tribes will lead to an understanding of species of plant that have metabolic and exterior defenses for infectious microbes such as *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa.* Understanding how the plants of this area were once used by Native American populations can help determine if those plants have any properties that can inhibit or eradicate common bacteria. Research will be done to investigate Native American remedies used to treat open wounds that may resemble symptoms of bacterial infections. Extracts of these plants will be tested to see if inhibition is achieved via the Kirby Bauer disc diffusion method.

Behavioral Phenotyping in Ankyrin 3 Knockout Mice

Marisa Moret with Dr. Qian-Quan Sun
Department of Zoology and Physiology
University of Wyoming

Poster

Wyoming Research Scholars Program *Fort Collins, CO*

Bipolar disorder (BD) is a mental illness characterized by alternating episodes of mania and depression. BD affects nearly 3% of the US adult population and is associated with a high rate of suicide. Genome-wide association studies have strongly implicated the Ankyrin 3 (ANK3) gene as a risk factor for BD in patient populations. Previous reports have observed altered behavior in ANK3 -/- mutant mice, but not in ANK3 +/- mutant mice. In the present study we used an automated apparatus to test ANK3 function in relation to behavior. We tested mice in the open field, light-dark box, and social interaction tests. Results show significantly altered exploratory locomotion and social interaction time between -/- ANK3 homozygotes and +/- heterozygotes in a bimodal pattern compared to WT mice. In all tests -/- ANK3 homozygotes exhibited a significant reduction in exploratory activity with less social engagement while +/- heterozygotes exhibited a significant increase in exploratory activity with increased social engagement. This would indicate a reduced level of anxiety in +/- heterozygotes compared to -/- ANK3 homozygotes and WT mice. The pathogenesis of BD is poorly understood and this study may shed light into the possible use of ANK3 mice in modeling mental illness.

Cost Parameters of an Outbreak of Foot and Mouth Disease

Laura Eve Mortensen with Dr. Dannele Peck
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Oral Presentation

University Honors Program *Casper, Wyoming*

Foot-and-mouth disease is a devastating and highly contagious viral disease that can affect animals with cloven hooves. The disease is characterized by a variety of clinical signs that cause immense pain and discomfort to the animal. The virus generally does not cause death, but it does cause the animal to become weak and unproductive. The United States has been free of foot-and-mouth disease since 1929; however, there is always potential for an outbreak. An outbreak would result in immediate and intense action in order to prevent spread of the disease as much as possible.

Numerous costs would be associated with responding to a disease outbreak, and it is important to have an understanding of the economic impact that would be involved. There are a variety of steps that would be implemented in a response including quarantining the facility where infected livestock are present, eradicating the infected herd and nearby herds if necessary, declaring a state of agricultural emergency, determining whether vaccinating animals would help to slow the spread, as well as ceasing all livestock and meat export out of the United States. Along with each of these steps comes a multitude of expenses, and an outbreak would be truly devastating to the economy. The purpose of this study is to develop the economic parameters and analyze the economic consequences of foot-and-mouth disease in the case of a national or regional outbreak in the United States for cattle, sheep, and swine in varying operational situations.

Finite Element Analysis of Nacre

Austen Motily with Dr. Mark Garnich
Mechanical Engineering
University of Wyoming
Oral Presentation

Department of Mechanical Engineering and EPSCoR *Cheyenne, WY*

Nacre, a material commonly found in mollusk shells, displays remarkable fracture toughness when compared to the mineral that comprises 95% of its weight. This toughness can be attributed to a unique microstructure that contains mineral platelets and an organic protein matrix. The mechanical behavior of this composite material is not fully understood, and existing mathematical models require severe assumptions about the interaction between the mineral and protein phases. Finite element analysis is the best method available to investigate the complex behavior of this material. Abaqus®, a finite element modeling program was used to analyze the nacre. This software implements the finite element method to predict material behavior in complex structures when subjected to various loads. Starting with basic two-dimensional models, the stress-strain relationships of the nacre were simulated and verified with values in literature. More complex three-dimensional models were also verified. With the continued study of the material microstructure, nacre could be used to inspire a new class of bio-inspired staggered composites.

BTEXterminator

Christine Munoz, Dr. Karen Wawrousek
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Oral

Honors *Green River, WY*

Oil and gas operators use millions of barrels of water to drill, complete, and produce wells all around the world. In the United States, there are strict regulations that determine how water that is returned to the surface, produced water, is disposed. Produced water is contaminated with several compounds ranging from metals, salts, and hydrocarbons. Specifically, produced water contains the components of BTEX (benzene, toluene, ethylbenzene, and xylene). BTEXterminator, a co-culture of two strains of *Psuedomonas putida*, is capable of naturally degrading all of the components of BTEX. Each strain of *P. putida* is capable of degrading half of the components of BTEX through either the TOL or TOD pathway. Both strains of *P. putida* were genetically modified using a plasmid that contains the complementary pathway the strain does not naturally contain, thus increasing the efficiency of BTEX degradation. This product has been designed to be viable in the harsh environment of produced water. BTEXterminator can be cultivated via a cell suspension, which will be used in a reactor to treat produced water. Further research to determine the necessity of other genetic modification to allow for the viability in produced water will also be done.

Relating Bar Formation to Sandy River Channel Width

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Oral and Poster Presentation

EPSCoR *Fair Oaks Ranch, TX*

Sandy rivers are complex systems that are not clearly understood but make up a large portion of rivers worldwide. Rivers effect many aspects of infrastructure like the building of bridges and dams. In addition to the impact that rivers have on society, they also effect many species of animals and plants. This is why improving human understanding of river movement is crucial for both environmental and societal purposes. After analyzing multiple rivers I have recognized general trends in the transport and deposition of sediments. I hypothesize that wider sections of rivers enable the formation of larger and more stable sandbars.

If wider parts of the river have more exposed sand then there will be a greater number of opportunities for nesting environments for the piping plovers and least terns, species that are considered to be threatened and endangered. These birds are more likely to select nesting sites on larger (2+ acre) sandbars. Therefore, building future habitats in relatively wide parts of the river would be more conducive to natural bird habitats. The results of this study will aid in improving overall understanding of sandy rivers as well as give insight into where birds select to nest based on the geomorphology of a system.

Potential Arsenic Contamination of Sediments in Coal Bed Methane Produced Water Retention Ponds

Kacey Myers and Mengqiang Zhu
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University of Wyoming
Oral and Poster Presentation

Ecosystem Science Management *Fort Collins, Colorado*

The state of Wyoming, especially the Powder River Basin, is among the most productive areas in terms of coalbed methane (CBM) extraction in the country. CBM extraction requires high quantities of aquifer water to be pumped to the surface. This decreases water pressure in the coal-seam and allows natural gases to be extracted. The pumped water is then directed into a retention pond. The produced water is suspected to contain a trace amount of arsenic (As) that can be concentrated into pond sediments. Arsenic is a highly toxic element and the potential for contamination is problematic, as As can contaminate ground water from a sediment source. The objective of this study is to understand the potential for arsenic contamination of the sediments of the CBM produced water ponds located in the Powder River Basin, WY. Sediment cores (up to 1 m long) were collected at multiple sites in the Powder River Basin and sectioned in the lab. Arsenic in the samples was extracted and the concentration in the extract was determined using ICP-MS. In addition, pH and electrical conductivity (EC) were also measured. Most of the samples had pH of 7 – 8 and with increasing sediment depth, no significant trends were observed. In contrast, for a few sites, the pH of the samples dropped from ~ 8 on the surface to ~ 4 at the bottom of the cores. EC and arsenic concentration measurements are ongoing.

Sirtuin-1 and Regucalcin Emerge as a Potential Target to Defy Redox Stress–Induced Accelerated Aging

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School of Pharmacy
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NASA *Littelton, CO*

Accelerated aging occurs during space flights due to high-energy radiation induced-oxidative stress. Recent research suggest that oxidative stress downregulates the expression of cellular proteins, which regulate cellular senescence and aging processes. Senescence marker protein-30 (SMP-30; regucalcin) and sirtuin-1 (SiRT-1; a protein that acts as a cellular sensor for energy and regulates aging) are important biomarkers, which are down regulated upon oxidative stress. We hypothesized that SMP-30/SiRT-1 overexpression/activation attenuates redox stress, and oxidative stress mediated aging process. To mimic the effects of oxidative stress caused by high-energy radiation, we used hydrogen peroxide (H_2O_2; an oxidizing agent) for our experiments. Our preliminary data suggest that H_2O_2 treatment suppressed the expression of senescence markers SiRT-1, SMP30 and p53 in transient receptor potential vanilloid subfamily 1 (TRPV1) expressing human embryonic kidney 293 (HEK293) cells and that overexpression of SMP-30 protected the expression of SiRT-1 and p53 from the effect of H_2O_2. Effect of capsaicin (TRPV1 agonist) and resveratrol (SiRT-1 activator) on H_2O_2-induced effect on SMP-30 and SiRT-1 expression in HEKTRPV1 cells will be evaluated.

An attempt to grow thermophiles, from Thermopolis, WY, using Winogradsky columns

Jennet Nedirmammedova with Suzanne M. (Suki) Smaglik
Department of Health & Science
Central Wyoming College

Poster Presentation

EPSCoR/INBRE *Ashgabat, Turkmenistan*

The purpose of the study is to determine if thermophiles can grow in Winogradsky columns in a lab setting. Extremophiles are difficult to culture in the laboratory. An initial review of the literature revealed that they should grow within a Winogradsky column. We used microbes collected from the main pool in Thermopolis, WY for this study. The springs are at a stable temperature of around 52°C (125°F). Long term water chemistry indicates a deep, well-mixed source of meteoric water.

A Winogradsky column is a cultured display of how different microorganisms perform their roles by enabling growth, simply using the energy from light, oxygen, and some nutrients (C, N, S) added to the column. The nutrients are graded through the column by the action of the microbes. Columns of this type are usually made using soil or mud but we have only microbial mats, some of which sit upon sand and gravel. Five locations at the hot springs were sampled. We used diatomaceous earth as our soil substitute. It is a fine clay-like substance composed of siliceous microskeletons and, we assumed that it would be inert to influencing nutrient distribution in the columns. However, it would give the microbes something upon which to grow and cycle nutrients. Our initial set up used direct sunlight from windows, but as that did not stimulate growth (windows may be UV-filtered) we changed our setup to use heat lamps as our heat and light source. The results of our experiment will be presented.

The Dictator

Chad Petersen, Ben Nelson, James Plocek, Mentor: Ruben Gamboa
Computer Science
University of Wyoming

Oral Projection

Senior Design *Laramie, WY*

The Dictator is a little black box that has totalitarian control over your entertainment systems. This box can be set anywhere in the back of your living room and be utilized as a universal entertainment system controller. Today's modern media systems have such disparate methods of communications for each part, such as controllers for game systems, as well as multiple IR and radio remotes. The Dictator will connect to your Wi-Fi and will run a local web server using node.js so that all of the user interface and control calls can be handled via web technologies. This also means that any device with a web browser can be used to control the entertainment system simultaneously with no client side install. This allows the Dictator to run on any device regardless of its OS.

Inertial Focusing of Nuclei in *Xenopus* Egg Extract

Katie Nelson, Dr. John Oakey
Chemical Engineering
University of Wyoming
Oral and Poster Presentation

EPSCoR *Louisville, Colorado*

The enlargement of nuclei can be an indicator of diseases such as cancer. While we know that this occurs, the mechanism behind nuclei scaling is unclear. We applied microfluidic encapsulation technology to encapsulate nuclei into different sized and shaped droplets, creating an artificial cell to test scaling mechanisms in a more *in vitro* environment. In previous experiments, this has proven to be hard because the nuclei stick together causing tens of nuclei to be encapsulated together, not one as wanted. To separate the nuclei, inertial focusing was used, as it has a predictable outcome and is passive in order to not harm the nuclei during focusing. This novel approach of using inertial focusing to separate an organelle will be described and explained.

Visualizing the Gonadotrope Network Using CLARITY

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Department of Zoology and Physiology
University of Wyoming
Poster Presentation

McNair Scholars Program *Cheyenne, WY*

Gonadotrope cells are one of five endocrine cell types in the anterior pituitary that are responsible for maintaining fertility. Recent tridimensional imaging of the anterior pituitary highlights that gonadotrope cells form structured and coordinated networks that are aligned along capillaries of the hypophyseal portal system. Additionally, the gonadotrope cell network displays remarkable plasticity to adapt to various physiological changes in the reproductive axis. The dynamic changes at the population level are thought to allow gonadotropes to coordinate with one another for synchronous hormone release critical for reproduction. Thus, it would appear that gonadotropes are both functionally and structurally poised for rapid and efficient secretion of hormone into the general circulation. Our past work has addressed gonadotrope network organization using ex vivo pituitary slice preparations but those studies had limitations with anatomical reconstruction of the gland. To overcome these limitations, we utilized a novel CLARITY (Clear Lipid-exchanged Acrylamide-hybridized Rigid Imaging Tissue hYdrogel) approach to make intact murine pituitaries transparent using acrylamide based hydrogels and lipid extraction. The advantage of this technique is that we can view the *entire* network of gonadotrope cells with unprecedented ease and accuracy. Utilizing a transgenic mouse model where gonadotropes are specifically labeled with green fluorescent protein (GFP), our results clearly show that gonadotrope specific fluorescence is detectable following CLARITY. Thus, we are well positioned to address broader questions on gonadotrope network organization such as how gonadotrope spatial and temporal positioning might be altered in disease and infertility.

Developing a cell culture system to study the effect of mutant huntingtin protein on indoleamine-2,3-dioxygenase activity

Nelson, RM; Donley, DW; Fox, JH.
Department of Veterinary Sciences
University of Wyoming

Oral and Poster

Department of Veterinary Sciences *Huntington Beach, California*

Huntington's Disease (HD) is an autosomal dominant, neurodegenerative disease caused by a polyglutamine expansion in the huntingtin gene. This mutation results in misfolding of the huntingtin protein. Mutant huntingtin induces neuronal dysfunction. Neuroinflammation is a feature of HD characterized by activation of microglial cells. Upregulation of the kynurenine pathway of tryptophan degradation is caused by neuroinflammation and may contribute to HD progression. Indoleamine-2,3-dioxygenase (IDO) is the first enzyme in the kynurenine pathway. We developed a cell culture-based assay for IDO activity. Our goal is to use a lentiviral vector to express wild-type and mutant huntingtin proteins in cultured microglial cells. Using this approach, we will test the hypothesis that mutant huntingtin expression in microglial cells increases IDO activity.

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, Wyoming*

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"). These 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. We are using 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, which have dramatically declined in abundance with overfishing as the human populations around the lake have grown in the last decades.

