University of Wyoming
April 21, 2012

Student Abstracts

Oral Presentations: Classroom Building,
University of Wyoming Campus
10:00 – 4:00 PM

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

Program Acronyms:
NSF EPSCoR: National Science Foundation Experimental Program to Stimulate Competitive Research

INBRE: IDeA Networks for Biomedical Research Excellence
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Working Group

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Brenda Turner, Wyoming NSF EPSCoR  Lisa Abeyta, Wyoming NSF EPSCoR

Moderators for the Oral Presentations

Anne Sylvester  Patricia Taylor
Brian Leonard  Charles Dolan
Brian Towler  Audrey Kleinsasser
Glaucia Teixeira  Rod Garnett
H. Gordon Harris  John Tanaka
Jonathan Prather  Chicory Bechtel
Mark Mehn  Anne Sylvester
Scott Morton  Allison Meyer
Scott Seville  Cathy Connolly
Stanislaw Legowski  Joseph Holles
Carol Frost  Ruben Gamboa
Eric Nye  Lynne Ipina

Engineering Judges

Electrical and Computer Engineering  
Mark J. Balas, Dept Head and Professor
Andrew A. Catellier, Institute for Telecommunication Sciences, US Department of Commerce (NTIA)
Brian J.W. Zuelke, NDC Power.

Mechanical Engineering  
Judges: Ashli Babbitt, ME Graduate Student, Douglas, Wyoming
Harold Bailey, E.I.T., Design Engineer, High Country Fabrication, Inc., Casper, Wyoming
William (Bill) Dolling, P.E., Retired Vice President Science & Engineering
ATK-Thiokol, Inc., Perry, Utah
Roland Lindford, P.E., Retired Engineer and Manager, General Electric Nuclear, Inc., Evanston, Wyoming
Dr. Donald Smith, P.E., Professor Emeritus of Mechanical Engineering, Laramie, Wyoming
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Plugging Ruby 43-15-4674BG With Bentonite
Eid Mubarak N. Al Hajri, Peter Lemke, Allan Tainsh, Shawn David Cody, and Yao Yao, with Dr. Brian Towler
Department of Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

Department of Chemical and Petroleum Engineering
Sturgis, SD
Three Hills, Alberta Canada
Aindar, Eastern Province Saudi Arabia
Milk River, Alberta Canada
Cangzhou City, Hebei Province, PR China

The conventional method for plugging and abandonment of coal bed methane wells utilizes concrete which is pumped down the well casing and sets to form a permanent plug. An alternative method for plugging wells is to replace concrete with bentonite. The benefits of using bentonite as a replacement for concrete include lower material costs, no need for specialized pumping equipment, as well as the flexibility and self-healing capabilities of hydrated bentonite. One issue encountered with using bentonite is its tendency to bridge-off before reaching the intended depth. Additionally, bentonite is not yet approved as a concrete replacement in the State of Wyoming.

This research focuses on the production and implementation of a bentonite cylinder which resists bridging-off. Development and production of the cylinders is discussed including the design of the production equipment and plug composition. Additionally, the plugging of a coal bed methane well using the developed cylinders is presented. The original design and subsequent modifications of the well plugging procedure are discussed along with the results of pressure testing. A comparison of the actual costs for the plugging of this well and the estimated cost of using concrete make a case for replacing concrete with bentonite.
Study of the Niobrara Formation in the Borie Field
Abdulaziz Muhanna Alhubil, David Scadden, Joe Lawson, Rachael Molyneux, and Gabrijel Grubac
with Dr. Brian Towler
Department of Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

The Niobrara formation has been a promising area of interest for exploration and drilling in the last few years. As technology has reached a point where producing from shales is both possible and profitable, this study looked at the Borie Field as an example for the Niobrara within Wyoming. By looking at log data for a series of wells, maps for formation thickness, porosity and water saturation are created and a range for oil in place for the Borie Field is given. Also, the available production data is used to estimate possible recovery. Recommendations on drilling methods based on other productive shales are made keeping in mind the environment, ethics and safety. Finally, an economic analysis is performed. This includes estimates for amount of produced oil, drilling costs based on recommended methods and possible future oil prices. Exploration and drilling in the Niobrara formation can be profitable so long as the proper methods are used and the correct areas targeted.

“The Fountain Overflows”: The “Proverbs of Hell” and Blake’s Proverbial Wisdom
Leighanne Allen
With Dr. Bruce Richardson
English
University of Wyoming
Oral Presentation

In Western literature, the proverb originates in a genre known as Wisdom Literature, or at least three books of the Bible including the book of Proverbs. William Blake’s “Proverbs of Hell” in The Marriage of Heaven and Hell (1790) follows in this tradition. While the Marriage is largely considered to be a satire, I will illustrate that it is able to break free of this genre and engage in the world of truisms. Its proverbs reveal the world as Blake views it, and they enter into a discourse with the book of Proverbs that, while both respecting and rejecting this established form of Wisdom Literature, illuminates the ways in which Blake operates as prophet instead of satirist. In my presentation, I will argue that Blake purposefully engages with the tradition of Wisdom Literature by imitating and parodying the book of Proverbs with the ultimate goal of exposing his moral codes of Hell as necessary, literary truths of the world.
Land Wind Racer Design
Shyla Allen, Nick James, Lee Mitchell, Austin Rykhus with Mr. Scott Morton
Department of Energy Systems and Mechanical Engineering
University of Wyoming
Oral and Poster Presentation

*Department of Energy Systems and Mechanical Engineering*                Baggs, WY
Rock Springs, WY
Denver, CO
Evanston, WY

Z4 Energy Systems LLC in September 2011 requested that RideWY Engineering, design a wind powered vehicle to be entered into the “Celebration of Wind” race held in Rawlins, Wyoming in May 2012. Design of this vehicle was to be completed by December 2011 with construction beginning in January 2012. Design constraints were set forth by the competition rules as well as Z4 Energy Systems, with a main goal of victory. Under these constraints, RideWY created the final designs and specifications using mathematical modeling and innovative designs. The optimal design for the land sailer would implement a 3 wheel design, with 2 wheels in the front. Steering was accomplished using a tiller system in the rear of the sailer. The frame material will be 1018 alloy steel. The sail utilized was a downwind sail, or spinnaker sail. The design of this project was completed in assistance with faculty and staff of the University of Wyoming, and presented in this report.

**Isolation of L-amino acid oxidase and anti-coagulation activity from *Agkistrodon piscivorus piscivorus* (Eastern cottonmouth)**
Olivia Alley, Taira Graves, and Duane McMurtry with Dr. Rob Milne
Chemistry
Sheridan Community College
Poster Presentation

Snake venom contains many toxins which are life threatening due to effects on different vital physiological systems. These toxins are of interest because of their potential medical applications such as anti-coagulation and bactericidal effects. The purpose of this investigation is to isolate venom components which may exhibit oral antibiotic activity or have the potential to dissolve atherosclerotic plaque.

Snake venom L-amino acid oxidase and fibrinogenolytic activities were isolated from *Agkistrodon piscivorus piscivorus* through a combination of size exclusion, ion exchange chromatography, enzyme assays, and gel electrophoresis. Preliminary results will be reported.
AC Power Measurement Instrument
Abdulmunem Al Yousef and Sachit Bikram Thapa with Dr. Stanislaw Legowski
Department of Electrical and Computer Engineering
University of Wyoming
Oral and Poster Presentation

Department of Electrical and Computer Engineering

Qatif, Saudi Arabia
Kathmandu, Nepal

The main purpose of power measurement instrument is to measure power consumed by an appliance or electronic equipment used at a house for certain period of time. It needs to measure voltage, current, and phase shift and calculate the power factor and the energy (kWh) of a device operating at certain period of time. This instrument will be used to know what electronic device is consuming more electricity and ultimately leading to lowering cost of consumed electric power, for instance adjusting a proper temperature in a refrigerator. All of these calculations will be done with the help of a microcontroller inside the instrument. The front part of the instrument will contain LCD display to display quantities i.e. voltage, current, energy or power. It also has 3-prong input at the front and 3-prong output at the rear part of the instrument. Our device helps to save energy and be eco-friendly.

The Effects of Vegetable Derived Compost on Hybrid and Heirloom Tomatoes Produced in the Laramie Valley
Erin Anders with Dr. Urszula Norton
Agroecology
University of Wyoming
Poster Presentation

McNair Scholars Program

Tomato production at high altitude, short-season climate and low fertility soils is a challenge to gardeners. The success of the production may rely on the active soil fertility management and selection of appropriate tomato varieties. Organic soil amendments provide economically feasible and sustainable options and compost from the local businesses’ kitchen waste produced by Agricultural Community Resources for Everyday Sustainability (ACRES) farm creates a viable alternative. However, we do not know the overall benefits of using the compost in the production of the most popular tomato varieties. Our goal was to test the performance of traditional (heirloom) and genetically improved (hybrid) varieties of grape and slicing tomatoes with and without the ACRES compost. Four beds in ACRES high tunnel were planted with tomatoes in a completely randomized arrangement: two beds were amended with compost at a rate of 0.5 L m$^{-2}$ prior to planting, and two were treated as controls. The following data were collected: fruit weight, diameter, color, a number per plant and plant height. Results suggest that hybrid varieties did not benefit in size from the compost amendment in contrast to heirloom varieties, which yielded up to 22% larger fruits. The grape tomatoes yielded up to 61% more total overall fruit biomass and up to 60% more fruits per plant when grown with compost and the slicing tomatoes yielded only up to 11% more total overall biomass and showed no change in the number of fruits per plant. The interaction of tomato variety (grape vs. slicing) and compost amendment showed that although larger fruit was produced in heirloom varieties under compost treatment, the overall yield was increased by the addition of compost to the grape varieties.
The Voices Inside: Wyoming project began in Burgin, Kentucky, when I had the opportunity to work with 10 inmates at a high security prison on the basics of acting and playwriting. I became so inspired by this program that I decided to try and bring a sister program to one of the prisons in Wyoming. I contacted the state penitentiary in Rawlins, the women’s prison in Lusk, and the medium security prison in Torrington. I decided to go to Torrington, and assembled a team of four faculty members and six other students to be a part of this project with me. I proposed the idea to Warden Hargett in November, and my team and I went in for training in late January.

At this point, this project is on a stand still. The prison currently has our identification badges ready, and a list of inmates who are interested in participating in the program, and the project has been approved, but we are waiting for them to tell us when we are allowed in again. However, I can safely say (having worked with the inmates in Kentucky for 3 months intensively) that this project is extremely beneficial for these men, as it provides a creative outlet for them, and a way to express themselves creatively. Projects like this are known to significantly reduce recidivism rates.

Junior and senior high schools are seeing an unsettling trend in reading and writing scores on standardized testing. They are working to increase those scores. The purpose of the class I have created is to help interest students in reading and increase their reading and writing scores. By using the familiar plot lines of Disney fairy tales and their modern retellings, students will be motivated to read the materials assigned in the course I have designed. Their writing skills will be tested and increased with the rigor and support that has been built into the class. Even though the class is set up for a class of juniors or seniors, it has been designed to be easily adjusted for younger grades or lower level students. Although not put into use as a whole, the class is based in research and all of the activities have been tested and successful in both interesting students and increasing their writing abilities.
A Search for Novel Antibiotics Produced by Bacteria Isolated from Rotting Wood
Katie Atkinson, Colt Dalton, Pat Dunks, Michael Fjell, Maria McNiven, Olivia Rogers, Erin Yarborough with Dr.s Allan Childs, Steve Harbron, Elise Kimble
Biology, Chemistry
Northwest College
Poster Presentation
INBRE Belfry, MT Cody, WY; Miles City, MT; Burlington WY; Powell, WY

Bacterial resistance to antibiotics is of increasing concern. We have chosen to search rotting wood as a source of antibiotic-producing bacteria. Samples of rotting wood were collected aseptically at numerous sites in six states and the District of Columbia. Bacteria were isolated and tested for ability to inhibit growth of *Escherichia coli*, *Pseudomonas aeruginosa* and/or *Staphylococcus aureus*. Wood samples had varying percentages of isolates that inhibited growth of these test organisms. Chromosomal DNA was extracted from bacteria with antibiotic activity and the 16S ribosomal RNA gene amplified by PCR. The PCR product was sequenced commercially and a BLAST search done to provide a tentative identification of the bacterial isolates. In some cases it was necessary to differentiate closely related species using physiological characteristics. When appropriate, an effort is made to elucidate the structure of secondary metabolites produced by bacterial isolates. A second avenue of research involves probing metagenomic DNA from our wood samples to detect bacterial polyketide synthase genes, as some polyketides are antimicrobial. We have detected such genes but do not yet have sequences for them.

Assistive Technology Fishing Device
Andrea Axmann, Lucas Lang, Bryan Overcast & Bryan Shears with Dr. Ann Peck
Department of Mechanical Engineering
University of Wyoming
Oral and Poster Presentation

The assistive technology field aims to improve the lives of people with mental and physical disabilities by providing technological devices to aid in various tasks ranging from everyday activities to hobbies and recreation. Assistive technology fishing devices are becoming more commonplace; however, the majority of these devices demonstrate poor variable distance casting and lack hooking action capabilities. According to Peter Pauwels, who has been working to improve the assistive technology field for 20 years, enhancing these particular aspects in these devices is an important advance. The aim of the project is to improve both the variable distance casting and hooking functions of previous AT Fishing Device prototypes.