Intercropping Hoophouse-Grown Tomatoes with Oyster Mushrooms (*Pleaurotus ostrearotus*) Reduces the Need of Phosphorous Fertilizer in Wyoming

Rael Otuya and Urszula Norton
Plant Sciences
University of Wyoming

Oral

EPSCoR *Kitale, Kenya*

Hoophouse tomato production in short growing season region remains vital to meet local consumer needs in Wyoming. Yield optimization is a challenge especially due to poor soil fertility and specifically, phosphorous (P) limitations. Sustainable integrated system that augment tomato yield by enhancing P is a key to successful production of tomatoes and possibly other vegetables. Planting edible mushrooms with tomatoes can help improve crop yields and provide additional high value crop but the information on such practice for the growing conditions in Wyoming where soil is marginally productive is limited. The study was established in May, 2015 in high tunnel at the University of Wyoming Students ACRES Farm. The main objective was to quantify the effect of intercropping different varieties of tomatoes with edible mushrooms on fruit crop and phosphorus (P) content and to compare the yield response with tomatoes grown with different fertilizer P rates. We hypothesized that mushrooms would produce fungal hyphae that extends out to greater riches of the soil thus increasing soil P solubility and availability to plants. The study consisted of a series of treatments arranged in a randomized complete block design (RCBD). Main treatments are tomato variety and P fertilizer amendment. We found that intercropping tomatoes with edible mushrooms perform equally well and comparable with P fertilizer. Producing edible mushrooms in addition to tomatoes creates an additional economic incentive.

"Language and Individual Identity"

Christopher J. Padilla
With Rebecca Steele
Department of Modern Languages
University of Wyoming

Oral Presentation

Honors Program *Powell, Wyoming*

As globalization develops, demographics evolve, and the linguistic blueprint of many countries morphs, the complexity of both language and individual identity becomes more acute. Yet, despite such fluidity, language and identity remain inextricably connected. The following thesis seeks to examine this relationship by analyzing select areas of overlap. First, the topics of language and identity will be operationally defined through the lens of psychology and linguistics. The larger question—how language is used as an expression of individual identity—will then be explored in relation to the topics of code-switching, dialect, and how self-perceived language proficiency is used to either affirm or deny cultural affiliation. What then follows are points of contention. That is, neither languages nor identities enjoy similar social prestige; on the contrary, both are unmistakably influenced by social constructs such as power. Finally, the anticipated future of this relationship will be discussed in regards to the role of translation and the possible use of constructed languages as a means of achieving a unifying, transnational identity.

Because all individuals attach significance to their identity and language, the topic of this thesis is one of general interest. Beyond that, its implications are of notable importance in the study of bilingualism and the maintenance of language and identity across generations.

As globalization develops, demographics evolve, and the linguistic blueprint of many countries morphs, the complexity of both language and individual identity becomes more acute. Yet, despite such fluidity, language and identity remain inextricably connected. The following thesis seeks to examine this relationship by analyzing select areas of overlap. First, the topics of language and identity will be operationally defined through the lens of psychology and linguistics. The larger question—how language is used as an expression of individual identity—will then be explored in relation to the topics of code-switching, dialect, and how self-perceived language proficiency is used to affirm or deny cultural affiliation. What then follows are points of contention. That is, neither languages nor identities enjoy similar social prestige; on the contrary, both are unmistakably influenced by social constructs such as power. Finally, the anticipated future of this relationship will be discussed in regards to the role of translation and the possible use of constructed languages as a means of achieving a unifying, transnational identity.

Since all individuals attach significance to certain aspects of their identity and language, the topic of this thesis is one of general interest. Beyond that, its implications are of importance in the study of bilingualism and the maintenance of language and identity across generations, particularly among immigrant populations.

Occupancy modeling to examine meso-mammal diversity and abundance at an urban-rural interface of Cheyenne, Wyoming

Devyan J. Paiz[1], Francis G. Schaffer IV[1], Dr. Ami L. Wangeline[1], Dr. Hayley C. Lanier[2], Dr. Zachary P. Roehrs[1]
[1]Department of Natural Sciences, Laramie County Community College
[2]Department of Zoology and Physiology, University of Wyoming - Casper

Poster Presentation

Department of Natural Sciences, INBRE *Cheyenne, WY*

Camera traps are a passive surveying method used to inventory and gather natural history and ecological information on vertebrates. In this study, camera traps were used to obtain occupancy estimates for meso-mammals in the Cheyenne Business Park Natural Area (CBPNA), Laramie County. In collaboration with the Laramie County Conservation District, these data will be used to address land use and other management decisions in the CBPNA. Eight camera traps were deployed sampling forty three 100×100 m survey grids, with each grid surveyed by one camera for 7 days, totaling 301 trap days. Grids were assigned to 1 of 3 habitats (prairie, riparian, or woodland). Occupancy data were analyzed using a single-season, single-species model within habitats and across the CBPNA. In preliminary results the riparian habitats hosted a more diverse meso-mammalian community in comparison to the prairie habitats. At present, 4 mammal species (*Neovison vison, Ondatra zibethicus, Procyon lotor, Sylvilagus floridanus*) have been detected on the CBPNA and occupancy has been estimated. Neither *N. vison* nor *P. lotor* are well documented historically within Laramie County. While all of these species are known to be present in Laramie County, none have been documented on the CBPNA specifically and this is the first study to estimate their abundance in southeastern Wyoming. Species expected, but not detected may have been due to anthropogenic or seasonal effects requiring further research. Results presented consist of winter data, but are part of an ongoing study to elucidate meso-mammal population dynamics in southeastern Wyoming.

Characterizing Star Clusters in Dwarf Galaxies

Rachel Parziale with Daniel Dale
Astrophysics
University of Wyoming

Oral Presentation

EPSCoR *Littleton, CO*

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

The Relationship between the Written Word and Visual Art

Madison Pass with Diane Panozzo
Honors
University Of Wyoming

Oral and Poster Presentation

Honors Program *Evanston, Wyoming*

Visual art is a category that is incredibly vast, and has a rich and vivid history. The visual arts have wound their way through history, leaving their mark on everything they have interacted with. This is true of the written word as well. Yet these two elements are so often separated very distinctly, both into separate categories and often actually separated by medium from one another. This project is an exploration of the ways that the written word works in tandem with visual art. This is completed by looking at the ways that visual art has included or worked written word into the visual art, and not just having something written in relation to a visual piece. To further explore this relationship I have taken the project further than just research, and have actually created three art pieces that combine the written word in with visual art. This was done in order to examine and explore firsthand some of the ways that the written word can interact with visual art, and can consequentially create different types of expression than either do alone.

Etic and Emic Perspective in the Creation of Constructed Languages

Madison Pass with Pamela Innes
Anthropology
University Of Wyoming

Oral Presentation

Self Designed Major *Evanston, Wyoming*

Constructed languages (conlangs) are used in various types of media for several different purposes. Currently more and more of these languages have become parts of popular culture such as Dothraki in the well-known Game of Thrones series, or less recently, Klingon in Star Trek. The people who create these languages are called conlangers, and while some of them are linguists this is not true of all. The field of linguistics has not focused much on constructed languages as they are not like natural languages. However, there is much to be learned in not only the study of conlangs themselves, but the study of the processes and perspectives of those who create them. This project is a study of conlangs and the ways that the creation process and other elements differ when the creators are approaching the creation from varying perspectives. In order to examine the ways in which diverse perspectives affect the process of creating conlangs and the type of product produced, three specific constructed languages and their creators' processes are examined and discussed at length. This study demonstrates that distinct and important differences in conlanging emerge when differing perspectives are taken into account.

The Effect of Footwear On Rotational Torques in Country Swing Dance

Hunter Perala, Dr. Boyi Dai
Department of Kinesiology and Health Promotion
University of Wyoming

Oral Presentation

EPSCoR *Cheyenne, WY*

The repetitive dancing movements of spinning, sliding, and landing generate cumulative loads to the lower extremity and lead to high injury rates [1]. Rotational loads to the knee can strain the anterior cruciate ligament and the medical and lateral collateral ligaments [3]. The purpose of this study was to examine the effect of different footwear on the peak rotational torque during a rotational movement in country swing dance. It was hypothesized that the leather bottom boots would result in the lowest peak rotational torque compared with the rubber bottom boots, barefoot, and running shoes. Eight female and six male country swing dancers (age: 20.6 ± 1.5 yrs; height: 1.72 ± 0.07 m; mass: 69.4 ± 8.7 kg; dance experience: 4.6 ± 4.4 yrs) participated in this study. It was found that rotational torque in country swing dancing is lowest when wearing leather bottom western style boots. Decreased rotational torques may be associated with decreased risk of injuries and improved performance. It is recommended that country swing dancers wear leather bottom boots instead of rubber bottom boots, running shoes, or being barefoot.

Correlation of Bedrock Fractures and Seismic Wave Velocities using Seismic Refraction Surveys and its implications onto the Critical Zone

Marc P. Peters & Dr. W.S. Holbrook Department of Geology and Geophysics
University of Wyoming, Oral Presentation

Supporting Program: EPSCoR, WyCEHG *Aachen, Germany*

Fracturing in the critical zone is poorly understood. Despite increasing scientific interest in this area, the accurate determination of fractionation in the subsurface remains difficult owing to prohibitive costs. Yet more precise characterization of this process provides critical insight in to point at which granite or bedrock becomes soil. We studied outcrops in the Laramie Range of southeastern Wyoming and correlated seismic P-wave velocities with outcrop fracture density. We used a rock physics model to validate our findings and provide a more robust characterization of the role P-wave velocities acquired on outcrops play in critical zone science. This approach marks a significant point of departure from precedent research, which has not applied P-wave fracture relationships in outcrops to the critical zone. We conducted seismic refraction surveys on fractured granitic outcrops. Measured velocities were then correlated against known fracture density. We compared our results with previous studies that used boreholes to determine fractionation. We found a clear, inverse relationship between a decline in P-wave velocity and an increase in fracture density. Our findings were consistent with other studies conducted in the same area, which suggests that outcrops can be used to determine fracture density in the critical zone. Our findings suggest that the use of seismic refraction surveys on outcrops provides a non-invasive, highly transferrable method through which critical zone fractionation processes can be better understood.

Perception Training on Physical Task in Virtual Reality

Thao Phung, Dr. Amy Banic
Department of Computer Science
University of Wyoming

Oral Presentation

Department of Computer Science, EPSCoR *Laramie, WY*

Prior psychology research has shown that as people perceive their performance on a task, their perception changes about the objects in the environment. For example, consider the sports scenario of hitting a baseball. If someone is doing really well at hitting the ball, then their perception of the size of ball is larger, or easier to hit and vice versus. Virtual Reality (VR) has been shown to have benefit for training. To further this, what if we can use this perception phenomenon as a way to prime the individual in order to manipulate and improve performance. We are investigating the role of perception and the effects of using perception in virtual reality training on actual real world physical task performance. The task for this experiment will be limited to a scenario where the individual has to putt a golf ball in a hole. We have chosen this task since prior research has found this phenomenon with this task. We use a virtual reality environment to prime the individual by manipulating the hole size. We collect data on their performance in their task pre- and post-VR priming. The golf player's performance will be measured to detect changes and determine if perception dictates performance. Also, performance will be measured after perception training exposure in the Virtual Reality Environment to determine the effects of perception training on performance. Our results will have implications for how virtual reality training can be used not only for improving skills, but also for dynamically manipulate perception.

Ritual Behaviors in Non-Suicidal Self-Injury

Shelby Plamann with Dr. Carolyn Pepper and Stephanie Bachtelle
Psychology Department
University of Wyoming

Poster

Psychology *Cheyenne, WY*

Fully 24% of undergraduates enrolled in General Psychology endorse engaging in non-suicidal self-injury (NSSI). To date, there is no research on the use of rituals in NSSI. Identifying differences in levels of NSSI routine behavior and associated self-injury severity would assist in both theoretical conceptualization and treatment of NSSI. The purpose of this study was to: a) determine whether rituals are used in NSSI, b) determine whether rituals are related to severity of NSSI, and c) determine if there are differences in perfectionism, impulsivity, depressive symptoms, and borderline personality disorder symptoms between those who report engaging or not engaging in NSSI rituals. Participants (n=93, 71% female) were between 18 and 27 years old (M = 19.9, SD = 1.87) and primarily white (91.4%), non-Hispanic (93.5%). All participants completed a batter on questionnaires online. Preliminary analyses suggest individuals engage in NSSI rituals, with 47.3% of individuals "preparing to self-injure in the same way" and 34.4% "listening to a certain genre of music/song" prior to engaging in NSSI. Higher self-reported levels of NSSI rituals associated with self-injury were positively correlated with levels of perfectionism, r = .42, $p < .001$. These findings suggest that those who engage in rituals associated with their self-injury may differ in personality. Additional findings and clinical implications will be discussed.

Chemical EOR Powder River Basin Field Screening

Thomas Pointon, Dr. Xuebing Fu
Department of Petroleum Engineering
University of Wyoming
Oral Presentation

Department of Petroleum Engineering, Honors *Riverton, WY*

This project received a large data package from the EORI. We screened through the data to find the top fields best suited for a particular chemical EOR method, and then determined incremental production increases. Finally we created a report detailing our process. In order to accomplish the above tasks, we first started with planning our project by dividing the work into four phases. We then went into screening and ranking fields by doing a field screening and ranking analysis, then used equations and reservoir techniques to provide the expected incremental production increases. Field screening compares a list of parameters from multiple fields (depending on the screening method, various parameters are used) to values on lookup tables that have been determined by experts for each enhanced oil recovery method. These lookup tables provide no more than a 'Go' or 'No Go' answer for each field; other methods (such as indexing) are required for ranking if multiple fields fit all parameters for a certain EOR method. An initial screening of our project reduced the number of fields from 4500+ to 114, and out of those fields, some of the data required for screening was missing. Accessing the WOGCC, our group was able to download well logs and go to other public sources for the screening information needed. Our indexing method involved comparing the range of field parameters against comfort reference values to find an index for each field, and using higher index values as better candidates.

Effects of Molecular Genetics on Cancer Management

Kourtney Puckett with Dr. Pamela Langer
Department of Physiology
University of Wyoming
Oral Presentation

Honors Program *Sheridan, WY*

With the development of next generation sequencing, the availability and effectiveness of genetic cancer panels is at an all time high. In the past, largely only single gene tests were available to test for the presence of some high penetrance genes, such as BRCA1 and 2. Single gene tests are less likely to give conclusive and clinically useful results due to the limited amount of data collected and heterogeneity of cancers. The benefits of full cancer panels from popular companies such as Myriad, GeneDx, and Ambry Genetics include greater sensitivity results and therefore a more conclusive estimate of potential risk. The major clinical implications of cancer panels can help influence the course of medical decisions by the practioner. Interpreting results showing variants of unknown significance, effectively communicating and establishing patient understanding, and the psychological effects on the patient from increased knowledge are challenges that underline the implication of cancer panel use.

In the case of cancer development, molecular management strategies including tumor markers and other tumor expression profiling methods can be used to significantly improve patient therapy by creating a personalized treatment based on the clinical genomics of a patient's cancer.

The Role of Elemental Residence in Constraining the Rare Earth Mobilization Potential of Hydrothermal Fluids in the Sherman Batholith

Jonathan Pullum; Advisor Dr. John Kaszuba
Geology and Geophysics
University of Wyoming
Presentation: Oral and Poster

EPSCOR *Converse, IN*

Elemental residence, defined as the specific mineral in which a certain element resides, can play a critical role in understanding a host of characteristics about a given suite of rock(s). The elemental residence of rare earth elements (REEs)s help constrain the mobilization potential of REEs that have come in contact with hydrothermal fluids. The Sherman Batholith, a granitic system in Southwest Wyoming and Northern Colorado, exhibits a high light rare earth element (LREE) enrichment relative to chondrites, decreasing as you move towards heavy rare earth elements (HREE). Elemental residence of the minerals in the Sherman Batholith can be used to determine the mobilization potential of hydrothermal fluids in that region. Preliminary results show the highest amount of light rare earth elements (in this case La, Ce and Nd) were in allanite and other epidote group minerals. The allanite appeared highly altered and a determination of the nature (primary or secondary) is ongoing. Additionally, zircon, while abundant, was often a carrier of uranium and thorium with minimal rare earth residence observed. Other rare earth-bearing minerals included apatite, which had minimal alteration. The highest REE presence was observed in the true granite (Sherman granite) of the Sherman Batholith. Future work seeks to constrain the nature of the fluids that altered the granite; preliminary data suggests that hydrothermal fluids may have played a role in the presence of the LREE-rich allanite that is found in much of the Sherman Batholith.

Developmentally Appropriate Evidence-Based Practices for an Older Adult Balance & Exercise Class

Kara Purcelley, Dr. Tami Benham-Deal
Division of Kinesiology and Health
University of Wyoming
Oral Presentation

Honors Department *Windsor, CO*

There are many health-related benefits associated with exercise. However, aging effects experienced by older adults can impact the quality and efficiency of the movement they perform during their exercise programs. The goal of the research is to collect information that will help design developmentally appropriate practices for older adults participating in a group exercise class. The motor performance of participants in a senior balance and exercise class at the Eppson Senior Center (Laramie, WY) was observed. Biomechanical characteristics of the movements were identified, physical properties of the movers were described, and possible task and environmental constraints were acknowledged. From these observations individual factors were specified that constrained or restrained the movements and the degree to which task and environmental constraints afforded efficient and effective motor performance. Finally, the results were used to develop evidence-based practices and suggestions for improvement of a senior exercise class.

Transformation of Frontenac Grapevine Embryos

Isaac Quarterman, Sadanand Dhekney
University of Wyoming

Oral and Power Point presentation

INBRE *Sheridan, WY*

Transformation of Grapevine has been an ongoing area of research at the UW extension. In this research project, Dr. Raju Kendal's pioneering research into activation of anthocyanin production, for use as a gene insertion reporter, will be continued. A different variety of Grapevine, Frontenac, is being tested for response to agrobacterium mediated transformation. Frontenac is a Vitis vinifera Vitis riparia hybrid, and is known to be a relatively cold hardy variety of grapevine. The embryos being transformed are at the developmental and plate-life limits of susceptibility to agrobacterium mediated transformation. This experiment will also explore the transformation rates to be expected when maintained embryonic cultures must be transformed before its too late. Possible modifications in the step order of the overall precision breeding protocol will also be explored.

Role of NK cells in chronic Toxoplasma gondii infections.

David Rach, Daria Ivanova and Dr. Jason P. Gigley*
Molecular Biology
University of Wyoming

Poster

INBRE *Comitan, Mexico*

Toxoplasma gondii is a protozoan parasite that affects 30% of the world's population. In most infected individuals it forms chronic and clinically silent infections characterized by intra-cellular cysts in brain and muscle tissues. Long-term infection with this parasite correlates with some neurological disorders including, schizophrenia, depression and dementia related diseases. This is hypothesized as being the result of chronic infections reactivating and causing neurological damage.
Our lab has previously shown that Natural Killer (NK) cells are important for the control of the parasite upon secondary infection, but only cytotoxic CD8 T cells are required to maintain control of brain cysts. However, mice chronically infected with Type II *T. gondii* eventually die due to immune exhaustion. When depleted of NK cells, chronically infected mice are rescued and survive. Consequently, we hypothesize that NK cells contribute to T-cell exhaustion.
To test NK cells interaction with CD8 T-cells in a chronic *T. gondii* infection, we infected groups of C57BL/6 mice with 5 cysts of *T. gondii* Type II via oral gavage. Seven weeks post infection splenic CD8 T-cell and NK Cells were harvested and analyzed via flow cytometry, in order to determine cell number, frequency and function.

"Economics of the Taxi Industry: An Uber Shake-up"

Steven Rahel
With Dr. David Finoff
Business
University of Wyoming

Oral Presentation

Honors Program Laramie, WY

The taxicab has been one of the dominant forms of transportation in cities all over the world. Since the late 1980's, almost all U.S. cities have chosen to regulate their taxi industry. However, a new technology called ride-sharing applications, such as Uber and Lyft, has caused a major disruption to the traditional taxi industry. Since Uber's inception in 2009, the ride-sharing company has taken a significant amount of business from the taxi industry and is valued at around $60 billion. This study aims to look at the economic impact of Uber on the taxi industry. The study will examine the negative externalities (efficiency, quality, and safety) that come with this new technology.

The economic impact will be analyzed by using Cournot's model and will examine the labor market. The main focus of the study will look at U.S. cities specifically the New York market. Possible economic policies will be proposed to create a more efficient taxi industry. The reason for this study is to get a better idea of how ride-sharing technology is changing the taxi industry and if a more efficient for-hire transportation market can be created.

The Winds

Sulaiman Raja |Harvey Hix
Humanities/Fine Arts
University of Wyoming

Oral presentation

Honors *Buffalo, Wyoming*

The winds, the winds are calling….Who feels their sway? Does your ear point towards the source? Will you listen? What vainglorious tempers will be aroused? What stroke of that nigh-ubiquitously perseverant Ego will mark your view? Do you choose to stay the inflexible rod, deaf to the sound of your own breaking? Or does your nature sway to tides of a world without? Questions arise when answers are sought. Paths illuminated along the way as the labyrinthian search takes you into the darkness of the present. Blind to your own world, Beauty attracts and embraces. It is the All that calls, calls, calls. Please sit down my child; listen. It fans and churns all into their place. At once settled, does thou dare to not sprout and take to the skies, rooted in the singularity of Is? A journey shall be taken, skies shall do as they do, and each step a flashing bridge between You and You, the ripples of time chiding the end and beginning of each artifice of bridgeous onwardity Who can stop the winds of Time from taking into jocund folds the spreadlings of each moment. The lookings into the gaseous fountains of our time shall need be ensued. Selfless goggles recommended.

Understanding the Human-Elephant Conflict in India: A First-hand Perspective

Anne N. Reed[1], Dr. Ramesh Sivanpillai[2]
1. Department of Zoology and Physiology, 2. Department of Botany & WyGISC
University of Wyoming
Oral presentation

Haub School of Environment and Natural Resources *Cheyenne, WY*
UW Center for Global Studies

Numerous incidents of human-elephant conflict occur in India, especially in ecological hotspots. In Southern India there are many conflicts that occur between the wildlife and humans, however, one of the largest, in terms of impact, which has been escalating since the 1980s is the human-elephant conflict. Loss of habitat due to fragmentation and land conversion are forcing the elephants into urban areas in search of food and water. Elephants raid crop fields and farmers have been trying various approaches such as digging trenching and erecting electric fences to prevent these animals from destroying their livelihood. Following a literature-based research, we visited Coimbatore, India in summer 2015. Talking to stakeholders and witnessing these sites in person provided insights about the magnitude of this problem, and how it is impacting human lives. This presentation will highlight the first-hand knowledge gained from visiting this conflict zone.

SafteyApp

Kayla Reid, Courtney Tray and Rolf Schuster; Dr. Ruben Gamboa
Computer Science
University of Wyoming
Oral Presentation

Department of Computer Science *Laramie, WY*

Every person lives a unique life with a unique schedule, which makes it impossible to have a security system that is dependable. SafetyApp provides personal security by allowing each user of the application to alter the settings, preferences, and use for their schedule. SafetyApp achieves this through the use of two modes configured by the user to send alerts to whomever the user chooses. For both modes the user configures a security question and who they would like the alert text message sent to. In the immediate mode, when the user is in a situation they find unsafe, they will hold a button to be released when threatened. Upon release of the button, a security question pops up. If not answered in ten seconds, the alert text with GPS location sends. In timed mode, the user creates an event with details like time frame, location, etc. The GPS location is recorded every 15 minutes. At the end of the event, the security question pops up and will send the alert if the user doesn't check in or if the GPS location changes greatly. On the back end, SafetyApp is connected to a server that collects all the information into a website so each user is able to alter settings to fit their needs. With these modes and configurability, SafetyApp gives the user a great layer of security for use in a variety of situations by users of many ages, children, students, parents, and more.

The Chronicles of Agriculture:
A Preservation and Adaptation Comparison of Yucatecan Maya and Peruvian Quechua Agricultural Systems

Amanda Reish, Dr. Mary Katherine Scott
International Studies and Spanish
University of Wyoming
Oral presentation

UW Honors *Littleton, Co*

This essay will seek to explore how Yucatecan Maya and Peruvian Quechua are preserving and adapting their indigenous agricultural systems to the modern world. This relation is examined through indigenous spirituality ceremonies, food systems and economic systems. In both cultures, there are ceremonies, which are done in order to appease the local gods and encourage bountiful harvests. The traditional food systems have also changed due to the effects of colonization, imperialism and globalization. Both cultures have also seen a shift in their economic systems, as they have had to adapt different forms of crop productions in order to survive. All of these changes have impacted the way everyday life is conducted for these people, yet their way of life has continued. Preserving local customs and traditions that have roots in the pre-Hispanic past is important for their ongoing negotiations of their indigenous cultural identities, though they recognize the necessity of being able to adapt and assimilate into dominant, often non-indigenous, ways of living. Such careful balancing of tradition and modernity has ensured their place in the modern world.

Investigating the Presence of Undersized Nestlings in Three Species of Sagebrush Songbirds

Ashleigh M. Rhea, Jason D. Carlisle, Matthew D. Carling
Department of Zoology and Physiology
University of Wyoming
Poster Presentation

Dept. of Zoology and Physiology *Dillon, MT*

Within a nest, young birds are often differently sized, but the frequency and causes of these size differences are not well understood. For songbirds nesting in Wyoming sagebrush ecosystems, previous research suggests that many nests have one nestling that is much smaller than its siblings, which is often referred to as a runt. This simple observation lead to the following questions: How common are runts? Does the frequency of runts vary by species? and Does brood size correlate with the occurrence of runts? To answer these questions, we located 109 nests and weighed 320 individual nestlings of three species of songbirds: Sage Thrashers, Brewer's Sparrows, and Vesper Sparrows near Sweetwater Station, Wyoming. We analyzed these data using Program R. There is no clear definition of what constitutes a "runt" nestling, so we focused on the differences in mass between the smallest and largest individuals of each nest. We found that on average the smallest nestling was 20% smaller than its largest sibling, but this varied by species. Our data suggest that there is not a strong relationship between brood size and mass differences among siblings. Little research has been conducted on songbirds of sagebrush ecosystems, so our findings provide new information on the breeding biology of these songbirds. Additionally, our data shed light on the potential differences in parental care of each species and how brood size affects the growth of nestlings.

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

Morgan Robins with Professor Todd Guenther
Central Wyoming College

Oral

Honors/ Anthropology CWC *Lander, Wyoming*

The Dinwoody Bison Jump was discovered by CWC archaeological field school during the 2015 Interdisciplinary Climate Change Expedition (ICCE) to the Dinwoody Glacier. This jump is several thousand feet higher than the next known recorded jump site, most of which are at far lower elevations. The Dinwoody jump consists of a gathering area of several square miles, a 1.6km long drive line which leads to a rocky outcrop jump off, and a butchering area consisting of a surface lithic scatter containing an estimated 10,000 sharpening flakes. What makes this site important is not so much its unique elevation as what it suggests about prehistoric people's large group adaptations, possibly year round, to the high alpine environment.

Enhanced Oil Recovery Planning for the Luckey Ditch Field

Blake Robinson, Rebecca Roskowski, Christopher Siebert, Hamilton Smith, and Whitney Smith
Dr. Xuebing Fu
Department of Chemical and Petroleum Engineering
University of Wyoming

Oral Presentation

Department of Chemical and Petroleum Engineering *Kemmerer, WY*
Grand Junction, CO
Laramie, WY
Billings, MT
Katy, TX

This project has been prepared by Team 5 to satisfy the requirements of the Petroleum Engineering Senior Design course. The design plan will be described for the Luckey Ditch Field in southwestern Wyoming, which will undergo an enhanced oil recovery (EOR) simulation of this team's design. The problem statement given to the team required the selection of a field in the Enhanced Oil Recovery Institute (EORI) database with appropriate data to characterize the reservoir. Additionally, a simulation was expected to be performed in order to develop an optimum EOR scenario. By Team 5's definition, an optimum EOR scenario should be determined through economic analysis of increased oil and gas production weighed against additional costs of the EOR equipment purchase and recurring expenditures. Additionally, safety, environmental impact, and practical industry feasibility will all contribute to the selection criteria for choosing an optimal EOR scenario for the Luckey Ditch Field.

The primary focus of the planning report delivered at the end of the fall semester was to design a plan to organize tasks to be completed for project success. The initial given data was analyzed, including well logs, production values for oil, gas and water, and many types of geologic data. Then a risk analysis evaluated the potential hazards to the overall success the project. Planning tools, such workflow diagrams and Gantt charts were developed to clearly define and schedule the completion of specific tasks, such as building static models and preparing research about the compatibility requirements of EOR mechanisms.

The spring semester included the completion of a static model that shows geologic data, such as formation depths from well tops and log property distributions. Due to data limitations from scanned, antiquated logs provided from the Wyoming Oil and Gas Conservation Commission database, a statistical approach was chosen to implement the selected EOR recovery data, including typical recovery enhancement percentages over primary production estimates and performance in similar fields, into the existing production decline curves. Thermal EOR methods were ruled out based on the large depth of the Luckey Ditch's producing formation, the Dakota formation. The gas cap expansion drive mechanism in the reservoir would likely benefit from gas injection for pressure maintenance and oil mobility control, such as CO_2 or N_2.