Variable distance casting was accomplished by varying the pullback distance of the fishing rod while the hooking function was attained by increasing pullback force. The final design uses a pneumatic rotary actuator to simulate the pullback, casting, and hooking processes used for fishing as well as an electric motor for the reel-in process. The AT Fishing Device uses simple switching and readily available components to increase reliability and manufacturability. This portable machine costs less than $1,000 dollars to build and ultimately affords the sport of fishing to a much broader audience.
BP’s Macondo blowout was the largest environmental catastrophe that America has ever faced. Multiple factors contributed to the blowout, but the final barrier check – the negative pressure test – was misinterpreted. Proper interpretation of this test might have alerted the rig crew of failed barriers and ultimately prevented the blowout.

Due to this blowout, the negative pressure test is now required by the Bureau of Safety and Environmental Enforcement. There is no industry standard, however, on how the negative pressure test should be defined, conducted or interpreted. This paper proposes that a proper negative test requires underbalancing the well with a packer system and monitoring for pressure on the drill pipe. A successful test is only when pressure remains at zero psi.

In light of the Macondo well blowout, the proposed procedure includes considerations such as proper spacer fluid selection, reservoir pore pressure and well control measures to decrease operator risk. With these considerations, the procedure can be adopted for any well. Better understanding and definition of the negative pressure test will decrease the operator’s exposure to risk and will mitigate the likelihood of future blowouts.

**Potentially New Eimeria (Apicomplexa: Eimeriidae) from Perognathus fasciatus (Rodentia: Heteromyidae)**

Delina E. Barbosa and Zachary P. Roehrs with Dr. R. Scott Seville

Department of Zoology and Physiology

University of Wyoming / Casper College Center

Poster Presentation

*Wyoming INBRE*

Casper, WY

There have been few studies focused on coccidians infecting rodents in the family Heteromyidae and no studies on the species *Perognathus fasciatus*, the olive-backed pocket mouse. We collected fecal samples from *P. fasciatus* trapped at three sites near Lysite, Wyoming and examined them for coccidian oocysts. Fecal samples were placed in potassium dichromate to sporulate the oocysts. Oocysts-were extracted from feces by floatation in Sheather’s solution onto cover slips that were examined at 1250X by light and Nomarski Direct Interference Contrast microscopy. Samples collected last summer have been examined, and two were found to be positive for an oocyst morphotype that does not compare favorably with oocysts of named species from *Dipodomys ordii*, sympatric in this region, and other coccidian species reported from other *Perognathus* spp. Although more data is needed to develop a robust description of this morphotype, data thus far provides support for the presence of a new species of *Eimeria* from the host *P. fasciatus*. 
Fracture Stimulation Techniques
Katie Barsness, Limin Fu, Josie Skinner, Alex Williams
Department of Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

Fracture stimulation techniques within the petroleum industry have been advancing at a rapid rate through the past decade due to the discovery of unconventional plays and the increase in the use of natural gas. These techniques have become common practice and have caught the attention of the general public who’ve developed concerns regarding safety, environmental, and ethical issues. Recent incidents on location and after effects of fracturing projects have led to a loss in support from the public and increased limits on fracturing in resource plays that require these methods to be economical. From an industry standpoint, fracturing techniques are essential in making many resource plays economic and must be used for successful field development. Specific techniques of high energy gas fracturing, slickwater fracturing, foam fracturing, sliding sleeve, and plug and perforate methods are taken into consideration for their use throughout the world and the United States. These techniques each have their own positives and negatives that must be investigated. Safety issues, environmental impacts, and ethical practices effect the public and as an industry, we must do all we can to inform and educate, fostering a mutual respect and understanding for the needed use of fracture stimulation and rolls of engineering.

Electronic Timer System for Pinewood Derby Racetrack
Aaron Bassham and Matthew Tanous with Dr. Stanislaw Legowski
Department of Electrical and Computer Engineering
University of Wyoming
Oral and Poster Presentation

The Pinewood Derby is a traditional wooden car race held in the Cub Scouts organization. As Cub Scout groups are funded by voluntary dues and timer systems can be expensive, many determine the winner of the race by eyesight. The goal of this project was to create a prototype for a timer system that would be more affordable for the Cub Scouts and accurate down to a hundredth of a second to determine the winner of a close race that eyesight could not. This is done by using an infrared laser “trip wire” in conjunction with a microprocessor to calculate real-time values. The results are then displayed to an LCD screen for the user. The result is an accurate race timer that can be built for under $100, in comparison to the typical $500+ timer sold on the market.
Solid Fuel Transfer for Vehicular Hydrogen
Tommy Baumgarder, Justin Gross, Eric Walker, Jon McNees, Daniel Blair and with Dr. Yuan Zheng
Department of Mechanical Engineering and Energy Systems Engineering
University of Wyoming
Oral and Poster presentation

College of Engineering
Gillette, WY
Casper, WY
Rawlins, WY
Bakersfield, CA
North Platte, NE

A University of Wyoming faculty member is attempting to create a 1/10th laboratory scale, by volumetric flow rate, fuel transport system for ammonia borane to be used in hydrogen powered vehicles. Ammonia borane is a powdered medium that has high hydrogen content by weight. Due to the difficulty of transporting ammonia borane, a co-rotating twin screw extruder is being developed by HyTrans, a Mechanical Engineering Senior Design team, to transport the ammonia borane from a reactor to a tank. A laboratory scale model has been designed to have 1/10th of a vehicle's volumetric flow rate. The twin screw transport system is designed to fit on a compact vehicle. A screw configuration will be most beneficial for the transportation of ammonia borane due to the ability to cleanse itself and propel material forward. Ammonia borane is too expensive to buy and test; therefore, surrogate materials have been explored to closely match the material properties of ammonia borane. Corn meal and low density polyethylene have similar characteristics to ammonia borane and will be used as the surrogates for testing.

Fast Pyrolysis of Biomass Using Concentrated Solar Radiation
Emily Beagle with Dan Mosiman and Dr. Yuan Zheng
Department of Mechanical Engineering
University of Wyoming
Oral Presentation

UW Honors Program/ Nielson Fellowship
Sheridan, WY

Concerns about climate change and rising petroleum fuel prices have sparked the need for research in alternative energy sources. Pyrolysis is a high temperature reaction (300-700°C) that occurs in the absence of oxygen and reduces biomass to char, gases and bio-oil. Fast pyrolysis occurs at high heating rates and results in a high yield of bio-oil. This produce bio-oil has the potential to be used as an alternative transportation fuel source. The use of concentrated solar radiation as a heat source for the pyrolysis reaction further increases its appeal as a viable energy alternative for the future. A bench size pyrolysis reactor and condensing system was designed, constructed and implemented to perform pyrolysis testing on biomass samples. A solar simulator was used in place of actual concentrated solar radiation. In order to improve the bio-oil collection a four stage temperature varying condensing system was designed and tested. Experiments were run in the laboratory using the designed reactor and condensing system that resulted in successful pyrolysis reactions with biomass and proper collection of bio-oil and other products in the four stage condensing system.
ASME 2012 Student Design Competition: Energy Relay
Emily Beagle, Kyle Deadwyler, Hector Fernandez and Andrew Davis, Dr. David Walrath
Mechanical Engineering
University of Wyoming
Oral Presentation

Department of Mechanical Engineering
Sheridan, WY
Highlands Ranch, CO
Santiago, Dominican Republic
Castle Pines, CO

Improving transportation energies is an important part of addressing the global energy problem. Our senior design project, the ASME 2012 Student Design Competition addresses this problem through the challenge of an Energy Relay. The task of the competition is to design four self-propelled devices with unique on-board energy sources. As a relay style race, all vehicles must be initiated by the previous vehicle. The maximum amount of points can be achieved at the competition by having a unique energy source on each device, ensuring that each device initiates subsequent devices and having a fast total race time. The four energy sources chosen were compressed gas, stored strain, electrical and chemical storage. Both the chemical storage and electrical vehicles will use an electric motor to drive the vehicle, one with a 9V battery and the other with an ultra-capacitor. Stored strain energy will be utilized through the compression and release of a torsion spring. Compressed gas energy will be utilized through compressed air expanded through a piston cylinder. In order to avoid damaging the vehicles with a physical initiation system, remote motion sensors were designed to sense and initiate each vehicle. The competition will be held at the end of March.

African Economics in the Global System: A Case Study of Nigeria
Allison Beaufort with Nicole Ballenger
International Studies
University of Wyoming
Oral Presentation

UW Honors Program
Broomfield, CO

Contemporary economic interactions around the globe are defined by capitalism and competition in its transactions and trade flows. The purpose of this study is to unearth cultural underpinnings preventing developing countries from entering the global market because of the clash between traditional economic systems and Western economic concepts. While there are many historical and external factors to be accounted for in the economic analysis of developing countries, the underlying cultural definitions of success and wealth play an important role in economic integration. Focusing on Nigerian economics and two ethnic groups native to Nigeria, the analysis of the African worldview within this context extracts the issues with fitting a cultural construct based on community and trust into a system of individualism and competition. This type of examination was performed through research on the African worldview, Western economic concepts, Nigerian economic status, and comparison of both Yoruba and Igbo traditional systems and attitudes. This study results in a thought-provoking debate about what it means to be wealthy and whether the development of a new economic structure that incorporates these cultural components may actually be a more realistic resolution for countries struggling to emerge as competitive entities in the global market.
The Nazi “euthanasia” program, also known as the T-4 program, is a gruesome euphemism that refers to the clandestine and systematic killing of handicapped persons. Often the tragic history of the Holocaust is simply thought of as beginning and ending with the disturbing systematic killing of the European Jewry. Yet, such a simplistic remembrance of the Holocaust does disservice to the Holocaust’s victims as well as to its legacy in the international community. For these reasons, the purpose of this research project is to connect the origins of the Holocaust to the T-4 program by discussing the perpetrators and the techniques carried out on the victims. Furthermore, the research project also discusses this connection by analyzing the impact the T-4 program has had on the Human Rights discussion. This analysis is done through looking at the opinion of bystanders and at the trials carried out after the Second World War. Research supporting the claims of the project are the result of extensive studying of both primary and secondary sources revolving around the T-4 program and the Nuremberg Trial, particularly the Hadamar and Doctors Trial. Taking the evidence from these documents, the Nazi “euthanasia” program’s impact and the memory of its victims should not be denied.

Identity, Community, and Development in Tepito, Mexico
Amie Belmont with Dr. Carolyne Ryan
Department of International Studies
University of Wyoming
Oral and Poster Presentation

Development in marginalized areas presents serious challenges for community, national, and international policymakers and organizations. In Tepito, one of Mexico City’s most notoriously dangerous and stigmatized neighborhoods, residents have been presented with a plethora of challenges to development within the past fifty years. In order to respond to these challenges, residents have responded to questions of development with community organization and mobilization. This study utilizes a combination of interdisciplinary scholastic research and ethnographic fieldwork to analyze the relationship between questions of identity, community, and development. Through an examination of gender, the informal economy, and local justice this study argues that the formation of identity and community allows enhanced popular participation and development. Furthermore, this study presents Tepito as a microcosm of Mexican society and offer policy suggestions for both community and national development within the country.
U.S. Patent 7321072 B2 introduces new technology that allows toluene to be converted with 99.9% selectivity to para-xylene when mixed with methanol under high temperatures. The key reaction for the process is: C₇H₈ + CH₃OH = pC₈H₁₀ + H₂O. This process uses a very low contact time of 0.36 seconds and a boron ZSM-5 catalyst to produce commercial quality para-xylene (99.8 wt%). The goal of the project is to produce 500E6 lb/yr commercial quality para-xylene after a simple distillation of the reactor effluent.

Our group has: simulated a para-xylene and a methanol plant using Aspen Plus, looked at regenerating the boron catalyst, added a fluid catalytic cracking reactor, implemented safety precautions, and accessed environmental impacts. The main focus has been on optimizing the process through energy integration by using the heat generated by the exothermic reaction and a network of heat exchangers. Our economical results show an NPV: 20 of $-2,343.00 and an IRR 6.6%. The process also has low conversion of toluene requiring a large recycle, which causes a tradeoff between selectivity and conversion. In the end, it is the large recycle loop and energy needed to run the distillation column that makes the para-xylene plant not profitable.

One of the earliest revelations about the protagonist of Virginia Woolf’s Novel Mrs. Dalloway is that Clarissa “always had the feeling that it was very, very dangerous to live even one day.” This line subtly introduces us to the novel’s antagonist: time. By assigning the adjective “dangerous” to “one day,” Woolf designates that time features as more than a background for her characters’ lives – time is a tyrannical force to be reckoned with. In this paper, I will argue that time reigns as the supreme agent of power in Mrs. Dalloway. Time succeeds as no other character does in meeting all the requirements of Woolf’s definition of power. Time influences all while being influenced by none, trapping characters in a painful present that excludes the possible comforts of past or future. Time also achieves inescapability by wielding power over all of earthly life. Woolf, however, presents time’s power in a very specific way: she personifies it in her novel through the feminine pronoun. I will contend in conclusion that, by characterizing power in her novel as feminine, Woolf offers an implicit portrait of how, through writing, women can effectively exercise power in a context of societal limitations.
How wildfire affected aquatic invertebrates in Yellowstone National Park, Wyoming  
Cody Bish, Lusha Tronstad  
Wyoming Natural Diversity Database  
University of Wyoming  
Oral Presentation  

Wildfire severity is predicted to increase with global climate change. Wildfire may affect stream fisheries by altering their main food source, aquatic invertebrates. We were able to investigate how the density and biomass of aquatic invertebrates changed after wildfire, because a wildfire unexpectedly started after collecting samples for 1 year. Therefore, we collected invertebrates one summer before the wildfire, and two summers post wildfire. We used a Hess sampler to collect invertebrates every 2 to 4 weeks in Cub and Little Cub Creeks, Yellowstone National Park. The samples were sorted, counted, measured, and identified under a dissecting microscope. The summers after the wildfire, invertebrate density (30,000 ind/m²) decreased compared to pre fire density (52,000 ind/m²). Invertebrate density may have decreased post fire due to flooding that occurred, because the lack of primary producers decreased water storage in the watershed. The second summer after the wildfire, Plecoptera (2x) and Ephemeroptera (1.5x) increased densities, while Diptera densities decreased. Conversely, biomass increased both years post fire (500 mg/m² before fire vs. 860 mg/m² after fire). Despite densities decreasing post fire, higher invertebrate biomass may be available for fish to consume.