At this time, CO_2 and N_2 injection scenarios are being evaluated using EOR mechanism property analysis, mainly comparing the reservoir data to previous successful EOR reservoir data in lookup tables. Additional conclusions about the volumetric production and economic effects of the selected EOR scenario will be evaluated and compared to primary production decline curves before April 15, 2016.

Lattice-points enumeration in polytopes
Study of the coefficients of the Ehrhart quasi-polynomial

Hélène Rochais, Dr. Tyrrell McAllister
Mathematics Department
University of Wyoming

Oral presentation

EPSCoR, Honors *Flers, France*

A very important problem in discrete geometry is counting points with integer-coordinates (also called “lattice-points”) in polytopes. A polytope is a geometric shape that is the smallest convex set containing the vertices defining the polytope. For instance, in two dimensions, a polytope would simply be a convex polygon. Lattice-point enumeration has applications in a lot of different areas of mathematics, including combinatorics and operations research. Our goal is to study the function that counts the lattice-points in a polytope and its integer dilates when the vertices of the polytope have rational coordinates. This function is a quasi-polynomial. That is to say, it is a polynomial with coefficients that are themselves periodic functions in the variable, meaning that the values of those functions repeat themselves after a certain period. This function is the Ehrhart quasi-polynomial of the polytope. For this research, I am focusing on the periods of the coefficients of the Ehrhart quasi-polynomial in order to see if they can take on any value for some polytope or if there exist restrictions on these periods. It has already been proven that no interesting restrictions exist for the 2-dimensional case and we have constructed a family of polytopes that proves that no interesting restrictions exist for the non-convex 3-dimensional case. We are also able to generalize some of our contructions to higher dimensions.

Guidance and Path Planning of a Parallel Robot with Feedback

Thomas Rochais, Courtney Long, Dr. Farhad Jafari
Department of Mathematics
University of Wyoming

Oral presentation

EPSCoR Program *Flers (61), France*

Optimal path planning and design is a fundamental and deep question in many areas of science and engineering. Here, we explore a bumper-car feedback approach to path planning and design. We describe the kinematics of a model parallel robot having contact with the surface and develop a path planning strategy guided by the robot bumping into the walls. Using a Snells' law model for reflection from the wall, a model for the local curvature (derivable from the tangent space) of the wall is developed, and the robot is guided by feedback. Such a model would be important in guiding a rescue robot through a circuitous mine shaft, where visibility/sensor feedback is not an option. This design is coded in Matlab and simulations are run to show the resulting dynamics. The effect of robot geometries on the path design is investigated.

Radio-loud and radio-quiet BAL quasars: a detailed ultraviolet comparison

Thomas Rochais, Dr. Adam Myers
Department of Physics and Astronomy
University of Wyoming

Oral presentation

Honors Program *Flers (61), France*

Studies of radio-loud (RL) broad absorption line (BAL) quasars indicate that popular orientation-based BAL models fail to account for all observations. Are these results extendable to radio-quiet (RQ) BAL quasars? Comparisons of RL and RQ BAL quasars show that many of their properties are quite similar. Here, we extend these analyses to the rest-frame ultraviolet (UV) spectral properties, using a sample of 73 RL and 473 RQ BAL quasars selected from the Sloan Digital Sky Survey. Each RQ quasar is individually matched to an RL quasar in both redshift (over the range $1.5 < z < 3.5$) and continuum luminosity. We compare several continuum, emission line, and absorption line properties, as well as physical properties derived from these measurements. Most properties in the samples are statistically identical, though we find slight differences in the velocity structure of the BALs that cause apparent differences in C IV emission line properties. Differences in the velocities may indicate an interaction between the radio jets and the absorbing material. We also find that UV Fe II emission is marginally stronger in RL BAL quasars. All of these differences are subtle, so in general we conclude that RL and RQ BAL QSOs are not fundamentally different objects, except in their radio properties. They are therefore likely to be driven by similar physical phenomena, suggesting that results from samples of RL BAL quasars can be extended to their RQ counterparts.

Are the Youngsters Home? A Search for Young Clusters in the Merger Remnant NGC 2655

Thomas Rochais, Dr. Adam Myers, Dr. Barry Rothberg, Dr. Olga Kuhn
Department of Physics and Astronomy
University of Wyoming and University of Arizona

Poster presentation

WRSP Program *Flers (61), France*

We are studying star clusters in NGC 2655, a shell elliptical galaxy that is likely a post-merger remnant and may yet still be forming new stars. Our project consists of two parts. The first goal is to put together a pipeline for taking raw images and transforming them into a final calibrated set of data. The algorithms we have developed will be useful for all astronomers who use the Large Binocular Cameras (LBCs) at the Large Binocular Telescope (LBT) located on Mount Graham in Arizona. The second goal is to effectively take a population census of young star clusters (YSCs) and Globular Clusters (GCs) in a galaxy undergoing a transformation from two spiral galaxies into an elliptical galaxy. NGC 2655 may be a future version of our Milky Way after it collides and merges with the Andromeda Galaxy. Stars are born in groups and clusters. When mergers occur between spiral galaxies, vast reservoirs of gas are turned into stars and these stars all form together in large clusters with masses ranging from 10^{4}-10^{7} M_{⊙}. As seen in major mergers like the Antennae and NGC 3256, thousands of such star clusters are formed during and after a galaxy merger. However, NGC 2655 is clearly an elliptical galaxy with strong indications of having undergone a recent major merger. Thus, it represents a transition object, allowing us to study both the GC and possibly YSC populations.

Improved Method for Accurate Measurement of Fatty Acids after In-Vitro Microbial Digestion

Heather Rose, Dr. Daniel C. Rule
Animal Science Department
University of Wyoming

Poster Presentation

University of Wyoming Agricultural Experiment Station *Lingle, WY*

Fish oil omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosohexaenoic acid (DHA), have been touted for their health benefits and importance to a balanced diet. Although these fats are associated with fish, their content in beef is a popular area of research. Concentrations of EPA and DHA in beef from cattle fed a supplement containing fish oil has been tested. Subsequently, effects of forage type on degradation of EPA and DHA using in-vitro microbial digestion (IVMD) with bovine rumen microbes was measured. Fatty acid content was determined by gas chromatography (GC) after freeze-drying digestion samples and reacting with HCl in methanol to convert free fatty acids to methyl-esters. Tridecanoic acid was used as an internal standard (IS) to calculate fatty acid concentrations from the chromatograph. Four trials of IVMD have been performed; inconsistencies in fatty acid measurement were observed. In two trials the GC signal for the IS and other fatty acids varied by forage type while in the other two trials no differences were observed. The current research aims to determine the cause of discrepancies and finalize a protocol that will produce consistent and accurate results. Initially, testing different methyl-ester reaction times and temperatures did not affect GC signal of the IS or fatty acids derived from the fish oil. However, a fatty acid derived exclusively from forage, alpha linolenic acid, was affected by time, temperature, and forage type. This research will determine a method for complete extraction and reaction parameters for accurate measurement of fatty acids.

Automatic Aromatics: Direct Conversion of Methanol to Aromatics

Gabrianna Ruskowsky, Tess Ward, Jonathan Weishaar, Brady Wilkison, and Dr. David Bell
Department of Chemical Engineering
University of Wyoming

Oral Presentation

Chemical Engineering Senior Design

Sheridan, WY
Laramie, WY
Alliance, NE
Laramie, WY

Aromatics are an important part of many chemical engineering processes around the world and have a large variety of commercial uses. In the future it is projected there will be a shortage of oil resources causing many research institutions to work actively to develop new techniques for producing aromatics. Para-xylene is a particularly profitable aromatic in today's industry. With the low cost of natural gas, converting methanol to para-xylene has become an attractive option. Methanol is readily available due to massive natural gas reserves underground and it is relatively inexpensive. Many current processes convert methanol to para-xylene in a two-reactor process, with DME as the intermediate. However, the process of converting methanol directly to para-xylene without the DME intermediate has been the focus of several papers and patents in the last couple years putting this process on the front end of innovation and in the sights of anyone wishing to produce para-xylene in a cost effective manner. Automatic Aromatic will use a catalyst to convert methanol directly to multiple aromatic compounds, the most marketable being para-xylene. Para-xylene is in high demand as it is used to produce polyethylene terephthalate which is used as a polyester fiber, film, and resin for applications in the container, cosmetic, textile, and packaging industries. The byproducts produced in this process are also lucrative as they can be sold to gas refineries to increase octane ratings. Our process design shows excellent conversion of methanol, and minimizes the amount of equipment in the process.

Methanol to Aromatics

Gabrianna Ruskowsky,
Mentor: Dr. David Bell
Chemical Engineering
University of Wyoming

Oral Presentation

Honor's Program *Sheridan, WY*

Methanol is a compound containing one carbon, three hydrogens, and one hydroxyl-group, or an oxygen-hydrogen group. Due to the single carbon, also known as the methyl-group, methanol can be used to build up other, larger carbon chains ranging from a two carbon chain to an eight carbon chain or larger. Using a special type of catalyst called a zeolite, these carbon chains can be built up and can form rings, or what are referred to as aromatics. These aromatics are desirable for their use in the chemical industry as they can be used to build up polymers that are used in everyday products. The process of turning methanol into aromatics also yields a variety of other carbon chain products that have their own uses as fuel sources, gasoline, and other chemical compounds needed in the chemical industry. This process design covers the necessary reaction for converting methanol to other carbon compounds, the removal of water from the carbon compounds, and the separations needed to isolate the compounds this process seeks.

Flagellar Protein Distribution and Function in *Agrobacterium*

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

Poster Presentation

INBRE Transition Scholars *Rock Springs, Wyoming*

Cell polarity is an important feature of organization in rod-shaped bacteria. In polarized bacteria, cell poles acquire complex, multiprotein assemblies, which are built upon scaffold-like organizing proteins. Nearly all *Alphaproteobacterium* include a putative scaffolding protein called PopZ, but understanding of the function of this highly conserved protein is limited to the model species *Caulobacter crescentus*. *Agrobacterium fabrum* is an agriculturally relevant *Alphaproteobacterium* that remains incompletely characterized. *Agrobacterium* is known to have several flagella that are arranged in circumpolar rings, however, their precise location and their pattern of localization with respect to the cell cycle have not been described. I used fluorescent protein tagging to locate the positions of flagellar basal bodies in *Agrobacterium* and characterized flagellar activity and localization in the absence of Polar organization protein Z (PopZ). My results show that flagellar basal bodies are produced at cell poles during the 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. In the next round of cell division, these basal bodies are degraded and subsequently reassembled at the new 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.

PopZ organization impacts Protein Functionality in *Agrobacterium*

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

INBRE Summer Fellowship *Rock Springs, Wyoming*

Polar Organization Protein Z (PopZ) is a bacterial protein that accumulates at the cell poles in *Alphaproteobactera*. In the plant pathogen *Agrobacterium fabrum*, PopZ is required for proper growth and development. In the absence of PopZ, the growth rate is reduced by 50% and the cell body is unable to develop normally due to the disruption of polar organization, including proteins that facilitate chromosome segregation. I have measured described basic properties of *Agrobacterium* such as the doubling time both with and without PopZ. This work resulted in a reliable doubling time, using a less time-intensive technique for obtaining a growth curve using a plate reader. Additionally, I have used molecular cloning to fuse the green fluorescent protein gene to target proteins believed to be dependent upon PopZ for organization. I am using these DNA constructs to determine the localization of proteins relative to PopZ. To do this, I use fluorescent microscopy to identify the spatial distribution of the GFP-tagged candidate protein relative to PopZ, which is tagged with a red fluorescent protein. Co-localization to PopZ would suggest a relationship between the function of PopZ and that of the protein. I can later test this be observing the localization of the GFP-tagged protein in a Δ*popZ* knockout genetic background.

NK Cells Involvement in Immune Exhaustion During Acute T. gondii infection

Giandor Saltz, Dr. Jason Gigley
Molecular Biology
University of Wyoming
Oral Presentation

INBRE *Powell, Wyoming*

The model for this research project is the *Toxoplasma gondii* parasite. Researching the immunological response to *Toxoplasma gondii* infection is important when trying to understand the pathogenesis of this parasite. T. gondii is the 3rd leading cause of food-borne illness in the U.S. The primary focus of this research proposal will be on natural killer (NK) cells, a cell that has traditionally belonged to the innate immune system. I focused on the effect of depleting of NK cells during acute T. gondii infection and how this changed the T cell response. T cells are effector cells of the immune system and vital for protection and removing infected cells. We found that the T cells, instead of having a boosted response as with viral infections, had a decrease in response after depleting NK cells. This leads us to conclude the NK cells are important for acute infections of T. gondii.

Salt-mediated Reduction of Weight Gain in Sprague-Dawley Rats

Rachel Schambow, Dr. Donal Skinner
Department of Physiology and Zoology
University of Wyoming

Oral Presentation

INBRE, WRSP *Janesville, WI*

High dietary salt levels have long been correlated with weight gain and obesity. Recent studies in the Skinner lab, however, have shown a reduction in weight gain in Sprague-Dawley rats fed a high salt, high fat (HS/HF) diet compared to those fed a high fat (HF) diet alone. This effect was not caused by increased activity levels of HS/HF animals, suggesting an alternative metabolic mechanism. To first determine if excess fat was being excreted through feces, we performed a fecal acid steatocrit analysis. Freeze dried fecal pellets collected from rats fed either a control, high salt, HS/HF or a HF diet were dissolved in perchloric acid and combined with .5% Oil-Red-O and then spun down in micro-hematocrit tubes. No significant difference in the proportion of excreted fat to overall feces was seen between groups. To then examine digestive efficiency, we performed bomb calorimetry. Pellets were made out of the collected freeze dried fecal matter and analyzed with a Parr 6200 bomb calorimeter. No significant differences in digestive efficiency were seen between groups. These results suggest that the mechanism of reduced weight gain is not due to the HS/HF group excreting more fat through their feces or because of a reduced digestive efficiency. They also reveal a more complex role of dietary salt in obesity, and further testing is required to fully elucidate the mechanism behind this salt-mediated reduction of weight gain.

Bald Eagles: The Tabooed Image of Cancer

Jaime Scherer, Dr. Erin Abraham
Department of Psychology
University of Wyoming

Oral Presentation

Honors Program *Gillette, WY*

There are taboos in contemporary American culture that have been developed and reinforced throughout history that depend on mandatory compliance from all unquestioning members of our society. Among the particularly commanding, and sometimes conflicting, tools of social constraint are gendered expectations of beauty and the taboos surrounding cancer. Society places high, even impossible, expectations on its members, especially women, to attain certain unachievable beauty standards. Deviation from norms and noncompliance to expectations result in punishment in the only way over which society possesses complete control: social exclusion, ostracism and ridicule, and ultimately, total eradication. This taboo regarding the societally inappropriate and even condemnable appearance of cancer is particularly influential because it combines double-standard, gendered taboos such as beauty, baldness, and subsequent lack of femininity with the powerful and potent, equally tabooed, topics of sickness, disease, suffering, and death. Because these subjects have been deemed inappropriate for mere discussion, much less exploration and inquiry, by a controlling and unrelenting society, women who suffer from life-threatening diseases that take more from them than just their hair are also forced to endure the insult added to injury that is the tabooed image of cancer. Through my presentation, I utilize personal testimonies and media to gauge the effects these taboos have upon real women in the hopes of countering the silencing effects of taboos and bringing these issues to a place where they must be not only acknowledged, but confronted.

Evaluation and Mapping of Antibiotic Resistance Genes in the Resistome

Kaylee Schimpf and Lane Schimpf with Dr. John Chase
INBRE
Casper College

Poster

INBRE *Casper, Wyoming*

Based on past research on the presence of the ß-Lactamase gene in environmental bacteriophage populations in Wyoming (Quealy, Lawless and Chase, unpublished), a metagenomic approach was adopted to continue research on ß-Lactamase and Klebsiella Pneumoniae Carbapenemase (KPC) genes within the Resistome. Many natural water and environmental samples were collected along with data on sample type, GPS location, pH and dissolved oxygen. Aquatic sample sites included the North Platte River, Alcova reservoir, Fremont Canyon, Pathfinder reservoir, Yesness Pond, Canyon Creek, Grey Reef, Deer Creek, Texas Creek, Little Medicine Bow River, Curry Creek, Walker Jenkins Lake, and Cook Pond. The samples were filtered through 3.1 μm and 1.2 μm filters to isolate both prokaryote and bacteriophage communities. Randomly amplified shotgun libraries (RASLs) were created for each sample by PCR. Spectroscopy and gel electrophoresis were used to quantitate and visualize the DNA samples. The future objective will be to examine these samples for the presence of ß-Lactamase and KPC genes.

Seasonal soil carbon, nitrogen and greenhouse gas emissions during post beetle forest successional recovery

Susan Irene Schmidt, Dr. Urszula Norton
Plant Sciences
University of Wyoming

Oral

EPSCoR *Albin, WY*

Bark beetle infestation has occurred in many forested areas all across North America. Delayed effects of the infestation on the forest ecosystem and on factors related to climate change can continue to occur years after infestation. This research was conducted June 2015 to November 2015 at a site in the Snowy Range mountains in southern Wyoming. As an observational project of the post-infestation effects on a slope in a mountainous forest, this research is specifically looking at the change of the forest floor's gas emissions, inorganic Nitrogen and Carbon, microbial nitrogen uptake, and soil water content. Steepness of slope, dead versus live tree clusters, and time elapse are compared for these variables. Specifically, whether or not the status of trees in a cluster, along with the natural hydrology of a slope, will affect the amount on soil green house gas (GHG) fluxes, labile C, N and mineral N concentrations released and taken up by varying components of the forest floor. Methods included weekly soil and litter sample collection and gas extraction over 30 significant plots on the slope. This data will show the relationship between N and C emission or absorption in dead clusters versus live clusters along the slope. This presentation will show the results of intensive forest slope monitoring for a better understanding of the impacts of beetle kill on GHG emissions and in forest ecosystems.

Fear or Safety? How the United States Ordnance has Evolved Warfare and Society

Jade Schmitt, Major William Lindmier
Honors Program
University of Wyoming
Oral Presentation

Honors Program *Green River, WY*

The United States has been in conflict to a degree since its establishment in 1776. During that time there have been numerous developments in weapons, technology, and intelligence all aimed at maintaining a power advantage over our enemies. The United States Ordnance Corps continues to develop weapons that change the warfare tactics and strategies used against America's enemies. When the development of new ordnance is authorized on the battlefield, they prompt new tactics, techniques and procedures based upon the utilization of these new developments. From the Civil War to the present War on Terrorism, there are direct correlations to how each war's ordnance and developments have influenced the outcome. Rifles, artillery, aviation, atomic bombs, and improvised explosive devices (IED) have changed the way the American Army has performed on the battlefield. The enemies in those wars have changed from conventional to insurgent in complex fashion. We can only speculate who we will fight in the future, and what that fight might look like. Aside from the strategic and tactical advancements of ordnance, the development of ordnance has impacted civilization. The more advanced ordnance becomes, the stricter laws and policies are passed to ensure they are not used to incinerate the earth eight times over. Shifts in policy during the Cold War indicate how the fear of ordnance dictates the behavior of societies. The research conducted in this paper illuminates the advancements of key ordnance that changed and shaped American wars. It also verifies that ordnance and the fear they cause directly impact our society, and leaves us questioning how it will impact the future of warfare.

Dencity Automata

Matthew Schneider with Anthony Denzer
Civil and Architectural Engineering
University of Wyoming
Oral Presentation

University Honors Program *Worland, Wyoming*

The world so large is growing ever so small. Scattered souls are slowly making their way quickly to urban concentrations, establishing residency in whichever fashion possible, thus slums are manifest. As of consequence, the health, safety, and overall standards of living for approximately one billion slum dwellers are less than poor and on the decline. To solve this problem a system must be initiated in place of the current infrastructure entanglement. A future proof system able to be universally implemented. By creating a standardized and compartmentalized housing design, the ability to grow organically from both existing and new roots can be achieved. Additionally, a majority of the current infrastructure and urban planning in place acts as juxtaposition rather than ease of circulation. As slums are cities within themselves, a more proper sense of city organization must be taken into account. To account for this, structures outside of residential must also be implemented. From community centers to business incubators, again standardized and compartmentalized, a variety of needs can be fulfilled unique to the many slums of today.

Guaranteed Tuition Policies and Student Success at US Public Universities – Senior Honors Thesis

Brian Schueler
Mentored by Assoc. VP of Academic Affairs for Undergraduate Education Dr. Anne Alexander
Department of Economics
University of Wyoming

Oral Presentation

University of Wyoming Honors Program *Buffalo, Wyoming*

This study of guaranteed tuition policies across various US public universities aims to evaluate the effects of guaranteed tuition policies with regard to recruitment, retention and graduation rates. Guaranteed tuition policies, also called 'locked-in' or 'fixed tuition' plans promise 4 or more years of flat tuition rates for students who meet minimum academic requirements from the time of enrollment. This study will use statistical analysis software to evaluate data from the Integrated Postsecondary Education Data System (IPEDS) for multiple universities which utilize and do not utilize guaranteed tuition policies. Statistically significant correlations between recruitment, retention, graduation rates, or other important university metrics and guaranteed tuition policies could provide indication of potential benefits and/or drawbacks of these policies. This research could then be used to inform policy decisions at the University of Wyoming and other public universities which might consider guaranteed tuition policies.

A Comparison of Body Fat, Energy Level and Diet in Performing Arts Majors

Katherine Schulz, Dr. Margaret Wilson
The Department of Theatre and Dance

Oral Presentation

The Department of Theatre and Dance *Casper, Wy*

The purpose of this study is to evaluate dietary consumption and energy requirements in vocal performance and dance majors. This research was done in three sections, participants in section one track the intake using an online diet tracking tool "Supertracker," which provides kilo-calories, as well as the macro and micro nutrients. The intake is analyzed and compared to the recommended values set by the USDA. In addition participants complete a pre-study survey about their satisfaction with their current diet and what affects the way they eat. The purpose of section one is to create a base line for the additional sections and to assess the current knowledge of the participants.

Participants in section two and three are volunteers from section one. Section two observes whether participants' energy levels change if they modify their diet to more closely follow the USDA's recommendations. The participants continue to record their food intake for two additional weeks, they also meet weekly with the personal investigator to discuss basic nutrition optimization. The final section is to perform a DEXA scan on the participants from section two. The DEXA scan is a low radiation X-Ray that allows lean and adipose tissue volume to be quantified. While this scan will not show any short term changes it will show whether the baseline nutrition of participants matches their lean to adipose ration. The purpose of this research is to gain additional knowledge about the eating habits of fine arts majors and provide participants with tools to improve performance.

Bow Shocks

Danielle Schurhammer ; Professor Chip Kobulnicky
Department of Physics and Astronomy
University of Wyoming

Oral Presentation

EPSCoR *Plainview, MN*

When some fast, massive stars move through the stellar medium, they can cause material to stack up in front of them in the same way that water piles up ahead of a ship. These arc-shapes, called bow shocks, help astronomers to find these massive runaway stars. These stars begin moving at very high velocities when a very nearby star explodes in a supernova or when they are thrown out of crowded star clusters. The speed and mass of these stars contribute to the size and shape of its bow shock. The more massive a star, the more mass it loses in these high-speed winds.

For massive stars, the rate at which they lose mass determines whether it becomes a supernova/neutron star or a black hole. The lower the rate of mass loss, the higher the final mass will be when it exhausts its nuclear fuel. The larger the final mass, the more likely that a star will explode as a supernova then become a neutron star or black hole. However, we don't accurately know the rates at which mass is lost during a star's lifetimes. Our knowledge of mass loss for larger stars is especially quite poor. This study focuses on these massive stars moving at high velocities. During the summer and fall of 2015 and the spring of 2016, I was able to find over 200 stars with bow shocks. Velocities were calculated for 79 of these stars and the standard deviation for the stars with multiple spectrums were also found. I was also able to spectral type 76 of these stars. I noted that there were only a small handful of binaries that had bow shocks. Professor Chip Kobulnicky found the distances for the stars that I was able to spectral type. All of the data can be found on Professor Chip Kobulnicky's website at http://physics.uwyo.edu/~chip/Shocks/.

Ethane to Aromatics

Emily Schwichtenberg, Mentor: Dr. David Bell
Department of Chemical Engineering
University of Wyoming

Oral Presentation

Honors Program *Norwood Young America, Minnesota*

Due to the recent oversupply of natural gas in the United States, prices for natural gas components, such as ethane, have dropped significantly. This creates an economic opportunity to use ethane in chemical processes to make more valuable products. The goal of the chemical engineering senior design group EBTAX was to design a process for converting ethane to common aromatics, such as those used for gasoline additives. The reaction itself is catalyzed by a platinum-germanium zeolite catalyst, which forms many products from many simultaneous reactions. Separating the primary products from secondary products and by-products was achieved through a series of distillation towers and recycle streams, which was the focus of my contribution to the group project. The separation system was designed with industry standards and precedents in mind, but modified to fit our project needs.

"A Comparison of the University of Wyoming's Electronic Waste Methods as compared to that of other Universities in the United States and on a Global Scale"

Rachael Shahi with Mentor Terri Rittenburg
Department of Management and Marketing
University of Wyoming

Oral Presentation

Supporting Honors Program *Lyman, Wyoming*

This project focused on the methods and options the University of Wyoming had in terms of electronic waste (e-waste), as compared to other universities in the United States, and on a global scale as well. The author reviewed current e-waste methods at the University of Wyoming, top e-waste recycling universities in the United States, as well as a few countries globally that outperform in terms of e-waste recycling. The purpose of the study is to identify additional options the University of Wyoming has in terms of electronic waste recycling. In conclusion, the author found there to be dismal efforts at the University of Wyoming, high efforts within the United States at other universities, and the best results globally. Leading campuses globally outperform the United States by far. Recommendations to the University of Wyoming would be to partner with IT Refresh to acquire electronic waste bins on campus to allow students to responsibly dispose of any electronics he/she may possess.

GPGPU Computing for Numerical Integration Methods on the Jetson TK1

Vivaswat Shastry and Suresh Muknahallipatna
Department of Electrical and Computer Engineering
University of Wyoming

Poster Presentation

Wyoming EPSCoR *Laramie, WY*

This experimental project looks at the potential benefits of using parallel programming concepts in numerical integration methods through CUDA C++ on the Nvidia Jetson TK1 board, through a serial connection. Since the calculations are implemented on a 127 mm^2 board, the extra space that is available is an advantage. The Mid-Point Rule, Trapezoidal Rule and the Simpson's 1/3 Rule are implemented in a parallel fashion and the timing measurements are compared to identify the fastest method that can be used, based on the speed-up with respect to the sequential version. This parallel program runs on an average $2x$ to $3x$ times faster than the previously employed sequential version. Factors such as Memory Bandwidth and FLOPs (floating operations per second) will also be considered in choosing the most memory efficient and computationally intensive method. The data obtained will allow for future programmers to choose their preferred method based on the requirements of their application.

Adaptation of Classic Literature Through Video Games

Ryan Shepherd with Susan Aronstein
Honors
University of Wyoming

Oral Presentation

Honors *Highlands Ranch, Colorado*

In today's culture, video games have become a prevalent form of media, one that scholars should engage. In this media, interactive story-telling, online communities, and game mechanics shape the world of the game, creating an experience for players unlike any other form of media. One advantage of this unique mode of storytelling is that it also allows for the potential of classic pieces of literature and literary themes to be reintroduced into today's mainstream society.

In order to examine this re-introduction of classic literature, this presentation focuses on a specific game designer, Hidetaka Miyazaki of From Software, and his two most popular games: *Dark Souls* and *Bloodborne*. Using adaptation theory, along with a critical literary and narratological analysis, I will examine how these two popular video games have re-introduced various classic stories and literary aspects from fantasy and H. P. Lovecraft into a new medium and how the current culture influenced the telling of those stories.

SAE Baja - Brakes

Don Siler – Mentor: Dr. Rob Erikson
University of Wyoming

Oral and Poster Presentation

Mechanical Engineering Department *Superior, WY*

The 2016 SAE Baja Project consists of multiple design teams, each analyzing and designing various subsections of the Baja vehicle. The purpose of each team is to analyze, design, and manufacture an entire off-road vehicle according to the rules established by SAE. The SAE Baja Brake team designed a spreadsheet to account for the many variables encountered during the design and fabrication of the vehicle. An important consideration is the increase braking force required at the front wheels of the vehicle, due to the vehicle's center of gravity causing a load transfer to the front wheels during braking. After taking into account the braking forces necessary to stop the Baja, and adhering to SAE competition rules, components were selected that would function correctly.

A large difficulty faced in vehicle design is the complicated interfacing issues caused by multiple teams making multiple design changes simultaneously. The SAE Baja vehicle creation process has shown that engineering is often as much about project management and creating realistic timelines as it is about the research and design involved.