Irish Oral Tradition  
James Bland with Barbara Logan  
University of Wyoming  
Oral Presentation  

Stories define culture through the villains and heroes. In a given culture or identity, stories prepare their audience by showing what to expect. Heroes exemplify positive traits to be mimicked, and villains and obstacles offer warnings for future challenges. The tone of stories, their length and their moral all vary depending on the medium, culture, and audience. The study of “stories” is separated from mass media by the academic community, and often by the general public. This separation is understandable, but not important. Stories persist through all mediums as a way to transmit an identity’s characteristics and attitudes.

The purpose of this project is to retell stories from the Irish oral tradition to illustrate traits, flaws, and virtues. For an identity as prevalent as Irish, there are a lot of pre-conceived ideas and about what the culture is like. Racism and stereotypes (positive and negative) contribute to an “identity” only partially of the Irish making.
Chinese Aquaculture
Cobus Block with Dr. Mariah Ehmke
International Studies
University of Wyoming
Oral Presentation

WU Honors Program Gothenburg, NE

China has a rich history of aquaculture dating back more than 2000 years. After China instituted economic reforms in the late 1970s, farmers and local governments rapidly increased aquaculture production. Today China is by far the largest producer and exporter of aquaculture products in the world. Aquaculture has been tremendously helpful in providing Chinese farmers with a way to diversify their production in a profitable manner; however, a number of issues face the industry today threaten to undermine its continued success. This paper investigates these issues with specific emphasis on those issues most affecting small farmers. It utilizes interviews and field research in addition to data analysis to draw conclusions about the state of aquaculture in China. Throughout, this paper focuses on how aquaculture can be better utilized to increase the economic wellbeing of rural Chinese. The results of this research suggest that an array of issues ranging from transportation to pharmaceutical regulation hinder further development in the industry.

The Spiritual Economy of Indian Gurus and Their American Followers:
Hindu Theologies and American Motivations
Evan Blonigen with Dr. Antoinette DeNapoli
Religious Studies Program
University of Wyoming
Oral Presentation

Program of Religious Studies Casper, WY

The rise of neo-orientalism in the 20th century was a result of calculated modifications of foreign viewpoints. These ideas included modified Hindu theologies by Indians who sought to bring these philosophies to the West. They knew that they must modify these theologies to meet the expectations of a very different culture. These modifications that stressed union with God, rationalism, and peace created a movement. This movement led to millions of Americans rushing to mediation centers, purchasing learning material, paying fees to classes, and donating billions to their gurus. In return, gurus amassed massive fortunes, formed complex corporations, and even began copyrighting their ideas. This massive variation on traditional guru lifestyle led to serious consequences. Allegations of sexual abuse, illegitimate lineage (essential to a guru’s legitimacy claims), lawsuits, and even bioterrorism have been the result of a once simple effort to open western eyes to legitimate eastern religions. This project will seek to understand the ways in which Indian and American cultures intersect in these new movements, as well as how this cultural exchange affected both guru and devotee.
Chemical Looping Combustion of Syngas
Paul Bonifas, Rizan Fazily, Clark Newbold and Ying Wang with Drs. David Bell, John Myers and Joseph Holles
Department of Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

Any existing coal power plant can see improvements in efficiency and fiscal viability by incorporating both an IGCC (Integrated Gasification Combined Cycle) and CLC (Chemical Looping Combustion) component. IGCC is a system that gasifies coal into syngas to provide additional energy. The additional advantage of integrating Chemical Looping into these plants is that instead of combusting the syngas with air, a metal oxide is incorporated which produces pure byproducts (CO₂ and H₂ gas) which can be sold for profit. Our goal is to create a 500 MW power plant that includes both of these improvements. This plant was extensively researched and an Aspen+ simulation was created. This simulation had the advantage of comparing a given power plant with and without the added components. Such a plant would potentially be a considerable investment for interested parties, making the economic analysis the most crucial part of the project. We concluded that our plant would require a $5 billion fixed capital investment. Though costly, we project an NPV10 of over $2 billion with an IRR of 14.05%. Therefore, the combination of chemical looping and IGCC not only yields more energy, but allows us to market the pure byproducts.

Neuro-aesthetics: A Scientific Approach to the Aesthetics of Art
Cayleigh Brown with Diane Panozzo
Honors Program
University of Wyoming
Oral Presentation

Why do we enjoy certain pieces of artwork but not others? Neuro-aesthetics can begin to answer this complex question. Although the fields of neuroscience and art seem unrelated, neuroscientists have recently found that our brains are wired in order to “like” certain basic components of art more than others. Yet, every individual still processes artwork with different underlying perspectives, experiences, and emotions, creating an individualistic connection to what they are viewing as well.

In researching the psychology, physiology, and neuroscience behind how we process art, as well as looking at experiments in neuro-aesthetics, viewing artwork, and working with a group of students directly, I identified possible basics behind why art is visually pleasing to the eye and why we might have differences in taste. Artists have employed these components in their work for years, and through their skill and intuition have discovered the basic rules of our more subtle visual perception.

The aesthetic experience has remained hard to explain, but by combining science and the arts, neuroscientists might find answers. Art can essentially be broken down into basic elements that cause more rapid firing of neurons, producing a sensation of pleasure deep within our minds.
Human hypertension is linked to elevated salt intake and like humans, the salt sensitive Dahl rat, develops hypertension when on a high salt diet. In contrast, Dahl rats given a normal diet maintain normal blood pressure. Identifying the underlying factors that predispose Dahl rats to hypertension when on a salt diet has human health relevance. Our lab has studied the neurokinin 3 receptor (NK3R), and its increased expression during hyperosmolarity. We know NK3R agonists stimulate Vasopressin (VP) release from the paraventricular (PVN) and supraoptic nuclei (SON), relating hyperosmolarity to the release of VP, but we wished to link NK3R to salt intake and hypertension. Rats were placed on salt diet for four weeks, had surgery to insert femoral catheters to measure blood pressure, sacrificed, then the PVN and SON were carefully isolated out of the brain, and levels of NK3R and VP were determined using Western blots. After being placed on high salt diet, salt sensitive Dahl rats, in contrast to control salt insensitive Dahl rats, have an increased blood pressure; increased Vasopressin (VP) levels in the blood, the PVN and SON; and increased expression of NK3R. This shows NK3R might have a role in hypertension.

Gay panic is a strategy used alongside legal defenses by heterosexual men accused of assaulting and/or murdering homosexual men to explain their violent actions. The strategy is based on the premise that the romantic or sexual advances of a gay man on a straight man disgust or outrage said straight man so severely they react with violence that is often fatal. This presentation will not only discuss the history of what is referred to as the “gay panic defense,” but also its use in modern courtrooms and the societal implications of allowing a strategy that is based in prejudice to be used by the accused. There will also be an examination of the influence of hegemonic masculinity on violence against gay men, as well as a discussion of the research on how to proceed in the future when cases involving gay panic arise, both legally and culturally.
Sediment Analysis used to produce a Paleoclimatic Record for the San Juan, Co region
Jacob E. Buettner with Dr. Bryan Shuman & Jeremiah Marsicek
Department of Geology & Geophysics
University of Wyoming
Poster Presentation
McNair Scholars Program

The purpose of this study is to establish a paleoclimatic record for the San Juan, CO region through grain size and density analysis of lake bed sediments from Little Molas Lake, CO. This lake was selected because it has no inlet or outlet stream, providing a precipitation gage for the past ~11,000 years. The objective of this project is to identify water available during the last ~11,000 years in the San Juan, CO region. Methods will include the analysis of grain size and density of lake bed sediments for use in producing a water availability climate record. The importance of this study is to analysis and understand the past water availability in the Rocky Mountain region to help suggest future trends. Water availability is a critical issue in the Rocky Mountain region and for the rivers that are fed from the Rocky Mountain watersheds. Understanding past trends in water availability can help forecast potential trends of future water availability.

Molecular Evolution:
Exon Shuffling and Alternative Splicing Generates a new Calmodulin Gene Variant in Plants
Jeremy Byers and Dr. Daniel Bergey
Biology
Sheridan College
Oral & Poster Presentation

Calmodulin (CaM) is a highly conserved, intracellular regulatory protein found in all eukaryotic cells. CaM mediates numerous cellular processes by interacting with free calcium ions (Ca^{2+}) to initiate diverse biochemical events. In this capacity, CaM functions as a primary calcium “sensor” and “signal transducer” to mediate second messenger signaling activity of intracellular free calcium. Upon binding free calcium within the cell, CaM undergoes a conformational change which enables the calcium-CaM complex to interact with an array of effector proteins (e.g., kinases, lipases, ion channels, etc.) which, in turn, initiate or modulate a broad range of intracellular signaling pathways. All eukaryotic cells express multiple CaM gene variants, and all known CaM isoforms reported to date are thought to mediate their activity strictly within the cytosolic compartment. Exhaustive screening of a plant leaf cDNA library resulted in the identification of a novel plant calmodulin (CaM) gene family member that is alternatively spliced to produce two different mRNA variants. One mRNA splice variant encodes a standard, cytosolic CaM protein product. In contrast, the other mRNA splice variant contains an unusual C-terminal exon fused in frame to the standard CaM coding sequence. This additional C-terminal exon consists of a 30-amino acid domain that functions as a consensus nuclear localization signal (NLS) which, presumably, targets CaM to the nucleus. Alternative splicing of this unusual CaM gene variant was confirmed by genomic DNA sequencing, and an alternative splicing model consistent with cDNA and genomic sequencing results is proposed.
Describing Three New Species of Allorhogas Wasp
Mary Louise Centrella with Dr. Scott Shaw
Department of Renewable Resources
University of Wyoming
Poster Presentation

EPSCoR  
Jackson, WY

Three new plant-feeding species of braconid wasp: *Allorhogas crinitus* reared from detachable, spherical leaf galls on *Protium*, *Allorhogas lacuna* reared from galls on plants in the family Melastomataceae, and *Allorhogas triopsis* reared from Psychotria fruit galls will be described here. All three of these species were found in Costa Rica. The presentation will detail the process of describing these three species, emphasizing their main differences from each other and the species they are closest to. *Allorhogas crinitus* is characterized by its differential spacing of the eyes, its scrobiculate sternalus, its scorbiculate area where the notali meet, the morphology present on T3, and the presence of longer and denser setae on the mesonotum. *Allorhogas lacuna* is characterized by its pit-like sternaulus, its interesting propodeal sculpturing, the sculpturing on the second terga, its well-defined scutellar sulci, and the absences or spectrality of its wing-veins. *Allorhogas triopsis* is characterized by the smooth circle in the center of its face, its distinct longitudinal carinae in the mesonotal lobe, the triangular area with coriaceous morphology present in T1, and the “crunching” of the basal wing veins.

Velo Fashion: Triumph and Tragedy
Joseph Chenchar with Dr. Kent Drummond
Department of Management and Marketing
University of Wyoming
Oral and Poster Presentation

UW Honors Program  
Cheyenne, WY

This presentation and paper will cover the development and incubation of a small start-up company that was created by two Cheyenne Central High School graduates. The business, Velo Fashion LLC is a small business, which specializes in the design, sale and manufacture of screen-printed goods. The project will follow the story of the small business’ successes and failures and the current plans for the future and how they will be implemented. The focus of the project will center on marketing and how certain themes are reflected in the story of Velo Fashion LLC. Such concepts that will be covered and analyzed include, but are not limited to, distribution systems, rushing to market, promotions, branding, and unifying themes. The project will focus on how many of these themes can be seen through the lens of this company and how a better understanding of the concepts could help ensure the success of the business.
Structure and Electronic Properties of Ni Nanoparticles Deposited on Ceria Thin Films  
Ching-Rong Chung with Dr. Jing Zhou  
Department of Chemistry  
University of Wyoming  
Oral Presentation

EPSCoR   Taipei, Taiwan

Hydrogen fuel is a clean and renewable energy resource, which can be used to resolve energy shortage crisis. Ni is one of the popular catalysts in the ethanol reaction for hydrogen production due to its excellent reactivity. Dispersing the Ni on ceria supports can promote its catalytic. To fully understand the chemistry of ceria-supported Ni nanoparticles as potential hydrogen production catalysts, it is important to understand their physical and electronic properties at the fundamental level. In this undergraduate research project, the structure and size of Ni nanoparticles as well as their interactions with ceria were examined under ultrahigh vacuum system using Ni/ceria model systems consisting of Ni particles vapor-deposited on well-ordered reducible CeO$_x$ (111) (1.5$\leq x \leq$2) surface. The pure ceria thin films were first prepared by depositing Ce onto Ru(0001) single crystal at the temperature of 700K. After the growth of ceria thin films onto clean Ru(0001) crystal, Ni nanoparticles were deposited on all ceria surfaces at 300K. Our scanning tunneling microscopy results suggest the particles are less than 2.0 nm wide and 0.5 nm high. X-ray photoemission spectroscopy spectra indicate that Ni maintains its metallic state on reduced ceria thin films at 300K. However, NiO can be formed on CeO$_2$.