Investigating the role of mir-190, mir-200, and mir-8 inhibition of the GCS protein in HeLa cells and *Drosophila melanogaster.*

Della Simmons, Anya Lyuksyutova
Molecular Biology
University of Wyoming
Oral Presentation

Honors Program *Gillette, WY*

Glucosylceramide synthase (GCS or GlcT-1 in Drosophila and UGCG in humans) is a key enzyme in sphingolipid metabolism and obesity. Pharmacological inhibition of GCS in obese mice improves their insulin responsiveness, adipocyte functions, and also reduces inflammation and liver fat content. MicroRNAs are non-coding RNAs that specifically inhibit genes by binding to target sites in the gene's mRNA. Based on preliminary evidence that GCS is regulated by microRNAs in vitro and that it contains well conserved binding sites for the microRNAs mir-8, mir-190, and mir-200, we propose to investigate the role of these microRNAs in GCS regulation and their ability to inhibit this protein. We propose to investigate the role of these microRNAs both in human HeLa cells and *in vivo* in *Drosophila melanogaster.*

In order to do this, we began by transfecting human HeLa cells with mir-190 and mir-200 as well as over-expressing mir-8 and mir-190 in *Drosophila melanogaster* using the UAS-Gal4 system. We also included negative microRNAs (untranfected cells and normal flies) as controls. After transfection and over-expression, the RNA was isolated and reverse transcribed into cDNA. This cDNA was then amplified and the effects of the microRNAs on the GCS protein were measured using qPCR.

Dead in their Tracks? Best Practice for Precautions against Multidrug Resistant Organisms

Lucas Simmons, Elizabeth Goodwin
Nursing, University Honors Program
University of Wyoming
Oral Presentation

Nursing, University Honors Program *Gillette, WY*

When caring for patients infected with Multidrug Resistant Organisms (MRDOs), the common transmission prevention is Contact Precaution (CP). Consisting of a gown and gloves, CPs are required for any visitors into a patient's room-nurses, doctors, family, friends, even environmental technicians are required to wear CPs. In recent years, however, researchers have begun to look more closely at CP, and if it is the best method of transmission prevention. Some studies show that there is little difference between CP and gloves while in an infected patient's room. A few researchers have suggested that gloves, instead of CPs, are better suited to long-term care settings. Other findings suggest that CPs interfere with complete patient care-and lead to more adverse events. My investigation seeks to determine the viability of CPs as a form of transmission precautions, and if there are equally effective and less expensive methods available. By analyzing current findings on CPs their effectiveness, I will determine the validity of CPs, as well as the possibility of a more potent alternative. My research will provide data that can improve patient care by stopping MDROs dead in their tracks.

Materials Testing of Bovine Serum Albumin Fiber Mats

Brian T. Simon and Patrick A. Johnson
Department of Chemical Engineering
University of Wyoming

Oral Presentation

INBRE *Evanston, WY*

Every year, millions of surgical procedures are performed creating wounds that need to be treated. The objective of this research is to create nanofiber mats from spider silk-like proteins (SSLP) providing improved wound dressings. Spider silk's biocompatibility, durability, and elasticity make it suitable for a wide range of medical applications. In combination with Bovine Serum Albumin (BSA), a widely available and affordable protein, SSLPs can be assembled to assess their utility. I analyzed the mechanical properties of BSA fiber mats of variable BSA concentrations and formation rates using strength and Young's modulus of elasticity. By establishing the mechanical properties of these BSA fiber mats, I hope to find ways to optimize both elasticity and strength to improve the use and function of these fiber mats.

Polycystic Ovarian Syndrome in American Indian Women: An Exploratory Study

Timothy J. Turner and George G. Sims, Professor Tara Womack-Shultz
Department of Biology
Central Wyoming College

Poster Presentation

Department of Biology *Riverton, WY*

Polycystic Ovarian Syndrome (PCOS) is a very common disorder affecting approximately 5-10% , with estimates as high as 2-26% , of women of reproductive age in the United States. Women with PCOS are at risk for significant associated healthcare problems, including fertility impairment, obesity, psychosocial stress, suicide, and decreased health-related quality of life.

Symptoms may include: ovarian cysts, irregular or no menstrual periods, acne, weight gain, excessive hair growth on face and body, and thinning scalp hair.

No specific studies have been conducted about the effects of PCOS in American Indian women, and this study is designed to improve the health-related quality of life of American Indian women with PCOS through:

- Determining PCOS symptoms which may be specific to American Indian women,
- Estimating the PCOS population prevalence among American Indian women, including risk for diabetes, in a sample of American Indian women with PCOS,
- Determining cultural and societal practices of American Indian women with PCOS, with emphasis on beginning development of patient-centered, culturally competent self-care interventions;
- Developing a conceptual model of the American Indian experience of polycystic ovary syndrome and initial development of a means of measuring the experience of PCOS based on the study results.

The study will be a collaborative effort between the University of Wyoming, Central Wyoming College, and the University of Colorado, involving self-identified American Indian women, both with and without PCOS, primarily from the Wind River Reservation in Fremont County, Wyoming, and with self-identified non-American Indian women, both with and without PCOS.

Determining Orientation in Radio-Quiet Quasars

Vikram Singh, Dr. Michael S. Brotherton
Dept. of Physics and Astronomy
University of Wyoming

Oral and Poster presentation

EPSCoR *Bangalore, INDIA*

We present further steps developing an orientation indicator based on optical parameters that can be used for radio-quiet quasars. We recently demonstrated that the ratio of orientation-biased black hole mass calculated using the velocity width of H-beta to the orientation-unbiased black hole mass calculated using the stellar velocity dispersion correlates with radio-loud orientation indicators, albeit with significant scatter. Our new work eliminates or reduces some sources of scatter to improve the significance of the correlation and to produce a better predictive prescription. Beyond biasing some mass measurements, orientation also affects luminosity determinations, and in turn estimates of the Eddington fraction, as well as luminosity functions, and other quasar properties. A practical radio-quiet orientation indicator for quasars is overdue.

World War I a Catalyst in the Russian Revolution of 1917

Kat Slaughter, Dr. Brose
Department of History
University of Wyoming

Oral Presentation

Department of History *Laramie, WY*

WWI was a catalyst that eventually pushed the unstable equilibrium of the Russian Government over the edge and into the Russian Revolution of 1917. Governments are always trying to stay in a state of a stable equilibrium. Goldstone's Equilibrium theory will be applied to the Russian Revolution of 1917 and the affects that WWI had on Russia's Equilibrium. When Russia entered WWI the country was already in a very unsteady state, by participating in the war it pushed Russia to the final tipping point that was needed for revolution. The forced abdication of the throne by Tsar Nicholas II leads to a power struggle between the Bolsheviks and Mensheviks, with the Bolsheviks eventually winning and implementing their governmental structure.

Selecting optimal thresholds for mapping water bodies in the Powder River Basin using Landsat images

Cameron Sloan[1], Dr. Ramesh Sivanpillai[2]
1. School of Energy Resources, 2. Department of Botany and WyGISC
Oral Presentation

WyCEHG *Cheyenne, WY*
WyomingView

The West Nile virus is a threat to public health and is carried by mosquitos. The virus can be passed on to humans, birds, and other mammals. This virus has the potential to be deadly and there are no effective vaccinations to combat it. Mosquitos prefer to lay their eggs in areas near stagnant bodies of water, particularly in riparian vegetation. By treating these areas before the eggs hatch it is possible to control the spread of West Nile virus. However identifying these habitats through ground surveys is an expensive and time consuming process. Alternatively, remotely sensed imagery can be used to identify and map existing water bodies, which could be used for locating potential mosquito habitats. However maps generated from remotely sensed imagery have errors. In order to be useful, these maps must have low omission and commission errors. The goal of this research project is to generate land cover maps depicting water bodies within the Powder River Basin in Wyoming with low omission and commission errors. Landsat images acquired in 2001, 2009, and 2015 will be classified using optimal thresholding values derived from high spatial resolution aerial photos acquired during these years. Optimal threshold values will balance omission and commission errors to maximize user accuracy. These land cover maps will be effective for identifying potential mosquito habitats and their changes over time.

Continued Analysis of Freely Propagating Dimethyl Ether Cool Flames

Nick Staiano with Dr. Erica Belmont,
Mechanical Engineering
University of Wyoming
Oral Presentation

Wyoming EPSCoR *Mead, Colorado*

The analysis of cool flames is a relatively brand new study to the field of combustion science. Despite their discovery 200 years ago, there is minimal research and information on cool flames. Cool flames have been found to be linked to engine knock experienced in internal combustion engines. Engine knock is likely caused by early ignition of gases in the chamber, and since cool flame ignition has been found to precede hot flame ignition, it is a plausible explanation for engine knock. Well established data profiling cool flames may be the key to engine design that eliminates the chance for engine knock. The primary drawback to cool flame experimentation was the difficulty of establishing self-sustaining cool flames. However, a recent study in 2014 succeeded in stabilizing n-heptane fueled cool flames. In the last year at the University of Wyoming, Dimethyl Ether cool flames were stabilized, and an experimental study of their characterization was begun. This study was conducted by Dr. Erica Belmont and PhD student Mohammadhadi Hajilou and associates. It is the goal of this project to continue the efforts of Dr. Belmont and Mr. Hajilou of characterizing these cool flames. Replications of Dimethyl Ether cool flame temperature measurement experiments are performed. Repeatability of this data reduces uncertainty and confirms the legitimacy of the recent cool flame study.

Building a Radiocarbon Database of North America

Jordan Stapley, Faculty Mentor Dr. Robert Kelly
Anthropology
University of Wyoming

Oral

EPSCoR *Montana*

Since its development in the 1950s, radiocarbon dating has become the primary method of dating archaeological sites of the past 50,000 years. Many researchers around the world now use databases, often consisting of thousands of radiocarbon dates, to create proxy measures of human population. These databases have proven instrumental for testing demographic hypotheses, e.g., the relations between population and climate change, or the relationship between different forms of economy (e.g., hunting/gathering vs. agriculture) and population growth rates. These radiocarbon databases are part of the movement within archaeology toward "Big Data" and are created by culling data from existing publications or grey literature, and by collating smaller databases. This paper discusses the issues encountered in helping to collect data for an NSF-sponsored radiocarbon data compilation project. These include issues of accessibility to the relevant literature, different reporting standards, resolution of duplicates, poor or variable reporting standards, a misunderstanding of radiocarbon dating, and changes over time in radiocarbon dating methods.

Home Energy Efficiency Modelling and Comparison

Aaron Stidolph, Anthony S. Denzer, Ph.D., Jon A. Gardzelewski, AIA, LEED AP
Department of Civil and Architectural Engineering
University of Wyoming

Oral and Poster Presentation

Department of Civil and Architectural Engineering *Laramie, Wyoming*

The idea of an energy efficient home appeals to almost everybody. Despite this interest, implementation of "green" design practices has not been widely adopted. In the past, solutions to energy efficient design has been either prohibitively expensive or represented an aesthetically unappealing option for consumers. Efforts to reduce energy consumption can now be coupled with on-site energy production, thereby creating homes that produce more energy than they use. UWBERG is developing a catalog of net-zero homes that can be built economically without sacrificing utility or architectural flair. It is important that solutions to environmental problems be backed up by appropriate data and modelling. This project will provide that data and analytically show the differences between conventionally constructed homes in Wyoming and those that have been specifically designed to take advantage of passive energy strategies. Specific to this project will be the analysis of energy conservation and production in terms of cost, performance, and aesthetics. There are hundreds of energy modelling programs out there and a secondary goal of this project is to compare a few of the popular programs against one another. This information can provide designers with the necessary tools to implement smart strategies that consumers will find attractive.

Infrared Spectroscopy of Deuterated Acetylene in Solid Parahydrogen and the Helium Recovery Initiative

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

Oral Presentation

Wyoming Research Scholars Program *Rock Springs, WY*

The linear tetratomic organic molecule acetylene, HCCH, has been surveyed extensively in the literature via numerous spectroscopic experiments, exploiting radiation across the electromagnetic spectrum. Of course, the mono- and di-deuterated acetylene isotopologues have also been widely studied, namely HCCD and DCCD. In this presentation, I will present high resolution Fourier transform infrared (FTIR) spectra of DCCD doped solid parahydrogen (pH_2) in the low-temperature regime (1.5-5.0 K). We intend to perform UV photochemical studies on DCCD doped solid pH_2 and, therefore, the infrared spectroscopy must be characterized prior. The FTIR signature of DCCD isolated in solid pH_2 exhibits rich fine structure in the ν_3 asymmetric C-D stretch region. In preliminary experiments, trace HCCH and HCCD are also observed in the mix, adding to the complexity of these spectra. Some spectral features may arise due to the formation of weakly bound acetylene isotopologue dimers and larger clusters. A simulated low temperature gas-phase spectrum will also be presented in order to address the extent of the rotational motion of DCCD in solid pH_2.

A liquid helium bath cryostat is used to grow and maintain the DCCD doped pH_2 crystals for spectroscopic characterization. Helium is a non-renewable resource, and, in recent years, the Anderson group has been building a helium recovery system. This helium recovery initiative will be discussed in an effort to promote sustainable helium use in small-scale cryogenics laboratories, describe how we implemented this new experimental system in our laboratory, and point out the major challenges faced in its implementation.

Gladiatorial Combat Portrayed in the Modern Era

Emma S Summers with Laura DeLozier
Modern and Classical Languages
University of Wyoming

Oral

Classics Department *Rock River, Wyoming*

This research looks at the film *Colosseum: A Gladiator's Story* directed by Timan Remme and its portrayal of gladiatorial training. Discussing the reality of gladiatorial training in ancient Rome it observes how modern ideas of training soldiers affects our perception of combat in filmmaking. Specifically, the goal is to understand how the US Marine Corps training influences an American audience when viewing a film based on courage within combat. The focus of this research will be on the how the value cultures place on courage affects their reception of how competitors respond within combat. By highlighting the similarities and differences between gladiatorial and military training we will see how the idea of bravery has evolved through time and how contemporary ideas shape our perception of ancient practices.

The edTPA and the Power of Arts Integration

Tricia Summers, Dr. Kate Welsh
College of Education
University of Wyoming
Oral Presentation

College of Education *Cheyenne, Wyoming*

For the Honors Program, I completed a two-part project during my student teaching experience in Cheyenne, Wyoming. I performed the elementary mathematics edTPA (teacher performance assessment) for my teacher education program, and I designed several lessons that integrated the arts. The edTPA is a nationally administered performance-based, subject-specific assessment used to emphasize, measure and support the skills and knowledge that all teachers need in the classroom (http://edtpa.aacte.org/faq). I taught three lessons about fractions and accomplished three interconnected assessment tasks: (1) the planning commentary, (2) the instruction commentary, and (3) the assessment commentary. My third grade class learned about fractions on a number line, equivalent fractions, and comparing fractions. In addition to the edTPA, I explored how arts integration enhances the learning opportunities of students.

Arts integration is an approach to teaching in which students demonstrate their understanding of a subject through art. Arts integration allows students to engage in a creative process that connects the arts with another core subject. Arts integration is important because it supports student learning. It deepens critical thinking, collaboration, and communication skills. Furthermore, incorporating the arts into school subjects promotes higher-level thinking skills and drives creative inquiry. Through creative inquiry, students can answer questions, solve problems, and take on new challenges. Incorporating the arts into the curriculum is essential because it engages students in the learning process. Arts integration offers a powerful way for students to gain meaning of a particular subject. My senior project aimed to incorporate the arts into the subjects of mathematics, literacy, and social studies. By teaching through the arts, I was able to empower the students to use their creativity and imagination to understand curricular concepts.

Comparison of Hearing Screening Protocols for Preschoolers, Infants, and Toddlers

Kailey Symes, Student Researcher
Mary Jo Cooley Hidecker, PhD, MS, MA, CCC-A/SLP
Communication Disorders
University of Wyoming
Oral Presentation

The purpose of this research was to compare the outcomes of two hearing screening protocols for preschoolers, toddlers, and infants: (1) Using only transient evoked otoacoustic emissions (TEOAEs); and (2) Using TEOAEs, immittance, otoscopy, and pure-tone screening. This research consisted of a secondary data analysis of hearing screening results from 709 preschoolers, toddlers, and infants screened in Albany County, Wyoming. Data was collected by the Wyoming Early Hearing Detection and Intervention program and analyzed using the statistical software program SPSS 22. The results of a McNemar Chi-square test showed no significant difference in the identification rates of hearing loss in the two hearing screening protocols. Four participant ears that were classified as passing TEOAE failed the overall screening, while no participant ears were classified as failing the TEOAE screening and passed the overall screening. There was no significant difference in sensitivity and specificity of the two hearing screening protocols. Using TEOAEs only is an efficient, low-cost hearing screening protocol that could maximize the early identification of infants, toddlers, and preschoolers with hearing loss and allow them the opportunity to benefit from early intervention

Gait Alteration through Motion Cue Manipulation in an Immersive Virtual Environment

Russell Todd, Dr. Amy Banic
Department of Computer Science
University of Wyoming

Oral Presenter

Wyoming EPSCoR *Baggs, WY*

When creating a virtual reality experience, one can create a massive, sprawling environment and yet, in order to walk around that environment using your own two feet, you would have to have an open area of equal size and shape so that you wouldn't encounter walls. Adapting how a user interacts with that environment so that a small real-world space can be used to house a much larger virtual environment is the focus of small room virtual reality. A common way to expand the reach of the small room in the virtual environment is to increase the speed of the user in the virtual environment relative to the real world. For example, taking a step in the real world could move you three steps in the virtual environment. However, there are many unknowns such as how manipulating the way a person moves in a virtual environment affects their gait, their immersion, the way they move, and how noticeable different methods are. This research is intended to answer questions along those lines. The main focus of the study is to achieve an understanding of how manipulating virtual environment movement affects the user in several different capacities and how these different manipulations can affect the user's sense of presence and immersion. A better understanding of small room virtual reality implementation could yield improvements in training simulations, VR games, and VR environment navigation such as virtual tourism.

Stroke Support Group: An ASPIRE! Mentorship Project in a Rural Setting

Anya Tracy, Lynda Coyle
Communication Disorders
University of Wyoming

Oral and Poster Presentation

Honors Program *Powell, WY*

I began my participation in the ASPRE! mentorship and leadership program in the College of Health Sciences in the spring of 2013, my freshman year of college. During my second year of the program, I decided I wanted to focus how Speech Language Pathologists and communication disorder professions are represented in the Laramie community as well as the leadership opportunities available. This began my involvement as a co-mentor of the Laramie Stroke Support group with faculty member and clinic director of the UW Speech and Hearing Clinic, Lynda Coyle M.S. CCC-SLP. The Laramie Stroke Support group focuses on aspects of support for caregivers, stroke survivors as well as people with other neurological disorders. The group brings in various speakers, provides a safe environment for discussion, and incorporates fun activities into its monthly meetings. Living in rural Wyoming presents unique access challenges for a stroke support group in terms of knowledgeable professionals, available resources and proximity to others with the same experiences. Participating in the Laramie Stroke Support Group as a part of my ASPIRE! project has not only taught me how to effectively facilitate a support group meeting, but also how to be resourceful in the selection of speakers and activities available in a rural environment. I have also learned about the importance of following through and providing an avenue to a support system whenever a caregiver or someone who has directly experienced trauma is ready. It is important to not only be an excellent professional, but also leader and visionary in the broader community.

Synthesis and Characterization of Ruthenium (II) Complexes and their Reactivity with Perchlorate

Kasey Trotter, Dr. Elliott Hulley
Department of Chemistry
University of Wyoming
Oral Presentation

Wyoming Research Scholars Program *Fort Collins, CO*

Perchlorate anion (ClO_4^-) salts are persistent environmental pollutants that harm humans by attacking the thyroid. These salts are found in Western states such as California, Utah, and Nevada as well as on the surface of Mars ($Ca(ClO_4)_2$ soil contamination ~0.5%). The ClO_4^- anion is thermodynamically a strong oxidizing agent used in rocket fuels but remains in the environment due to a high kinetic barrier to decomposition. Our ultimate goal is to catalyze the decomposition of the ClO_4^- anion into its components Cl^- and O_2 by focusing on the inherent instability of ClO_4^- in water. We have focused on examining ruthenium (II) complexes as they have been proven to oxidize water, and reduce ClO_4^- in separate situations. We report the synthesis and characterization of ruthenium (II) complexes and their reactivity with ClO_4^-.

Lowering Eye Height to Increase Knee and Hip Flexion during Landing

Tyler Trumble, Dr. Boyi Dai
Division of Kinesiology and Health
University of Wyoming
Oral Presentation

Wyoming INBRE, Division of Kinesiology and Health *Green River, WY*

Anterior cruciate ligament (ACL) injuries commonly occur during jump-landing tasks. One strategy to decrease the risk of ACL injury during landing is to increase knee and hip flexion and decrease impact forces. During a landing task, eye height naturally decreases with more flexion at the hip and knee joints. The purpose of the current study was to evaluate the changes in knee and hip flexion angles and impact vertical ground reaction force (VGRF) during landing when the effect of lowering eye height with an external object was presented and then removed. Recreational athletes participated in the current study. After determining baseline jump-landings, participants performed 6 perception trials and 15 jump-landing trials using a red horizontal line to decrease training eye height. The red horizontal line was removed for retention jump-landing trials where participants attempted to maintain the same eye height as they were trained. For the perception trials, the difference in vertical position between the horizontal line and actual eye height was calculated. For the jump-landing trials, the lowest eye height, peak knee and hip flexion angles during the stance phase, and peak VGRF during the first 100 ms of landing were calculated. The findings support that participants demonstrate increased knee and hip flexion angles through lowering eye height with an external object during a jump-landing task. Therefore, lowering eye height can provide an effective and efficient strategy for jump-landing training, and it may also have implications for modifying landing patterns in real sports environments to prevent injury.

Forecasting Volatility Using Interpolation and Numerical Methods

Levi Turner with David Finnoff
Departments of Mathematics and Economics
University of Wyoming

Oral Presentation

Honors Program *Anchorage, AK*

Forecasting volatility is important to financial asset pricing because a more accurate forecast will allow for a more accurate model to price financial assets. Currently the VIX is used as a measure of volatility in the market as a whole, but a major issue with this is that it is calculated based on manually traded options on the S&P 500. Another method of forecasting volatility is that of solving for volatility from the Black-Scholes model in option pricing, but this method is not consistent across prices; for different strike prices, a different volatility will be found, creating what is known as a volatility smile. I will develop a method which calculates a similar measure of volatility to the Black-Scholes method and the VIX, but using electronically traded options on the SPY ETF which tracks the S&P 500. I will also be incorporating the mathematical model developed by Britten-Jones and Neuberger in their 2000 paper, which is another variation from the method in which the VIX is calculated. The method developed will provide a smoother and more accurate forecast of volatility over any given time frame, with a 30 day forecast being the industry norm. The method will also have the ability to forecast volatilities for individual assets, not simply the whole market.

The Validation of a Novel qPCR Assay for Brucellosis

Corinne Vaughan with Dr. Brant Schumaker and Noah Hull
Veterinary Sciences
University of Wyoming

Oral Presentation

INBRE *Albuquerque, New Mexico*

Brucellosis is an important zoonotic disease caused by bacteria of the genus *Brucella*. There are an estimated 5,000,000 human cases of the disease reported annually. In 1934 the United States created the State-Federal Cooperative Brucellosis Eradication plan to eradicate brucellosis from domestic livestock. This plan was largely successful in eliminating the disease from most of the country. However, elk and bison in the Greater Yellowstone Area still serve as reservoirs of the disease, which has led to spillovers in Wyoming, Idaho, and Montana livestock. Current diagnostics for brucellosis include serologic tests and isolation of the bacteria by culture, but both methods are unreliable to a certain extent because they can produce false positives, and take a long time to confirm. In contrast, quantitative polymerase chain reaction (qPCR) assays have proven to be very sensitive and specific when identifying infectious agents in biological samples. Additionally, qPCR can yield a diagnostic result in a matter of hours, while compared to the gold standard of culture, which can take weeks. QPCR has been used previously to diagnose brucellosis, but it has not been widely implemented due to a wide range of sensitivities outside of the laboratory that validated the assay. It is the overall objective of this project to develop, validate, and implement an ante-mortem qPCR assay for *Brucella abortus*. A new diagnostic test would benefit both producers and the state by saving them transport, quarantine costs, depopulation of false positive animals, as well as reducing the possibility of transmission within the herd.

Methane to Aromatics

Aric Von Buettner
Chemical Engineering
University of Wyoming

Oral with Powerpoint

Honors Program *Casper, WY*

The recent downturn in natural gas prices worldwide has opened up an avenue for alternative chemistry methods to create hydrocarbon products such as aromatics. One such process proposed by my senior design group involves using a catalyst to convert methane directly to benzene and toluene, with the formation of hydrogen and naphthalene byproducts.

In this presentation, I will explain my own contributions toward building this project. In regards to the technical aspects of its design, I helped in designing the layout of the system using various computer modeling programs, in addition to performing research into what type of catalyst would be best for the process. For the purpose of determining the feasibility of this project, I also contributed to an economic analysis of it. This involved determining the cost of the necessary infrastructure and chemicals in order for the system to run, as well as analyzing ways in which we could benefit economically from any waste created by the process. In order to achieve an understanding of our process's broader impact if it were to be implemented, I also helped in analyzing the economic and environmental impacts of this project.

Methanol to Aromatics

Tess Ward, Dr. David Bell
Department of Chemical Engineering
University of Wyoming

Oral Presentation

Honors Program *Laramie, WY*

Aromatics are an important part of many chemical engineering processes around the world and have a large variety of commercial uses. In the future it is projected there will be a shortage of oil resources causing many research institutions to work actively to develop new techniques for producing aromatics. With the low cost of natural gas, converting methanol to aromatics has become an attractive option. Methanol is readily available due to massive natural gas reserves underground and it is relatively inexpensive. For my senior engineering design project I worked with a team to design a plant that converts methanol to aromatics using a ZSM5 zeolite catalyst impregnated with silver ions. Our design included a working simulation of the plant, an economic analysis of the plants profitability, and sensitivity analyses of the plant's resilience to changing market conditions. I will be presenting my contributions to this project for my senior honors project. This will include the business opportunity for the plant and the product market, modeling a portion of the plant, estimating equipment costs for the unit operations of the plant, a production cost estimate, and an overall analysis of the plant's value.

Examination of Tree Characteristics of Three *Pinus sp.* in Relation to *Dendroctonus ponderosae* Infestation in the Wyoming Region

Monique Weaver, Dr. Will Clark,
Department of Math and Science
Western Wyoming Community College
Oral Presentation

In the Rocky Mountain Forests, pine bark beetle is the second highest cause of tree mortality. At current epidemic proportions, the insect is causing extensive damage (Kayes et al 2012). Many factors have been linked to pine bark beetle infestation, one of which being DBH (Amman et al 1988). A study was conducted to determine if certain characteristics of trees of *Pinus sp.* are linked to *Dendroctonus ponderosae* infestation. DBH, height, age, canopy cover, and surrounding tree density was collected from both infected and uninfected trees in close proximity. Data was collected from various forests in the Wyoming and Utah area. Needles from trees were also collected for future genetic work. The average age for infected trees was found to be 31.2 years and the average age for uninfected trees was 24.2 years. Previous studies have found that age of trees have an effect on infestation rate of mountain pine beetle (Taylor and Carroll 2003).

Stern-Volmer Behavior of Organic Photocatalysts

Rachael Weber, Dr. Edward L. Clennan
Department of Chemistry
University of Wyoming
Oral Presentation

National Science Foundation *Laramie, Wyoming*

Viologens are the diquaternary salts of 4,4'-bypridine. They have many applications, such as herbicides, electron transfer relays, charge transfer complex components, redox indicators, electrochromic switches, as well as many other uses. However, photophysical and photochemical studies of viologens are rare. The purpose of this project was to utilize Stern-Volmer kinetics to study how the fluorescence properties of the 5,10-dimethyl-5,10-diaza[5]helicene bis-tetrafluoroborate viologen change in the presence of several different organic quenchers and varying concentrations of the quenchers. This presentation focuses on the synthesis and physical properties of the viologen, the understanding of Stern-Volmer Kinetics, and the discussion of how each of the different quenchers had an effect on the fluorescence of the viologen.

Living Structures: A Native American Archaeologist's Perspective

Nelson White III
Central Wyoming College

Tepees are the most familiar lodge structure used by Plains Indians. This paper compares tepees which were generally used at lower elevations, with wikiups, or pole lodges that were often used in the mountains. Topics will include construction materials and techniques, dimensions, how and where they were used, as well as why they were used in particular environments, whether they were used differently by males or females, and how the two types of structures might be distinguished in the archaeological record. Examples will include sites recorded by CWC field schools and ethnographic information from the presenter's Northern Arapaho relatives.

A comparative analysis of the Mexican vs. Mexican-American diet and rates of obesity through two case studies

Nick White with Dr. Mary Katherine Scott
Department of Physiology
University of Wyoming

Oral Presentation

Honors Program *Douglas, WY*

In this research paper I analyze and compare the diet of the inhabitants of a rural village in Yucatan, Mexico with the diet of Mexican-Americans living in Laramie, WY in order to discern the reasons behind the increasing trends in obesity among these particular populations. This project is based on data collected through interviews with volunteer participants from among the target audiences. Data on nutrition and obesity among Yucatecan populations was previously collected during the summer study abroad course, "Maya Art & Culture", taught by Dr. Mary Katherine Scott (2014). This data is compared with new data collected in Laramie, WY in the spring of 2016.