Identification of MaSp1 Like Silk Protein Sequences from Orb Weaving Spider Araneus Gemmoides  
Brian Clark and Mark Coulter with Drs. R. Scott Seville and Dagmara Motriuk-Smith  
Department of Zoology and Physiology  
University of Wyoming/Casper College Center  
Poster Presentation

INBRE   Casper, WY

Orb-weaving spiders are capable of producing up to seven different types of silk. Spider silks are composed of highly repetitive motifs and conserved non-repetitive carboxy termini. The dragline silk is composed of MaSp1 and MaSp2 proteins. Our research has identified a MaSp1-like partial protein sequence and partial carboxy terminus from Araneus gemmoides. Sequences were obtained using PCR and cloned into plasmid vectors. A total of nine DNA sequences have been identified and they were translated into protein sequences. Three of them show high sequence identity. Three clones of a positive control, Argiope trifasciata, have been sequenced as well. Obtained sequences have repetitive GG(X) motifs and are similar to other known MaSp1 sequences. Additionally, the sequence contains polyalanine stretches, which are 8-10 amino acids long and form the beta sheets that contribute to the overall strength of the silk. Obtained sequences contain a partial carboxy terminus which will be aligned with and compared to other known conserved sequences.
Remote Monitoring Station for Natural Gas Distribution Systems  
John Clay and Dustin McKen with Dr. Stanislaw Legowski  
Department of Electrical and Computer Engineering  
University of Wyoming  
Oral and Poster Presentation

Industries reliance on electrical and mechanical processes creates a need for remote, unattended systems to monitor and control these processes. One such process is natural gas distribution. Existing infrastructure facilitates the distribution process and requires high pressure, long distance transmission. Transmission pressure exceeds safe conditions for consumption. In order to safely distribute natural gas to consumers the pressure must first be reduced. Pressure regulator stations are tasked with reducing the pressure. The critical nature of these stations requires monitoring to ensure proper operation and system integrity. Many systems currently utilize an onsite paper chart recorder that requires operators to visit sites regularly. Additionally, aging systems lack the ability to alert personnel in case of emergencies. To address these inadequacies the developers aimed to produce a system that will monitor input and output pressures of the regulator station, offer instant emergency notification and provide a non-intrusive package. This was accomplished by the use of an electronic system that utilizes the cellular network. The system monitors stations and transmits state of health information via SMS text messages to any desired contact at any location. This provides an innovative, customizable solution that is effortlessly deployed.

Butifuel: The Butanol Advantage  
Alec Cookman, Jennifer Graves, Justin Martin, Kyle Hanson, and Hui Zhong  
With Drs. John Myers, Joseph Holles  
Department of Chemical and Petroleum Engineering  
University of Wyoming  
Oral Presentation

Butifuel: The Butanol Advantage  
Alec Cookman, Jennifer Graves, Justin Martin, Kyle Hanson, and Hui Zhong  
With Drs. John Myers, Joseph Holles  
Department of Chemical and Petroleum Engineering  
University of Wyoming  
Oral Presentation

Department of Chemical and Petroleum Engineering  
Denver, CO  
Seattle, WA  
Mitchell, NE  
Gillette, WY  
Shanghai, China

Our energy sources must become more renewable, efficient, and environmentally friendly. Society looks to biofuels as an alternative to fossil fuels. Bioethanol is the primary biofuel, because it is produced from an abundantly available feedstock. Biobutanol is proving to be more advantageous than bioethanol, because butanol can be blended with gasoline at much higher levels than bioethanol. That is, the physical attributes of butanol are similar to those of gasoline. Butanol also has a lower vapor pressure than ethanol, which makes it safer to store and handle. This team, using Aspen Plus Simulation software along with the National Renewable Energy Laboratory’s (NREL) model, has designed a 400 MMlb/yr biobutanol plant located in southern Louisiana with sugar cane as a feedstock. After preparing a detailed economic analysis, it has been shown that the design will be profitable due to state and federal government incentives with an internal rate of return of 14%. Our simulation model is based upon the NREL bioethanol plant design. The most significant processes in the Butifuel plant are fermentation and separation of alcohols. The fermentation section will utilize the Acetone-Butanol-Ethanol (ABE) fermentation pathway, while the separation section uses liquid-liquid extraction to purify the butanol product.
**HERMS Home Brewing System**  
Kelsey Crea with Dr. Stanislaw Legowski  
Electrical Engineering Department  
University of Wyoming  
Oral and Poster Presentation

This is a customized home brewing system that makes use of the Heat Exchanged Recirculation Mash System (HERMS). The system is driven through a single wall outlet. The brewery is set up so that the user is able to customize the brewing process. Upon powering on the brewery, the user can enter specific time values and specific temperatures using the keypad to make each batch of beer brewed to the user specifications. The temperature is controlled using a standard PID temperature controller that includes different brewing settings for the brewer to utilize. When the user completes the power on menu that denotes time and temperature, the LCD will prompt the user when it is time to add hops and open valve control throughout the brewing cycle. There are indicator lights, and alarm’s to help the user understand what is exactly happening during their brewing process.

**Paleoflood Analysis and Flood Wave Propagation in Panama’s Chagres River**  
Adam Marsh and David Cummings with Dr. Fred Ogden  
Civil Engineering  
University of Wyoming  
Oral Presentation

Changes in land use within the Chagres River watershed in Panama have led to increased runoff during storm events. As a result, flood frequency and maximum discharge have increased markedly since the construction of Panama Canal control structures. Record flooding during December 2010 exceeded the design standards of numerous control structures, most notably Madden Dam, causing the Panama Canal to close for only the third time in its 98 year history. Historic accounts exist of another, potentially larger flood, which occurred in the mid 1850’s; landmarks delineating the maximum water level of this flood are still intact. The purpose of this study is to determine the peak discharge of the historic flood. This is done using palaeoforensic techniques to reconstruct the topography of the Lower Chagres River Channel prior to the construction of the Panama Cannel. Using cross-sections from the reconstructed river channel, we use a computer model to determine the peak discharge of the historic flood. This value is then compared to the December 2010 flood and to the design criteria used for construction of Madden Dam.
Sources of Bacterial Species with Antibiotic Activity: Soil & Rotten Wood
James C. Dalton with Drs. Allan Childs, Steve Harbron, Elise Kimble
Northwest College
Oral Presentation

INBRE Cody, WY

We chose to compare two environmental sources of bacterial species, rotting wood and soil to see which of the two would be the best possible source of bacteria that produce antibiotics. We chose to sample from decomposed wood because of the wide range of available nutrients which would allow for higher competition. We believe that decomposed wood will harbor some bacteria that were not found in soil in our previous work. Samples of rotted wood and soil were collected aseptically at numerous sites in six states and the District of Columbia. Bacteria that grew aerobically were isolated and tested for ability to inhibit growth of *Escherichia coli*, *Pseudomonas aeruginosa* and/or *Staphylococcus aureus*. Chromosomal DNA was extracted from the bacteria with antibiotic activity and the 16s ribosomal RNA gene amplified by pcr. The pcr product was sequenced commercially and a BLAST search done to provide a tentative identification of the bacterial isolates. Wood samples varied in percentages of isolates that inhibited growth of these test organisms. The data were analyzed to determine if the rotted wood and soil were statistically different sources of bacteria with antibiotic activity.

Reservoir Simulation of the Silo Field
Jonathan Daraie, Justin Dunn, Yang Jiang and Gregory Williamson with Dr. Brian Towler
Department of Petroleum Engineering
University of Wyoming
Oral Presentation

Petroleum Senior Design

The Silo Field is located in the North Eastern portion of the Denver Julesburg basin and is just thirty miles North East of Cheyenne Wyoming. It produces from the Niobrara formation. The purpose of this study is to explore the possibilities of simulating an eventual enhanced recovery technique to be applied in the Silo field. After data analysis and interpretation of logs and well data, it has been determined that the Niobrara formation in the Silo field has little to no matrix permeability. The porosity ranges from 6% to 16% and oil saturation averages 40%. Because initial production of the field is believed to be attributed primarily to the draining of the natural fractures it is our belief that there is significant residual oil left in formation that could possibly be swept out using a flooding EOR technique. Because of the naturally fractured nature of the Niobrara it has been determined that the most effective way to simulate this formation will be to utilize an effective permeability model correlating permeability with fracture concentration. Through analysis of reservoir simulation techniques and economic and environmental evaluations, this study has determined the most effective enhanced stimulation technique is the utilization of a CO₂ flood.
Graph theory is an area of mathematics dedicated to the study of graphs. In this context, “graph” refers to a mathematical structure used to model pairwise relations, known as edges, between objects, or vertices, in a collection. Numerous problems of practical interest in a variety of fields such as computer science, chemistry, and physics can be modeled using graph theory. The method of creating graphs to model situations and relations lends itself particularly well to games and puzzles that involve mathematic problem solving. Puzzles such as the Knight’s Tour and Traveling Salesman problems and both one and two player games like Instant Insanity and Sprouts have long been used to teach and explore graph theory and its applications. In this study I investigated classic and new puzzles and games, their history, and the graph theory methods demonstrated in each example.

Non-wetting phase trapping in hysteresis cycle for gas-liquid phase systems
Tewodros Debebe with Dr. Vladimir Alvarado
Department of Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

The objective of this research is to investigate the amount of gas trapped in a porous media and the nature of its mobility, in a context of CO2 geo-sequestration in laboratory experiments under realistic pressure and temperature conditions. In this liquid-gas system, nitrogen is non-wetting phase and brine represents the wetting phase. For our research, we will use sandstone (core) from a saline aquifer in Wyoming obtained from the experimental well project. For this research we used reliable equipment called CPCS-355Z Capillary Pressure CO2 System, which enables us to measure very small capillary forces while at high pressures and temperatures similar to those conditions encountered in a petroleum reservoir. The CPCS-355Z offers a method to measure incremental or continuous desaturation data versus pore capillary pressure at reservoir conditions of temperature and pressure. Due to its major reduction potential of CO2 from the atmosphere, implementing of CO2 geo-sequestration in the future is very likely. The results of the planned experiments can help us to understand how much CO2 can be trapped in liquid-gas phase system.
Do Tourists Bug Bacteria: The Effects of Human Presence and Pollution on Bacterial Diversity and Distribution in the Streams of Glacier National Park.

Kelsie Delaney with Drs. Melanie Murphy, Gerard Andrews, and Shannon Albeke
Department of Microbiology and Department of Renewable Resources
University of Wyoming
Oral Presentation

NASA Space Grant Consortium, Polson, MT
EPSCoR,
UW Honors Program

Anthropogenic activity and waste can have a huge effect on the microbial biodiversity of a stream system, potentially destabilizing the ecosystem through the disruption of bacterial nutrient cycling. This project assessed the species composition of stream microbes within the streams of Glacier National Park and measured the effect of human traffic and waste on their spatial distribution. Streams of particular concern to Glacier National Park, due to heavy human activity and the presence of near-by pit toilets, were sampled from their headwaters to their confluence with higher order streams; a stream that has no known human contact was sampled as a control. Samples were taken every 700 m and species distribution determined through indicator organisms. Interest species were chosen based on their known abundance in similar waters outside of the Park and their ecological significance. Quantitative PCR was used to enumerate the number of normal flora versus the number of coliforms in each sample.

Correlation of selenium tolerance and antioxidant capacity in fungi isolated from selenium hyperaccumulator and non-accumulator plants

Berthal Devilbiss, Rebecka Y. Myers, Qi Wang, Dr. Zac Roehrs, and Dr. Ami Wangelin
Department of Biology
Laramie County Community College
Poster Presentation

Wyoming INBRE Cheyenne, WY; Cheyenne, WY; Pangali, China

In the current experiment, 252 fungal isolates were recovered from feeder roots and seed pods of selenium (Se) hyper accumulating and non-accumulating plants from seleniferous sites near Lysite, WY. All of the fungal isolates were evaluated for their qualitative Se tolerance, and a subset was additionally evaluated for total phenolic concentration (TP), and Trolox (Vitamin E) equivalent antioxidant capacity (TEAC). Tolerance was tested by placing each isolate on a slant of malt extract (ME) agar without Se and with 10ppm sodium selenate. Colony diameter and density were examined after a minimum of 3 days of growth. For TP and TEAC, isolates were grown for 14 days in ME broth without Se and with 10ppm sodium selenate, after which tissue was vacuum harvested, and lyophilized. The harvested fungal material was extracted with acetone, exposed individually to both the Folin–Ciocalteu reagent (TP) as well as ABTS radical (TEAC) and evaluated using spectroscopy. As Se is known to be an essential component of oxidative radical scavengers in animals, and the antioxidant capacity of phenolic compounds is generally high, this study examined the potential correlation(s) between Se tolerance, total phenolics and antioxidant production in this fungal population originating from a seleniferous environment.
Techno Tron 5000  
Alex Dietz, Kaitlyn McRann and Tyler Plugge with Dr. Ruben Gamboa  
Department of Computer Science  
University of Wyoming  
Oral and Poster Presentation

Department of Computer Science  
Littleton, CO  
Lander, WY  
Papillion, NE

Laser light machines are currently expensive and made for a large room setting. We set out to make a cost effective version for smaller personal use. We connected the laser module to a microprocessor based Digital to Analogue Converter (DAC) using an Ethernet connection. This hardware is enclosed in a toolbox with two openings to display our laser images and provide power. We control the hardware with a user interface that is intended for a Windows computer. This graphical user interface allows the user to manually draw the images they wish to display with the mouse. The laser is sent the images over the network by our software, with a simple export function. Our hardware DAC is a brand new non-commercial board with no current software written specifically for it, requiring us to write our own driver software for communication between the hardware and software. The laser hardware is point based; shapes are created by the light between the two points Windows extracts for each shape. Our system makes it easy for most computer users to have their own laser light show in a private setting.