The Use of Binaural Beats for Brain Entrainment

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Poster Presentation

Wyoming INBRE *Sacramento, CA*

Binaural beats may be defined as a subjective hearing sensation that occurs when the brain perceives two pure tones of differing frequencies. Brain entrainment endeavors to match the oscillations of brain waves (neural responses) with a rhythmic stimulus. The current study investigated the ability to entrain delta waves using a 4 Hz binaural beat. Twenty adults participated in the study. We recorded 5-minute baseline brain oscillation patterns via EEG, then presented the participants with a 10-minute session of a delta binaural beat (4 Hz). Brainwave recordings continued for 10 minutes after the session for post-session data. There was a significant main effect of Condition (Pre, Delta Beat, and Post) on the power of the delta frequency band, $F(2, 38) = 11.07$, $p < .001$. Pairwise comparisons revealed that the Pre condition ($M = 0.999$) had a significantly higher power than the Delta Beat condition ($M = 0.823$; $p = .001$) and the Post condition ($M = 0.821$; $p = .008$). Therefore, when exposed to a 10-minute delta binaural beat (4 Hz), the power of the delta EEG frequency of 20 subjects diminished while the stimulus was presented and remained diminished in the 10 minutes after stimulus presentation ended. Although all subjects reported feeling more relaxed during the stimulus presentation, EEG recordings showed no evidence of a brain entrainment response. Additional analyses should be conducted to determine other affected EEG frequencies (i.e., alpha, beta, and theta). We plan a follow-up study to include additional participants and increase our statistical power.

Application of the Robel Pole Visual Obstruction Method of Determining Grazing Utilization Relative to Site, Timing, Precipitation, and Repeatability

Jessica Windh, Dr. Derek Scasta
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Oral Presentation

EPSCoR *Reedley, CA*

Grazing leases in the western United States, including Wyoming, are an important resource for ranchers to supplement their cattle's diets with mountain grasses during the dry summer months. Management of these summer leases is important to maintain adequate vegetation for the sites to restore themselves in order to continue yearly leasing. In the past fifteen years multiple journal articles have been published on proper utilization for different vegetative communities based on the Robel Pole method to determine utilization. Several US Forest Service districts have adopted this method as standards for their lessees to adhere to. The adoption of these standards has been controversial in that some range managers feel that the research is being applied too broadly, and that a single linear regression equation cannot accurately reflect the optimum use of vegetation for every area in an ecological site. In response to this controversy, my research project is to monitor different plant communities using the Robel Pole method and determine how this method applies across different plant communities, to the timing of sampling relative to grazing and plant phenology, and to intra-annual precipitation variability and quantify how fine scale (weekly) precipitation patterns affect variance of results.

Daily Metabolism of Spring Creek, Wyoming

Alison B. Winkler with Dr. Robert Hall
Zoology and Physiology Department
University of Wyoming
Poster Presentation

EPSCoR *Cody, WY*

Freshwater ecosystems vary in their photosynthetic production and respiration. The data was collected using a Minidot Logger placed in Spring Creek which calculates the dissolved oxygen content every ten minutes. Throughout this we can use diel variation in oxygen concentration to calculate the data of the whole stream metabolism. Using statistical modeling, we calculate the metabolism for each day at an estimated proximal time series. After deciphering the data we will be able to better understand part of the Spring Creek ecosystem. Our current data collections show stability in the streams oxygen content related to primary production within the creek.

Impacts of Dams on Western Ghats Rivers and Migratory Fishes

Breanna L. Winkler[1], Dr. Ramesh Sivanpillai[2]
1. Department of Anthropology, 2. Department of Botany & WyGISC
University of Wyoming
Oral presentation

Haub School of Environment and Natural Resources *Scottsbluff, NE*

Dams are built across rivers for storing water and generating electricity. The stored water is used for irrigation and provide drinking water to urban areas. In India, these dams are viewed as a green energy source because they do not emit greenhouse gasses or generate toxic wastes that would require specialized storage facilities for disposal. Proposals for building new dams are under consideration in the Western Ghats region of India, a biodiversity hotspot with the highest number of endangered freshwater fish species. Building new dams will create more barriers for native fish species impeding their migration routes along the rivers. This reach will examine the positive and adverse impacts of building new dams in this ecological hotspot which serves as habitat for numerous terrestrial and aquatic species.

The Effects of Conductivity and Calcium Content on Native and Invasive Gastropod Populations in the Greater Yellowstone Ecosystem

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

Oral Presentation

Wyoming EPSCoR *Laramie, WY*

Conductivity (total ion levels) and calcium ion content in aquatic ecosystems are known to be a vital factor in gastropod shell formation and body growth. The invasive New Zealand Mudsnail (*Potamopyrgus antipodarum*) reduces algal biomass and changes nutrient cycling, however, few studies have addressed calcium ion and conductivity levels on native compared to non-native gastropods and how these levels may affect snail density, distribution, and richness. I conducted a field survey in five streams with geothermal input in the Greater Yellowstone Ecosystem and for each stream, I collected five quantitative samples above, at, and below the geothermal input, for a total of fifteen samples per stream. Within each stream, I collected abiotic factors such as conductivity, temperature, and calcium content. In the lab, I counted, measured, and identified gastropods found in samples, and also conducted an experiment comparing growth rate and mortality of *P. antipodarum* and two native species in five different conductivity solutions. Using linear regression analysis, I found that temperature was the only significant factor positively correlated to native snail density, while the regression showed no significant abiotic factor correlations with *P. antipodarum* density. In the lab experiment, *P. antipodarum* showed a decrease in growth and increase in mortality at low conductivity levels, while native snails showed no change in growth or mortality based on treatments. This ability to live in lower conductivity conditions could provide snails a refuge from *P. antipodarum*.

Studying the Increased Durability Effects of Dye Sensitized Solar Cells WithProtective TiO2 Thin Films

Zach Witters, Dr. Bruce Parkinson Department of Chemistry
University of Wyoming

Poster Presentation

Department of Chemical Engineering *Littleton, CO*

Dye sensitized solar cells (DSSC) have seen a lot of interest over the past few years due to the availability of different substrates such as Titanium dioxide (TiO2) and Tin oxide. Silicon, the largest used substrate for photovoltaic, requires a great deal of purification to perform as a reliable solar cell substrate and is the main cost preventing the large---scale usage of solar cells. Using a TiO2 substrate, which is much cheaper to manufacture than silicon, studies have been conducted with Cadmium Selenide (CdSe) quantum dots covered with a thin film of TiO2. Preliminary results have shown that the thin film reduces desorption of the quantum dots, prevent oxidation of dots (which decreases efficiency) and increase the lifespan of the solar cell. Thin films have been applied on top of the CdSe dots via Atomic Layer Deposition (ALD), which allows for monolayers of reactants to be placed on a substrate at a time. This in turn allows for very specific thicknesses of films to be deposited. Different thicknesses of TiO2 layers have been deposited and Incident Photon Efficiency (IPCE) measurements have been conducted to determine the photo---efficiency of the cell after ALD treatment. Further test involving a corrosive electrolyte, Potassium Iodide, that allow us to study the quantum dot desorption resistance with respect to time. This research will help reduce the costs associated with DSSC by increasing their lifespan and in turn make DCCS the next generation solar cell.

The Adaptation of Humans for Sustainable Energy Production

Taylor Wollert with Dr. Kevin Kilty
Department of Mechanical Engineering
University of Wyoming

Oral Presentation

Honors Program *Lingle, WY*

Sustainability is essentially made up of three pillars: societal, economic, and environmental. In the modern world, physical activity is now considered a pastime rather than a necessity, electricity is the center point of civilization, and conventional electrical sources are known to have negative atmospheric effects. The senior design project my team is pursuing will address these issues via a bicycle-powered charging system. This system will offer people an opportunity to exercise while simultaneously harnessing the mechanical energy they produce for charging small electronic devices. The system will be composed of two primary parts: the support frame and the charging components. The support frame will be similar to a normal bicycle trainer with a friction cylinder beneath the rear wheel to attach the charging components. The charging components will include a generator connected to a battery pack. The battery pack will be capable of charging small electronic devices such as cellphones and will have multiple removable USB ports for charging after bicycle operation. The increased mobility allowed by the removable USB ports and the physical power provided by the support frame allows us to further integrate the social and physical dimensions of peoples' lives. At the same time, l power consumption through traditional electrical sources may further reduce the individual economic burden while concurrently decreasing environmental pollution.

Chemical EOR Powder River Basin Field Screening

Maxwell Wong, Dr. Xuebing Fu
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Oral Presentation

Department of Petroleum Engineering, Honors *Calgary, AB*

This project received a large data package from the EORI (Enhance Oil Recovery Institute). We screened through the data to find the top fields best suited for a particular chemical EOR (Enhance Oil Recovery) method, and then determined incremental production increases. Finally we created a report detailing our process. In order to accomplish these tasks, we began with project planning. We divided the project into four phases. We then went into screening and ranking fields by completing a field screening and ranking analysis, we then used equations and reservoir techniques to provide the expected incremental production increases. Field screening compares a list of parameters from multiple fields (depending on the screening method, various parameters are used) to values on lookup tables that have been determined by experts for each enhanced oil recovery method. These lookup tables provide a checkpoint or decision point on whether to continue with the field or not; other methods (such as indexing) are required for ranking if multiple fields fit all parameters for a certain EOR method. An initial screening of our project reduced the number of fields from 4500+ to 114. Additionally, for many of these fields there was missing data needed for screening. Accessing the WOGCC (Wyoming Oil and Gas Conservation Commission) website, our group downloaded and analyzed well logs as well utilized other public information sources for the screening data we needed. Our indexing method involved comparing the range of field parameters against comfort reference values to find an index for each field, and using higher index values as better candidates.

Preparation of SnO_2 Single Crystal Substrates for Sensitized Solar Cell

Qian Yang and Dr. Bruce. A Parkinson
School of Energy Resources
Department of Chemistry
University of Wyoming
Oral Presentation

EPSCoR Program,
Departmetn of Chemistry, School of Energy Resources *Laramie, WY*

Titanium Dioxide (TiO_2) and Zinc Oxide (ZnO) are the most commonly used wide band gap crystals in sensitized solar cells. We used Tin Dioxide (SnO_2) in our study because of its low energy conduction band and high electron mobility relative to most other conducting oxides. SnO_2 is a promising substrate because it can accept electrons from sensitizing agents that have lower conduction band edges than TiO_2 and ZnO. We use series of physical and chemical treatments to prepare natural and synthetic SnO_2 crystals in order to obtain atomically flat surfaces that can be used for fundamental sensitization studies. We used AFM to obtain information about the topography of the surfaces. Mott-Schottky analysis was used to determine the doping density of the SnO_2 crystals. To test our method of crystal preparation, we photosensitized crystals with cyanine dyes and quantum dots, and found the photocurrent spectra to match that of the sensitizer absorbance.

Improving Our Understanding of Deep Neural Networks by Better Visualizing Them

Richard Yang, Faculty Mentor: Dr. Jeff Clune
Department of Computer Science
University of Wyoming
Poster Presentation

Wyoming Research Scholars Program, Wyoming EPSCoR *Laramie, WY*

Multi-layered networks of computational nodes known as Deep Neural Networks (DNNs) are currently the best-known way to have computers recognize patterns in data, including being as good as humans at recognizing objects in images. However, a challenge remains to understand what actually occurs internally at each layer of the network. To better understand DNNs, we synthetically generate images that result in high activations of neurons, which allows us to learn what each neuron has learned to fire in response to. We accomplish this task through a process known as gradient ascent, where we start with a random image and continually change it in ways that increase the activation of the target neuron. If the target neuron has learned to recognize faces, for example, then this process should ideally produce a picture of a face. This technique works, but only by biasing the optimization process to produce images that share basic properties with natural images (e.g. neighboring pixels should mostly be the same color). Such "natural-image priors" improve the recognizability of images, but more work is needed to produce clear, informative, perceptible images. My research is to find new, better priors to produce highly recognizable images so that we may further understand how DNNs work, and thus improve them. One of these new priors is Total-Variation Denoising (TVD), which we found to produce great results. My experiments were to find the ideal values for parameters in the TVD function, and also to see the effect of combining TVD with existing priors.

Transit Photometry at Red Buttes Observatory

Student: Rex Yeigh Mentor: Dr. Hannah Jang-Condell
Department of Physics and Astronomy
University of Wyoming

Poster Presentation

Department of Physics and Astronomy *Buffalo, Wyoming*

We present transit photometry of exoplanet host stars from the Red Buttes Observatory (RBO). Targets identified by Kepler and KELT (Kilodegree Extremely Little Telescope) exoplanet surveys were observed by our group at the University of Wyoming from the RBO. RBO is a .6 meter telescope and through partial automation it can be used remotely. We present two light curves one of WASP-58b, a confirmed exoplanet, and one a KELT target both observed multiple times. Both targets showed a dip in brightness in their light curves indicative of a transit event. Comparisons to previous light curves have shown similar results. RBO will continue to be used to gather data for determining the light curves of various targets.

Gonadotrope Specific Ablation of JNK 1/2 Leads to Impaired Fertility

Kelsea N. Zukauckas with Brian S. Edwards, Shaihla A. Khan, Amy M. Navratil
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Oral Presentation

Wyoming INBRE *Cheyenne, WY*

Gonadotropin releasing hormone (GnRH) activation of gonadotrope cells initiates an intricate network of signaling pathways that results in the synthesis and secretion of gonadotropins, luteinizing hormone (LH) and follicle stimulating hormone (FSH), from the anterior pituitary. Previous work highlighted an important role for the c-Jun NH_2-terminal kinase (JNK) signaling cascade in regulating GnRH receptor (GnRHR) expression levels and pulsatile secretion of LH; essential events for reproductive viability. Awaiting systematic clarification are the *in vivo* requirements of JNK in the regulation of fertility at the level of the pituitary. To specifically address this, we utilized cre/lox technology to selectively knockout JNK 1 and JNK 2 (JNK 1/2) in the gonadotrope (JNK DKO). Conditional knockout of transgenic C57BL/6 mice with floxed JNK 1/2 alleles was accomplished using the previously described GRIC mouse, in which expression of Cre recombinase is coexpressed with the GnRHR gene. Estrous stage cycling revealed that JNK DKO females had irregular cycles, marked by prolonged diestrus and abnormal cycle length that ranged to upwards of 9 days. Consistent with abnormal cyclicity, our initial breeding experiments showed that JNK DKO females paired with a CRE-negative male had significantly reduced litters from control animals. Litter sizes were similarly reduced when control CRE-negative females were paired with JNK DKO males suggesting reproductive deficits may also occur in males. Collectively, our results reveal that ablation of JNK1/2 expression impairs the timing of ovulation, and functional JNK activity is important for fertility in both females and males.