Oxidative Desulfurization using Functional Thiol Dioxygenase Models  
Patrick S Dilsaver with Dr. Mark P. Mehn  
Department of Chemistry  
University of Wyoming  
Oral Presentation

EPSCoR, UWYO-SER CPAC  
Cheyenne, WY

The sulfur contaminants in diesel fuel are a major source of SO$_2$, a greenhouse gas, and particulate matter emissions. Thiol deoxygenases use iron (an inexpensive, abundant and non-toxic metal) and oxygen to carry out the oxidation of thiols under ambient temperatures and pressures. For these reasons, we have developed iron complexes that mimic the chemical environment found inside the enzyme of cysteine dioxygenase (CDO). The air sensitive complexes were synthesized using standard Schlenk or glove box techniques under a dinitrogen atmosphere. The first coordination sphere is structurally similar to the enzyme and we are examining how closely the reactivity matches the enzymatic system. Once exposed to oxygen, the reactivity was monitored by UV-Vis spectroscopy. The products of this reactivity have been studied by UV-Vis spectroscopy, mass spectrometry, and NMR. The characterization of these products will be discussed. In addition to this, the mechanism of this reaction was probed using kinetic studies.
The Effect of Candidate Blunders in Presidential Primaries and General Elections
Max D’Onofrio with Dr. Andrew Garner
Political Science Department
University Of Wyoming
Oral Presentation

*UW Honors Program*                          *Laramie, WY*

The United States Presidential primaries and general elections are highly scrutinized political races that are covered 24 hours a day. Every action a candidate takes is monitored and analyzed by the media and the citizens who follow the race. Whenever a candidate on the campaign trail makes a mistake, a blunder, or a gaffe, the news media is highly likely to publicize the event and the citizens who are going to vote in the elections take note. Despite the knowledge that citizens are made aware of candidate blunders, there is very little research on the effect of these events on voting behavior. This study researches the effect of candidate blunders on national polling data in the 2012 GOP primary and 2008 General Election. By analyzing the coverage of candidate blunders reported on in national newspapers, the study looks at how the intensity of media coverage of different categories of blunders can have differing effects on voting behavior. This study brings important data to an under researched area of political science by presenting data on the effects of media coverage on presidential candidate blunders in national polls.

Parasites That Are Detrimental Cattle Health and Methods for Best Parasite Control
James Draine, Rick Landis
Department of Animal Science
Northern Wyoming Community College District: Sheridan College
Oral Presentation

*Department of Animal Science*                          *Sheridan, WY*

This research had two objectives: One to determine which parasites were most detrimental to beef cattle’s health, reproduction and productivity. The second was to test two cattle dewormers to eliminate parasites in cattle. With research, specific parasites were targeted, classified and grouped by how each parasite class relied on the beef cow and their damaging costs. The two dewormers tested was Pfizer’s Dectomax injectable versus a generic form of Ivermectin pour-on. This research was conducted on 96 head of Angus calves around 6 months old. These calves were processed through a chute and randomly sorted into treatment groups. Weights were taken on day 1 and day 26. Each calf was assigned a method of parasite control and calves randomly placed into three groups: Control, Dectomax injectable or Ivermectin generic pour-on. Results found the internal nematodes to be the most detrimental to beef cows and the Generic Ivermectin pour-on to be the most effective dewormer determined by the calves weight gain during the period. In conclusion, all parasites cost cattle producers a substantial amount of money annually and the Generic Ivermectin pour-on was superior the control group by 8 pounds and Dectomax injectable by nearly 12 pounds.
Activity of Prodigiosin from Two Bacterial Species
Pat Dunks, Erin Yarborough
with Drs. Allan Childs, Steve Harbron, and Elise Kimble
Chemistry, Biology
Northwest College
Poster Presentation

Wyoming INBRE Cody, WY
Powell, WY

This study was conducted to discover the variations in prodigiosins produced by two Serratia species. Prodigiosin has been shown to be an effective antimicrobial agent against bacteria, protozoa and fungi and also to have anticancer and immunosuppressive activity. This red pigment is produced by several bacteria including Serratia marcescens and Serratia plymuthica, which we isolated from rotting wood. S. plymuthica inhibited Escherichia coli and Pseudomonas aeruginosa while S. marcescens inhibited neither. To address possible structural differences, thin-layer chromatography was performed on the two samples of prodigiosin, in addition to a commercially available prodigiosin sample as a control. Prodigiosin from the two Serratia species and the commercially available sample migrated at the same rate. Future work may include mass spectrometry to verify structural similarities and differences. It is possible that the structure is the same but S. plymuthica secretes prodigiosin while S. marcescens does not. Prodigiosin extracted from the bacterial cells of the two species could be tested using the disc diffusion method.

« La vie n’est pas un conte de fée » or is it ?
Disney Values in America and France
Alexandra Edwards, International Studies
Advisor: Susan Aronstein, English
Oral and Poster Presentation

I am a child of Disney. Like many of my American peers, I grew up singing, “A dream is a wish your heart makes.” However, from studying abroad in France, I realized that translating “The Disney Magic,” wasn’t hard because of the words, but because I couldn’t translate the idea. The inability to explain Disneyification within a French cultural context persuaded me to research the ability of Disney values to cross cultures. This paper will address why Disney values are inherently American, the influence of the Princess Phenomenon, cultural differences seen through service attitudes, and the unsuccessful franchise of Disney values into the European, specifically French culture.

My methodology comes from field research within Disneyland California and Disneyland France. I also consulted journal articles from various disciplines, including women’s studies, management, geography and history, with supplementary material from the original European fairy tales and the Disney fairy tales. In conclusion, the creation of Disneyland France can be seen as American imperialism and an imposition of not only Disney values but American values. Due to cultural differences, the pixie dust does not successfully cross the Atlantic Ocean; instead, Disneyland France is seen simply as another amusement park instead of a rabbit hole leading to a land full of wonder and magic.
Bentonite Testing: Lab Trials
Ahmed Elgohary, Kendra Williams, Tracy Quance, and Yifan Zhang with Dr. Brian Towler
Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

Engineering Senior Design
Laramie, WY

The goal of our group is testing three bentonite plugs in various saline solutions to determine the effect of salinity and heat on plug strength.

Previously, only cement has been used to plug wells. Now technology exists to use bentonite to plug wells, as an alternative method to cementation. Most states’ regulations don’t allow wells to only be plugged with bentonite, due the lack of research. The objective of this project is to test hydration properties of bentonite under different kinds of conditions and obtain results to prove that bentonite plugs are effective for plugging and abandoning oil and gas wells.

The results found by the group have shown that the plugs maintained their integrity over a period of 12 months. With the addition of heat, there is an increase of plug strength followed by a steady decline in strength as more heat is added.

Testing will continue by measuring heat effects on all of the test subjects. New plugs will also be made and tested. These new plugs will be in a salinity of 20,000 ppm with and without the heating apparatus. These results will then be compared back to that of all prior work done.

Evaluation of sterilization, germination, and controlled growth methods for Basin, Mountain, and Wyoming Big Sagebrush
James Erdmann, Myranda Riggle, Xingnan Guo, with Dr. Ami Wangeline
Department of Biology
Laramie County Community College
Poster Presentation

Wyoming INBRE
Gillette, WY; Cheyenne, WY; Benxi, Liaoning, China

Big sagebrush (Artemisia tridentata Nutt.) is an important plant species in the western rangelands of the United States providing forage and shelter for numerous mammals, birds, reptiles, and invertebrates. The native range of big sagebrush overlaps with soils originating from Cretaceous shales which contain high levels of selenium (Se). Given the small window between essentiality and toxicity of Se for animals and the widespread occurrence of big sagebrush in these seleniferous soils, the interaction of the plant and element warrant further study. Traditional laboratory growth methods were found to be unsuitable for big sagebrush, likely due to the reduced aeration of the growth media. The goal for the present study is to develop methods for culture of big sagebrush varieties in a controlled environment including seed sterilization, germination, and plant growth techniques to allow future evaluation of this plant’s ability to tolerate and accumulate Se.
Prototype of a two Stage Beer Fermenter
Tyler Erickson with Dr. Stanislaw Legowski
Electrical and Computer Engineering
University of Wyoming
Oral and poster presentation

Department of Electrical and Computer Engineering Aurora, CO

Home beer brewing is a common hobby in the country as well as around the world. Making beer easier to brew and better tasting is always an active pursuit and the best way to get better beer is by managing temperatures and time in the fermentation stage better. In my senior design project, I am trying to make beer not only come out tasting better by better temperature control, but to also make it easier for someone who may or may not be an experienced home brewer. The device I’m designing will control the temperature according to a user input for each stage to allow maximum control over the fermentation process, while making it work within a chest freezer. It will also control the amount of time in each stage of fermentation based on a user input. One other mode allows normal operation of the freezer. The final goal of this project is to make it really easy to use for anyone. The user interface is being designed to be simple, intuitive and as user friendly as possible. The end result of using this device will be better tasting beer and ease of use for experts to beginning brewers.

Fuel Tank Tumbler
Bryan Erickson, Roberto Garcia, Jay Leininger, and Andrew Niemann with Dr. Chung-Souk Han
Department of Mechanical Engineering
University of Wyoming
Oral and Poster Presentation

Laramie Radiator Works Freedom, WY
Pine Bluffs, WY
Carpenter, WY
Weston, NE

Older fuel tanks can develop rust and small holes, causing safety hazards such as leaks and fuel system problems. Many of these tanks are no longer manufactured and cannot be purchased aftermarket. For these tanks to once again be usable, they can be put through a process that lines the inner walls with a specialized sealant. Distributing this sealant is often done through manual tank rotation, which can lead to inconsistent coverage and is a time intensive task. A machine was designed to yield consistent coverage in a fraction of the time. The machine uses two rotation axes to ensure complete coverage of the fuel tank. Due to the flammability of the sealant, pneumatics are used to drive the system. In order to decrease the drying time of the sealant, a regulated air supply is used to supply air flow through the tank. This drying air is used in a closed loop, allowing for the sealant fumes to be handled in accordance with local regulations. The machine allows for varying fuel tanks to be reconditioned safely and efficiently.
Formation of Calcium Carbonate at Hell Gap
Krista Evans
Dr. Marcel Kornfeld; Dr. Mary Lou Larson; and Dr. Ken Sims
Department of Anthropology and Department of Geology
University of Wyoming
Oral Presentation

**EPSCoR**

**Coopersburg, PA**

Hell Gap is a stratified prehistoric site located in the Hartville Uplift, north of Guernsey, Wyoming. Investigations at the site occurred between 1959 and 1966, then again beginning in 1993 to the present. The current investigations resulted in more vigorous testing including several intensive soil studies. The current project is an addition to two previous studies directed to determine the formation of carbonate in the soil matrix. The two previous studies concluded with two conflicting hypothesis: the carbonate is a result of groundwater or a result of pedogenesis. My study expands on the hypotheses by adding an analysis of the chemical composition of the carbonate to find the parent source and more micromorphological analysis of the carbonate structure.

Phenotypic and Genotypic Characterization of an Antibiotic Resistance Integron in *Salmonella enterica* serovar Newport
Kala Farley with Dr. John Willford
Departments of Microbiology and Molecular Biology
University of Wyoming
Oral Presentation

**Advanced Problems Course Student**

**Laramie, WY**

Several strains of *Salmonella enterica* have resistance to multiple antibiotics. This antibiotic resistance can be acquired in many ways, including through mobile DNA elements called integrons. In a series of *Salmonella* Newport outbreak strains, three integrons (1.0, 1.2, and 1.8kb) were frequently isolated in a previous study. The purpose of this study was to clone and characterize the 1.8kb integron phenotypically and genotypically to determine its role in antibiotic resistance. Initial cloning of the potential resistance integron appears to have been successful and characterization is ongoing.
MaxForce Designs Novel Compound Bow
Lance Faulkner, Joel Hazelett Jordan Jack and Tyler Ward, with Dr. Ray Fertig
Mechanical Engineering
University of Wyoming
Oral and Poster Presentation

Nextra Archery  Cheyenne, WY
Lander, WY
Casper, WY
Pine Bluffs, WY

The Novel Compound Bow design was created to reduce the draw force supplied by the archer in half by increasing the effective draw length. This will allow for easier draws on bows that normally require higher draw weights. A gearbox that enables a 2 to 1 draw weight reduction will be attached to a compound bow. To use the bow, the archer will first draw a ripcord from the gearbox twice to pre-compress the limbs. The limbs will then stay pre-compressed while the archer hunts. When the time comes to fire the arrow, the bow string will be drawn and easily fired as a regular bow. The design was created to appeal to avid archers who want to use high energy limbs to create greater arrow velocities without doubling the required draw weight. This same design will also allow the youth and handicapped the ability to operate low draw weight bows that meet state archery hunting regulations. MaxForce Designs modified a 60 pound draw weight bow to reduce the draw weight to 30 pounds. The same design will be applied by the project sponsor to use on 140 pound limbs in an attempt to produce a 400 feet per second arrow velocity.

The Use of a Knowledge Survey in Microbiology
Lacey Favazzo with Rachel Watson
Department of Microbiology
University of Wyoming
Oral and Poster Presentation

UW Honors Program  Rock Springs, WY

Knowledge surveys are exams that ask students to answer questions in terms of their confidence in their ability to respond rather than to actually formulate an answer. They allow a wide variety of material to be tested quickly and easily, without the use of extensive in class time and effort. The benefits to students and instructors are numerous and include improvements in class organization, communication, learning techniques, clarity of expectations, and can serve as valuable study tools. The goal of this study was to determine the usefulness of knowledge studies within the Department of Microbiology and to ascertain if there was a correlation between confidence and correctness on a knowledge survey. A knowledge survey was compiled of questions dealing with material encountered in the program and classified according to Bloom’s taxonomy. This knowledge survey was administered to general microbiology students as a pre-test and a post test in the spring and fall semesters of 2011. Students were asked to both answer questions and to rank their confidence. Data indicate that there is a positive correlation between correctness and confidence. They also show that such a knowledge survey can be useful department wide, and that continued effort and research would be beneficial.
2012 Moonbuggy Senior Design Project
Davis Fay, Alisa Frohbieter, Lesley Young, and Ryan Williams with Dr. Dennis Coon
Department of Mechanical Engineering
University of Wyoming
Oral and Poster Presentation

Wyoming NASA Space Grant Consortium

The National Aeronautic Space Administration, NASA, holds an annual student design competition in Huntsville, Alabama called the Great Moonbuggy Race. Students are required to design and build a vehicle that focus on a series of engineering problems similar to those faced by the original Moonbuggy team. The vehicles are raced by two students, one male and one female, around a course including simulated moon terrain. This senior design project includes the complete design of a two passenger, human powered moonbuggy to compete in the 2012 NASA Great Moonbuggy Race. The design includes a frame made of 4130 Chromoly steel tubing. To fit in the specified dimensions, the frame will fold in half at a hinge in the center. Steering will be accomplished by articulation about the center hinge. Riders will sit back-to-back and will power the moonbuggy through basic bicycle components. The project is funded by NASA who has provided a budget of $5000 to help cover design and fabrication costs as well as travel expenses for the competition.

High Aspect Ratio Inertial Focusing for Complex Fluid Enrichment
Nathan Fletcher and John Oakey
Department of Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

INBRE

High aspect ratio inertial focusing channels offer high throughput portable devices that can remove colloidal-size particles from a continuous media for the preparation of samples or membraneless filtration for point of care operations. This research attempts to increase concentrating efficiency by studying particle behavior in the expansion phase of a high aspect ratio inertial focusing channel. The particle behavior in the channel expansion depends on the geometry of the inertial focusing phase of the channel. The inertial focusing geometries studied were two straight channels one with a tall aspect ratio and the other with a wide aspect ratio and the last device used a staged channel. With a straight tall inertial focusing device (IFD) a 6 to 16.7 fold increase in particle concentration of a solution was attained. The particle concentration efficiency is dependent on the initial particle concentration of the feed solution. This demonstrates the viability of using IFDs for particle separations from bulk solution. However, higher concentration efficiencies are achievable through staged IFDs as opposed to the straight IFDs. Staged IFDs produce one focusing position near the channel wall which provided the narrowest particle streak in the channel expansion. Making staged IFDs the most efficient particle separation devices.
Raman Microfluidic Biosensor
Nathan Fletcher and Sharlee Mahoney with Dr. Joseph Holles
Department of Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

Dept of Chemical and Petroleum Engineering                        Cody, WY
Sugarland, TX

A Raman microfluidic biosensor is being produced that will use a cartridge containing a microfluidic device and a syringe pre-loaded with a sample preparation solution. This cartridge will be used with a handheld Raman spectrometer to analyze a water sample for three common bacterial contaminatees, \textit{E. coli}, \textit{G. lablia} and \textit{V. cholera}. The microfluidic device prepares the water sample by using inertial focusing to concentrate the bacteria from a 5 mL sample to a 30 µL sample. After concentrating the bacteria, the water sample is mixed with the sample preparation solution in the microfluidic device. The preparation solution is made up of gold nanoparticles tagged with a Raman active dye and a bacterial antigen and will bind to a targeted bacteria antibody. This binding allows the handheld Raman spectrometer to produce a spectrum that portrays the bacteria present in the sample. This cartridge provides quick and easy operation, portability, accurate and fast results, and is less expensive than competitors due to the use of the microfluidic device. The project has a NPV10 of $32 Million with an IRR of 16%. This leads to the conclusion that this is a profitable endeavor.

Involvement of Yme1 Regulatory Proteins in F1F0-ATPase Assembly
Madeleine Francis with Dr. Peter Thorsness
Department of Molecular Biology
University of Wyoming
Oral Presentation

Previous studies in the Thorsness lab provided genetic evidence for participation of the Yme1 protein and the Hsp90 proteins, Hsc82 and Hsp82, in the assembly of the molecular motor F1F0-ATPase in the inner membrane of yeast mitochondria. Loss of Yme1 allows growth of strains lacking Hsc82 or Hsp82. Yme1 appears to be regulated by three proteins, Mgr1, Mgr2 and Mgr3. Under some conditions loss of one of these three proteins can have growth effects similar to the loss of Yme1. This project has determined the effect of removing each of the regulatory proteins on growth of strains lacking Hsc82 or Hsp82, to see if they might also be involved in assembly of F1F0-ATPase. Although an effect on growth similar to the loss of Yme1 has not so far been observed, germination of Hsc82- or Hsp82-depleted spores is significantly impaired by removal of either Yme1 or Mgr1, suggesting that Yme1 and Mgr1 proteins are involved in the assembly/organization of F1F0-ATPase in the mitochondria of spores.
BG Mobile  
Sandy Gabriel, Tom Pearce & Noelle Keller with Dr. Ruben Gamboa  
Department of Computer Science  
University of Wyoming  
Oral Presentation

UW IT Information Services  
Laramie, WY  
Buffalo, WY  
Casper, WY

UW locator mobile will be for both the Android and IPhone. The application will be one app that is contained within the current WyoMobile Application Suite. This app will help UW students, faculty, staff, or guests figure out how to get from where they are to some particular location on campus. The app finds buildings, rooms, departments, faculty/staff offices, businesses and other key locations on campus that are either input directly by the user or selected from a listing of all known locations. Other applications in WyoMobile will be able to ask our application for a specific location. The mobile app will be helpful in acclimating students to their new school.

British Composers and the First World War:  
Choral Expressions of Wartime Experience by Vaughan Williams and Gustav Holst  
Daniel Galbreath with Dr. Anne Guzzo  
Department of Music  
University of Wyoming  
Oral Presentation

UW Honors Program  
Laramie, WY

Despite the coincidence of the so-called “British Renaissance” of classical music and the First World War, two events central to British cultural development at the turn of the century, little research exists regarding their interrelation. Using primary and secondary documents found in Laramie and London, this project seeks partly to fill that gap, examining two choral works which served as their respective composer’s reactions to WWI. Gustav Holst’s “Ode to Death” and Ralph Vaughan Williams’ “Dona Nobis Pacem” were both analyzed for motivic, formal, and orchestrational means used in settings of war-related texts. Additionally, biographical information and correspondences were used to provide context for the works and to elucidate opinions and emotions the composers had toward the war and its affiliated issues, including violence, politics, and the spirituality of mortality. These feelings were complex and occasionally contradictory. A variety of musical means were found to be used to communicate these nuanced opinions; the composers’ perspectives defy such restrictive designations as “pacifist” or “hawkish,” and these pieces reflect this.
HuntWyo
Paul Gargaro and Quintin Wills with Dr. Ruben Gamboa
Department of Computer Science
University of Wyoming
Oral Presentation

Department of Computer Science
Arvada, CO
Potter, NE

HuntWyo is an application designed for Wyoming hunters who use Android or iOS devices. This is a mobile solution to tackle the issue of hunters losing their relative location within a legal hunting area. To accomplish this, HuntWyo incorporates data from WYGIC with the pre-existing Google Maps application to view the various hunting areas on mobile devices running either Android or iOS. The user can select the game they are hunting and then the area for which they have drawn a tag. Game that the user can choose from includes: Antelope, Big Horn Sheep, Elk, Moose, Mule Deer, Rocky Mountain Goat, White Tail Deer. HuntWyo provides hunters the real-time information about their location, the legal hunting areas, the local weather, and will help hunters stay within their legal hunting area.

LMGS Powered Nail Puller
Luke Ginsbach, Manoj Khanal and Sterling Leinen; Dr. Erikson
Department of Mechanical Engineering
University of Wyoming
Oral and Poster Presentation

Frontier Barnwood
Laramie, WY

LMGS Engineering from the University of Wyoming Mechanical Engineering department has been designing and testing a powered nail puller throughout the past school year for Frontier Barnwood. Frontier Barnwood wanted a tool to speed up the process of disassembling snow fences for the use of the weathered wood. They generally use cat’s paws and pry bars driven by hammers to pull nails, which is a relatively slow process. There have also been other senior design groups that have tried to fulfill their requirements, but those groups did not design sufficient tools. The nail puller that LMGS Engineering has designed is powered by an air hammer. The air hammer attachment consists of a specially designed cat’s paw bar attached to an air hammer by an air hammer bit and clevis pin. This design allows the user to rotate the air hammer around the cat’s paw in order to change the direction of the air hammer force: parallel to get the cat’s paw under the nail and perpendicular to the cat’s paw to extract the nail. LMGS Engineering’s design will be a simple yet highly functional tool for Frontier Barnwood to pull snow fence nails.
My current body of work explores insanity as a state of mind in which the imaginative aspects of reality are intensified while reason is inhibited. Important to the work is the fascination in the inability to work out what is ‘real.’ This notion is allied in the illusoriness of insanity and the historic past of fairground shows and rides. There is a morbid appeal in the concept of an intensified consciousness that places the imaginative world over that of the rational world. The fairground rides, stalls, and shows replicate the experiences that produce anxiety in removing participants from the light of the world. One must decide whether or not what they perceive derives from reality. This current body of work—developed from attending the 2012 SGCI Navigating Currents printmaking conference and independent research—has been produced to be on display in the 2012 Spring BFA group art exhibit. The objective is to show how both the concept of insanity and historic fairground shows rely on an isolated and unpredictable environment, allowing a nostalgic sensation of dark, still, seemingly unmoving places turning in upon the self.

Ibuprofen Transdermal Patch
Logan Gradisher & Analisa Stephens with Dr. Joseph Holles
Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

Many pain sufferers have difficulty using oral dosages or injections of medications, bringing about the need for an alternative means of delivery for both over the counter and prescription medications. A promising option is medicated patches that can transfer pain relieving drugs through the skin to a localized area. The purpose of this project is to design a viable transdermal patch that delivers an effective dosage of ibuprofen to the affected area. With a transdermal delivery system, a patient reluctant to take pills or have an injection will still receive the pain relieving medicine they need. Ibuprofen was chosen to use in our patch design due to its pain, fever, and inflammation reducing properties. Additionally ibuprofen has been FDA approved which will cut clinic and FDA approval costs of the product. A transdermal patch will reduce the total amount of drug to equal an effective dosage and can be sold in an over the counter dosage or a prescription dosage. The patch itself will be a reservoir type patch which was found to fit with the design of our drug used in delivery. The final design is a reservoir type patch with a drug depot containing ibuprofen, enhancers, and a gelling component. The drug transport will be regulated with a porous rate control adhesive membrane. There will also be an occlusive backing that will seal to the adhesive membrane keeping the patch intact as well as protecting the membrane.
Raze and Raise: The Power of Misunderstanding in Mansfield Park
Bailey Graham with Dr. Eric Nye
English
University of Wyoming
Oral Presentation

Mansfield Park is Jane Austen’s most complex and least popular novel. Fanny Price, a poor cousin, grows up on the estate of Mansfield Park, where multiple courtships among the estate’s young people end with Fanny’s marriage to her beloved cousin Edmund. The purpose of the paper is to explore the relationships within the novel and their foundations in misunderstanding. The main romantic couples are deconstructed in terms of their contradictions. Four couples and Fanny are analyzed as individuals and as elements of the whole novel. The story centers on Fanny and her incisive observations are the closest one gets to understanding, but her judgment is sometimes faulty. Henry Crawford and Maria Bertram’s relationship structures the story and their superficiality is an important element throughout the text. Mary Crawford and Edmund Bertram’s relationship is based on self-deception, which every character suffers from. Henry Crawford and Fanny Price’s relationship fails through misjudgment. Finally, Edmund Bertram and Fanny Price can only fall in love because of the cacophony of disastrous misunderstandings that dominate the book. The paper concludes that the void of understanding upon which Mansfield Park is built is integral to and dependent upon the novel’s hopeful reconstruction of humanity.

The Frequency and Distribution of West Nile Virus-Infected Culex tarsalis Mosquitoes in Fremont County, Wyoming
Josh Graham, Seth Hosking, Jonathan McFall, with Dr. Steven McAllister
Department of Math and Science
Central Wyoming College
Oral and Poster Presentation

West Nile Virus (WNV) is an RNA arbovirus in the family of Flaviviridae. Birds are the primary reservoir for the virus, but horses and humans are a terminal host. Fremont County is a hotspot for WNV. In Wyoming, the primary vector for WNV is the Culex tarsalis mosquito. The goal of this research was to determine the frequency and distribution of WNV-infected Culex tarsalis mosquitoes in Fremont County. In this study, mosquitoes were trapped during a five week period in late summer in five different locations. Each site varied in environmental conditions. In a change from previous years, collections were made without the benefit of carbon dioxide. Of the total mosquitoes captured 17-36 percent consisted of the Culex tarsalis species. An unexpected finding was that zero percent of the Culex tarsalis captured tested positive for WNV. Future research will include the testing of corvids (the group of birds that usually carry the virus), the addition of atmospheric pressure sensors, and the imposition of a more consistent collection protocol including the use of carbon dioxide.
West Nile virus (WNV) is an RNA arbovirus in the family Flaviviridae. Birds are the primary reservoir for the virus, and in Wyoming the Culex tarsalis mosquito acts as the primary vector. Humans are a terminal host and most infections are asymptomatic. However, less than 1% of infections have severe symptoms including paralysis, encephalitis, and death. Fremont County, population 40,123, is a hot spot for WNV in Wyoming. It was hypothesized that an inverse relationship existed between the number of reported cases and the percentage of residents previously exposed to WNV. For this serosurvey, approximately 10 milliliters of blood was drawn from 84 subjects residing in Fremont County. Serum samples were then tested for the presence of West Nile virus IgG antibodies using Enzyme Linked Immunosorbent Assays (ELISA). The presence of high titers of IgG antibodies is indicative of past exposure to the virus. ELISA results indicate that approximately 16% (95% CI: 5% to 22%) of the population of Fremont County has been exposed to WNV. These results indicate that a majority of the population of Fremont County has not been exposed to the West Nile virus and is still at risk for WNV infection.

Large-scale production of green algal biomass: Experiments with Chlorella vulgaris.
Adam Grasmick with Dr. Stephen Herbert
Plant Sciences
University of Wyoming
Poster Presentation

Chlorella vulgaris is a unicellular green alga suitable for large-scale production in cooler climates. Chlorella biomass can be utilized for renewable liquid fuel, soil amendment, and food for animals and humans. Production of clean, dry Chlorella inoculum for rapid initiation of large-scale cultures would accelerate biomass production and reduce the potential for culture contamination. Experiments were conducted to quantify drying survival of Chlorella cells with and without addition of the osmoprotectant dimethyl sulfoxide. Results provide baseline data for comparison to the effect of other osmoprotectants and responses of genetically improved lines of Chlorella. The long-term goal of this project is to produce dry Chlorella inoculum that can be shipped and stored for prolonged periods at room temperature.
Comparative study of mid-leaf anatomy and spine morphology in *Billbergia* classification.
Adam Grasmick with Dr. Gregory Brown
Botany
University of Wyoming
Poster Presentation

*Independent study*

The genus *Billbergia* is in the flowering plant family Bromeliaceae (Pineapple Family), and contains 64 species, all of which are tropical epiphytic plants. Leaf anatomical characters in the past have not been widely used in this family for taxonomic use. This study was initiated to explore new anatomical characters for systematic study and classification. *Billbergia* was selected because the genus is considered to be monophyletic. Leaf cross sections, spine color, height, width, and distance of spines are compared in 22 *Billbergia* species. Overall there is a high degree of similarity between species, but there are interesting difference between the distributions of hydrenchyma, chlorenchyma, vascular tissue and epidermal layers. This poster will present these anatomical data both systematically, and from an ecological perspective.

Heart Rate Measurement and Arrhythmia Detection using Pulse Oximetry
Douglas Hall with Dr. Stanislaw Legowski
Electrical and Computer Engineering
University of Wyoming
Oral and Poster Presentation

Pulse Oximetry is typically used to determine the concentration of oxygen in a patient's cardiovascular system. However, by observing the rate of change of blood oxygen level over time using pulse oximetry, heart rate and other features of pulse can be measured. Using this information, certain kinds of cardiac arrhythmia can be detected and used as a simple early warning system for the patient. This can be done without the need for complex heart monitoring systems which require proper placement to make accurate and reliable measurements.
Target Tracking System
Zachary Tanner Hamilton and Cameron L. Mock, Dr. Stanislaw Legowski
Department of Electrical and Computer Engineering
University of Wyoming
Oral and Poster Presentation

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

Autonomous robots are invaluable tools in removing humans from environments posing a risk to safety. One example of such an environment is a fire. There will always be considerable risks to the well-being of firefighters due structural instability or the potential for explosions and other hazards that are inherent to such an environment.

The proposed project is to build a robot that can automatically track a target in a disturbance environment. This will be accomplished by implementing a nested actuation control design. The high frequency actuation was already designed and implemented using a voice coil actuator prior to our proposed research. Our design solution includes the architecture of the turn table system and a two stage control design which will locate then track the target. The voice coil actuator is used to track high frequency signals and to reject small disturbances up to 2 Hz, while the turn table is used to keep the voice coil from saturating in the case of larger input signals or disturbances. Upon implementation, this system will be able to automatically locate the hottest parts of a fire and allow firefighters to take themselves out of harm’s way while still effectively fighting fires.

Below The Waste Land: Failed Masculinities in T. S. Eliot’s Early Poetry
Kate Hartman with Dr. Julia Obert
English Department
University of Wyoming
Oral Presentation

UW Honors Program  
Cheyenne, WY

My paper will explore and prove the thesis that Eliot’s poem The Waste Land assumes a male masculine hegemony. However, male figures throughout the poem seem to fail in their masculinity, which accounts for why the poem is so bleak. Eliot was concerned with the performativity of gender because of the 20th century “crisis of masculinity” occurring at the time. Eliot’s anxiety over failed masculinity is due to the presence of WWI and the British soldiers who came back feminized; before this syndrome was called “Shell Shock” it was called “hysteria” because it mimicked the symptoms of the female malady. There exists in the poem a simultaneous empowerment of women and basic misogyny; women come into power to fill the vacuum left by the emasculated men, but I will argue that for Eliot, this was definitely not a good thing. In addition, when male figures fail to connect with female counterparts, reproductive failure is a result (infertile land). This causes more anxiety as the future of the race comes into question. The cause of all the failed, hopeless images in The Waste Land are the failed masculine characters leaving the seat of power and allowing women to take on power.
Statistical Analysis of Commodity Futures Prices
Andrew P. Hauser with Walt G. Werner
Economics and Finance Department
University of Wyoming
Oral Presentation

UW Honors Program

This study will examine patterns of the trading price of natural gas and wheat futures from 1995 to the present. The objective of this study is to determine trends and statistical properties in the natural gas futures prices. We are also looking to see if there is a correlation between futures prices and companies’ stock prices that are closely correlated to the commodity. To do our analysis, we will use natural gas market data, wheat market data, and stock prices of Williams Company and Archer Daniels Midland. Our method includes using programs, such as Microsoft Excel and S.A.S., to perform statistical analysis of the data and see what conclusions are apparent. This study of futures prices is important to the understanding of the commodity markets.

Ancestral Dolls
Jennifer Heater with Dr. Diana Baumbach
Art
University of Wyoming
Oral Presentation

UW Honors Program

My mother’s father traveled extensively, and he always brought my mother a doll, in traditional costume, from the places he traveled. When I was younger, my mother would sometimes take out her collection of dolls and look at them with my siblings and me. She would tell us where each one was from. These dolls fascinated me.

My work is a visual family history of dolls. The dolls’ costumes are based on the traditional costumes of the countries my ancestors came from, layered with the objects that hold the memories and stories of my relatives. My work looks at cultural identity, immigration, memories, eradication, and evocative objects.
Weaning Stress of Beef Cattle
Drea Hespen with Rick Landies
Animal Science
Sheridan College
Oral Presentation

Animal Science

People in the cattle society are always looking to reduce weaning stress in order to attain a higher weaning weight during weaning season. The “Weaning Flap” method was used to reduce weaning stress on calves. To explain our research, we ran 98 head of calves through the squeeze shoot; three calves in a row retained a flap while the next three did not engage in the flap procedure, the same pattern of three on and three off was used throughout the total number of head. This method was hypothesized to reduce weaning stress on calves by allowing the calves to stay with their mothers but prohibit suckling and in return produce a higher weaning weight. After research was conducted, through weighing the calves before and after the allocated time, the results presented the flaps in a negative way. Calves without the flap ultimately gained more weight. As a result, the flaps proved to be a disappointment being as they did not rise to their advertised potential of increased weight gain due to stress relief.

Environmental Challenges of Winter Olympic Infrastructure
Tom Hesse
With Courtney Carlson
Communications and Journalism, Environment and Natural Resources
University of Wyoming
Oral Presentation

UW Honors Program

The 2014 Winter Olympics will be held in Sochi, Russia. To prepare for such an event, the Sochi infrastructure had to be completely re-built, including a 30-mile highway and rail project that runs through one of the most sensitive national parks in Russia. This project examined the road and rail project along with Russian environmental practices, criticisms of the project and international oversight to determine what environmental protection measures existed in Russia. This project also examined flaws in those environmental protections as well as how the pressure of hosting the Olympic Games has impacted the project. By comparing the Sochi project to similar projects in the United States, this research determined that there were numerous shortcomings in Russian environmental practices including lack of public involvement and lack of federal oversight. These shortcomings have led to a project that has forever damaged the sensitive region of Sochi National Park and have further demonstrated the need for careful environmental review processes.
Analysis of selenium hyperaccumulator seeds and seed borne fungi in relation to seed viability and fungal selenium tolerance

Annie Hoag, Trenton Newbury, Bill Trebelcock, Jie Wang with Dr. Zac Roehrs, and Dr. Ami Wangeline
Department of Biology
Laramie County Community College
Poster Presentation

Wyoming INBRE Windsor, CO; Cheyenne, WY; Cheyenne, WY; Benxi China

The metalloid selenium (Se) can be found in high concentrations in the Eastern Rocky Mountain Front Range. Here, seeds collected in the summer of 2011 from Lysite, WY, a known seleniferous region, from two known Se hyperaccumulators (Astragalus racemosus Pursh and Stanleya pinnata [Pursh] Britton) and a third non-accumulator (Cleome lutea Hook) were plated on malt extract agar (MEA) containing 10 ppm inorganic selenate (Na₂SeO₄), to quantitatively test for the presence of culturable fungi. A total of 51 fungal isolates were obtained and evaluated for Se tolerance. Seed samples, representative of sampled population for all three plants, were also tested for viability using 2,3,5-triphenyltetrazolium chloride (TTC). A Kruskal–Wallis analysis with a post-hoc Mann-Whitney U was used to examine differences between plants (by site) in both the number of recovered isolates and Se tolerance of those isolates. Fungal tolerance data of isolates was compared against mean site specific plant Se concentrations which were collected during summer 2011 and had been previously analyzed using inductively coupled plasma atomic emission spectroscopy (ICP-AES).

Involvement of neurokinin 3 receptor (NK3R) in embryonic development and chemotaxis

Chelsea Hoekstra and Eli Kinney Lang with Dr. Bill Flynn
Neuroscience Program
University of Wyoming
Poster Presentation

INBRE Program Laramie, WY
Gillette, WY

Early in embryonic development, neurons use a process called chemotaxis in order to find targets and wire the brain correctly. Chemotaxis is the process in which neurons sense chemical gradients and grow in the direction of a chemical stimulus. One receptor which may play a role in early chemotactic development is the neurokinin 3 receptor (NK3R). NK3R is a G-protein-coupled receptor that is novel in nature, as it is internalized into the nucleus. Rat embryonic hypothalamic (REH) cells were transiently transfected with green fluorescent protein and time-lapse imaged using the Zeiss 710 LSM Confocal microscope. Cells were imaged for ten minutes of baseline at which point agonist, Senktide was added. Cells were then imaged for thirty minutes and quantified. Results have demonstrated that activation of NK3R by receptor agonists causes increased outgrowth in both number and length of neurites in REH cells as compared to control groups. This outgrowth of neurites can be predicted by mathematical modeling techniques. Previous research has shown that NK3R plays a role in the Phospholipase C signaling cascade, perhaps implicating it as a player in the release of calcium allowing for neurite outgrowth. Future research will test this hypothesis.
Within-nest allometry of the bumblebee tracheal system
Jessica Howard with Dr. Michael Dillon
Department of Zoology & Physiology
University of Wyoming
Oral Presentation

The scaling of insect respiratory systems with body size has important implications for ecology and evolution of insects, ranging from allometry of aerobic performance to current and past environmental constraints on insect body size. Previous work examining scaling across beetle species and during ontogeny of grasshoppers suggests strong tracheal hypermetry, with larger insects investing relatively more volume in their tracheal systems. However, these approaches potentially confound body size differences with species or life stage differences in morphology or physiology. To circumvent these issues, we took advantage of large body size variation within bumblebee nests, with workers (sisters) varying 10-fold in body size from 50 to 500mg and queens exceeding 1g. We estimated tracheal volume, dimensions of pronotal and propodeal spiracles, and body size of individual bumblebees (Bombus impatiens) from lab-reared nests. We describe the allometry of tracheal morphology within and among bumblebee nests, and discuss implications for size-related performance, and for respiratory limitations on adult body size.

The Implementation of Organosolv Pretreatment Into a Cellulosic Ethanol Plant
Alyssa Hughes, Neil Neuberger, Kelsey Thrush, and Shuai Tan with
Dr.s John Myers and Joseph Holles
Department of Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

In recent years an emphasis has been placed on the research and development of new technologies for the production of fuel and energy alternatives. One alternative is the production of ethanol from biomass. The National Renewable Energy Laboratory (NREL) has constructed a feasible computer simulated model for an industrial ethanol plant that has the capabilities to produce fuel grade ethanol from corn-stover. Our project aims to optimize the NREL plant model through the implementation of a new pretreatment process. The new process will utilize Organosolv pulping technologies and be able to improve the NREL model. The Organosolv process breaks down the lignin in the feed stock which leads to a more effective hydrolysis process that can result in refined byproducts. The byproducts will have the potential to be sold for a profit instead of being burned as they are in the current model. With less byproduct being burned the size of the required boiler will decrease. Since the boiler block is the most expensive part of the current ethanol plant, decreasing its size will increase efficiency in both the initial startup costs and running costs. By utilizing the Organosolv pretreatment block the minimum selling price of ethanol can be lowered over one dollar a gallon and still obtain the same IRR as the current NREL model.
Direct Lewis Acid Mediated Synthesis of Amines from Benzylic Alcohols
Amy Hughes, Molly Plemel, Megan Radke with Dr. Rocky J. Barney
Department of Chemistry
Western Wyoming Community College
Oral Presentation

INBRE

Rock Springs, WY

The benzylic amine moiety is present in a wide range of chemical structures having broad applications. Benzylic amines are found in pharmaceuticals, agrochemicals, polymers, surfactants, and pharmacological probes. It is apparent, given the prevalence of benzylic amines in such varied and critical applications, that inexpensive, environmentally responsible, direct, and efficient methodologies for the synthesis of benzylic amines are critical to the further development and application of this class of compound. While there are a range of methods for the synthesis of amines, many require multiple steps, and the few direct methods of amine synthesis from alcohol precursors reported in the literature require harsh conditions, expensive catalysts, or specialized apparatus to facilitate the desired transformation.

While examples of the direct synthesis of benzylic heteroatomic compounds exist using a range of nucleophiles including sulfur, oxygen, and phosphorus nucleophiles, nitrogenous nucleophiles have yet to be reported. We have performed a series of experiments in an effort to develop a direct one-flask method for the synthesis of benzylic amines from their benzylic alcohol precursors via Lewis acid activation. Several Lewis acid activators, as well as varied amines have been evaluated and our preliminary results will be reported.

ACSI File Transformer
Kris Humphries, Nate Wermers, and Richard Walton with Dr. Ruben Gamboa
Computer Science
University of Wyoming
Oral Presentation

Laramie, WY

Computer Science Department

This computer science senior design presentation will display the file transformation application created for American Collection System’s Inc. The application is a business application designed to drastically remove the time that is spent transforming medical data into a standard format. The application has been developed to read in all current hospital data format with room for expansion to other data formats. This application will be the culmination of two semesters of planning, consulting, programming, and testing of the desired file transformation application. We will highlight how the programming was conducted, what the actual program will do, why the program performs its particular features, and how the product will be marketable. We will address the struggles of working in a real world situation on real problems and the difficulties in programming specific functionality into the application.
Monitoring post-wildfire vegetation regeneration in the Northern Black Hills of Wyoming using Landsat images
Orin J. Hutchinson¹ with Dr. Ramesh Sivanpillai²
1. Department of Ecosystem Science and Management and 2 Department of Botany
University of Wyoming
Oral Presentation

Wildfires are an integral part of forest ecosystems that results in the removal of old and decadent trees and reestablishment of new vegetation. Following a wildfire event, invasive species and grasses/forbs will establish on the site first followed by shrubs and trees in later years. This natural cycle is necessary for wildlife requiring open space and for species that require old growth as the area matures with time. Forest managers are interested in monitoring this re-growth but do not have all the resources to conduct periodic ground-based monitoring. Over the recent years this condition is further exacerbated due to the increase in the number of wildfires.

Satellite images can be used to monitor re-growth at these sites due to the fact that they periodically collect data. In this study, Landsat images acquired prior to and after the 2004 Basin Draw fire were used to monitor vegetation regeneration across different burn intensities (high, moderate, and low) and aspect (north and south). Results from this study reveal the patterns of regeneration and how they vary across different burn intensities and aspect.

Conventionally Grown/Genetically Modified Agriculture vs. Organically Grown Agriculture
Christina Irion with Edward Bradley
Department of Agriculture Economics and Applied Science
University of Wyoming
Oral Presentation

Can we feed the world? With this analysis we looked into some numbers and completed a cost/benefit analysis to determine if conventional/genetically modified grown agriculture is more efficient or effective over organically grown agriculture. In the end I recommended that an agriculture producer may find it easy to produce conventionally.
Improved Army Exhaust Brake

Eric Jensen  
Team Mates:  Jeff Watters  
Kate McKinnon  Mark Shimelpfenig  
Mentors:  Mr. Brian Frymiare  
Mr. Mike Dinh  Dr. Dennis Coon  Mr. Scott Morton  Dr. Rob Erikson

Department of Mechanical Engineering  
University of Wyoming  
Oral and Poster Presentation

The Army Materiel Systems Analysis Activity has commissioned a team of four students from the University of Wyoming to develop an improved exhaust brake for the US Army. The current exhaust brake is a butterfly valve located in the exhaust stream which when closed provides back pressure and a braking effect on the engine. When descending steep grades this provides vehicle operators with more control and extends the life of traditional friction brakes. The current exhaust brake is corroding and seizing at a rate of approximately four times per engine life of 1,000,000 miles. This creates much waste and unnecessary difficulty and danger for United States military personnel. To improve the brake, key components of the butterfly valve have been replaced with corrosion resistant stainless steel parts and stainless steel bushings have been shrink-fit into the housing. The stainless steels selected were chosen to minimize the probability of galling, the magnitude of thermal stresses, and galvanic corrosion. To ensure proper operation and modeling of the improved brake, ambient temperature, thermal shock, corrosion, cyclic operation, and mechanical loading tests were performed. With these alterations the exhaust brake is designed to last the life of the engine with minimal maintenance.

Serenity and Conflict: Using Sociological Theory to Understand Science Fiction

Nicole Jensen with Jeremy Weaver  
Sociology  
University of Wyoming  
Oral Presentation

Joss Whedon’s sci-fi television series “Firefly” and the subsequent movie Serenity portray a complex futuristic society. This universe is full of both flying spaceships and horse drawn wagons. The society Whedon created can be analyzed using sociological theory. Through an integrated theory of conflict, the structure of this society demonstrates how inequalities among members of a society can lead to a clash of interests. The dynamics of societal groups competing for valuable resources can indicate an impending and possible violent conflict. Understanding the process that occurred in Whedon’s world shows that sociology can be used in the interpretation of fiction, but it also enables us to better understand our own society. The themes and events that unfolded on screen can be seen as a reflection of our own society that is indeed full of inequality and the possible conflicts we might experience as a result.
Engineering a Light Activated Caspase-3 for Cell Biology Research and Cancer Treatment
Tricia Jensen with Dr. Mark Gomelsky
Molecular Biology
University of Wyoming
Oral Presentation

EPSCoR Douglas, WY

Optogenetics is the study of how light can be used to control specific processes in living cells by hinging microbial proteins, which respond to visible light, to model animals. My project was to create a red-light activated caspase-3. Caspase-3 is the final protease that initiates apoptosis (cell death). To engineer this light activated caspase-3, a red-light sensing photoreceptor was fused to a caspase-3 mutant. This gene was inserted into a plasmid and transformed into Escherichia coli. Active caspase-3 cleaves an essential gene in E. coli, causing the bacteria to die. The goal was to have the caspase-3 be active in red-light and inactive in the dark. Eight fusion constructs were created. Seven out of eight showed caspase-3 activity was high (cells died) when grown in the dark and low (cells lived) when grown in the red-light. These results are the opposite of our objective, but show that a light-controlled caspase-3 can be made. Further creation of fusion constructs may identify a light activated caspase-3. A red-light activated caspase-3 could have great significance. The ability to control the death of a single cell would create new opportunities to study the impact a cell has on an organism and possibly treat diseases.

Social Network Approaches to Dominance Interactions in Animal Societies
Sydney Jones with Dr. David McDonald
Department of Zoology and Physiology
University of Wyoming
Poster Presentation

EPSCoR Sugar Land, TX

Dominance interactions play an important role in animal societies, affecting every aspect from survival to mating success. Dominant individuals often have greater success in acquiring resources and mates, and are often the fittest regarding survival. Dominance interactions occur across many levels of the animal kingdom, providing important information on the differences in social systems of different species. Because dominance affects many aspects of animal societies, it is likely that new approaches to understanding dominance will deepen our general understanding of social behavior.

Contest matrices tally the accumulation of dominance interactions within an animal society. The amount of interaction between individuals within a population was noted using contest matrices and triad types to distinguish between dominant and lower-ranking individuals. The creation of the outcome matrix is essential in evaluating the timing of behavioral equilibrium in dominance relations. I analyzed 40 published dominance studies from the novel perspective of viewing them as social networks. For each dataset, I ran scripts in the R computer language, written by Dr. McDonald to calculate various network metrics and to produce graphs that assessed the dynamics and emerging orderliness of dominance interactions across a wide range of animal taxa (ants to elephants).
The ethanol and stress response element (ESRE) network in *Caenorhabditis elegans* regulates stress-induced gene expression. The ESRE network is highly conserved and is involved in responding to a variety of environmental stresses. The ESRE motif is predicted to be the binding site of an unknown transcription factor, termed the ESRE-binding protein (EBP). This project aims to identify the EBP and other potential ESRE regulatory molecules using a combined approach of RNAi and mutational genetic screens. The RNAi screen consisted of knocking down known transcription factors and signaling molecules in *C. elegans* and looking for a subsequent decrease in an ESRE-dependent fluorescence reporter signal, indicating interference with the ESRE stress response. The mutational screen consisted of inducing random mutations in the genome and looking for a change in the expression of ESRE-dependent fluorescence reporters. This screen resulted in gain-of-function mutations that cause constitutive expression of ESRE genes as well as loss-of-function mutations that cause a reduced ESRE response after induction of stress. Further analysis of the selected candidates may reveal the identity of members of the ESRE regulatory network.
Death in Stasis: An Examination of Writing on Illness  
Mary Kaiser with Pamela Galbreath  
English  
University of Wyoming  
Oral Presentation  

UW Honors Program, Casper, WY

There are an untold number of stories about illness, particularly in the nonfiction genre: from cancer to genetic diseases to disorders housed in the DSM-IV, there’s something about the subject of sickness that fascinates our culture. But what is it that makes these works work (or fail)? How does a writer avoid the pitfalls of the subject – the grotesque, the technical, and the maudlin?

The goal of my project was to answer those questions, and to produce a creative nonfiction work that would serve as a successful example of this genre. To do this I studied the works of several different nonfiction authors, long and short, concerning mental and physical illnesses, and with a variety of tones.

Writing doesn’t exist in a void: it is the product of an examination of and a conversation with that which has come before. By examining the genre in which I intended to write and producing my own work I have thrown my own opinion into the discussion, and the impact of this work is ideally to move the form forward, to produce a new perspective or to add further nuance to the canon.

Neotropical Ichneumonid; Mysteries to be unraveled  
Muhammad Kala with Dr. Scott Shaw  
Department of Ecosystem Science & Management  
University of Wyoming  
Oral Presentation

NSF-EPSCoR, UW Honors Program, Port Louis, Mauritius

Ichneumonidae is the largest wasp family and is particularly diverse in the tropics. There are around 24,000 described species in the family but entomologists estimate at least 60,000 species to inhabit the planet, which means that the majority of ichneumonid wasps do not even have scientific names. Most ichneumonids are also parasitoids and, for this reason, many species hold great potential as bio control agents. Entomologists are afraid that numerous species might go extinct even before being discovered and that is why I decided to work on these insects for my project.

I identified specimens collected from Ecuador (caught from nets, pan traps and vials, as well as reared from hosts) and sorted them into subfamilies, genera, or species using the latest keys available. By identifying parasitoid specimens that were reared from their hosts, I was able to contribute not only to the taxonomy of these wasps but also to better understand their life history as my findings were recorded in the CAPEA* project database where information about their hosts, plants…etc. are recorded. Many species with no previous records were found (likely to be new species), and changes were seen in distribution of known species, which warrants additional research.

*CAPEA- Caterpillar And Parasitoids of the Eastern Andes
Computational Analysis of a Nonlinear Driven Damped Harmonic Oscillator
Kristy Katein-Taylor
With Andrew Magstadt and Dr. David Thayer
Physics and Astronomy Department
University of Wyoming
Oral Presentation

Honors, Physics and Astronomy Department               Colorado Springs, CO

The emergence of wind energy as a competitive means of alternative energy has driven an effort to advance current efficiency levels and reduce overall costs. One area of interest is the improvement of the efficiency of the turbines’ aerodynamics, which regularly experience dynamic stall from varying inflow conditions. Understanding the aeroelastic phenomenon between the wind and turbine blade is essential to increasing efficiency. This research investigates a numerical model of a wind turbine blade based on a nonlinear harmonic oscillator in order to mimic real-world conditions. Aerodynamic data from the Wind Energy Research Center is integrated into the model as a first approximation to this highly-coupled system. The complicated response is very sensitive to a variety of parameters, making interpretation difficult; consequently, these results will be used primarily to aid in future research, as well as to design a more advanced model of an elastic blade section appropriate for wind tunnel experiments. It is anticipated that this data can be used to better understand the complex aerodynamics of wind turbine blades, ultimately leading towards increasing the power and efficiency of wind energy technology.

Rapid evolution or adaptive phenotypic plasticity as a mechanism of the indirect effects of invasive lake trout on zooplankton in Yellowstone Lake
Melissa Kerr with Dr. Amy Krist
Zoology and Physiology
University of Wyoming
Oral Presentation

EPSCoR                                                                               Jackson, WY
Honors Program

There is very little research into the indirect effects of invasive or introduced species, yet it is critical to our full understanding of ecology and the negative impacts associated with human interference. One ecosystem demonstrating these indirect effects is Yellowstone Lake. Lake trout, *Salvelinus namaycush*, were illegally introduced into Yellowstone Lake in the mid-1980s. Lake trout prey upon the native cutthroat trout, *Oncorhynchus clarkii bouvieri*, and have drastically reduced their population size. The cutthroat trout feed on zooplankton in the water column and since the reduction in their population size, natural selection on the zooplankton has been weakened. Due to this, zooplankton life history traits should be different now than they were before the introduction of lake trout. I analyzed life history traits of the zooplankton species *Daphnia pulicaria* in samples from Yellowstone Lake from before and after the introduction of lake trout. The results indicated that after the invasion of lake trout, clutch sizes were smaller and fewer individuals were brooding. These results are consistent with the predictions of both the mechanisms of rapid evolution and adaptive phenotypic plasticity. More research into the cause of the life history shifts is needed to distinguish between these two mechanisms.
Games as Tools in Teaching Mathematics
Carolyn Ellie Kerstetter with Dr. Michelle Chamberlin
Department of Education
University of Wyoming
Oral and Poster Presentation

Games are resources that when used as tools in teaching add depth and understanding to topics. In mathematics using educational games to introduce and teach new topics will not only help students’ ability to complete the tasks they can also aid a student’s overall understanding of the concept. There are a variety of math games available with more being created all the time. Unfortunately math is a subject where many students enter with a biased opinion thinking that math cannot be fun and that it is too difficult to learn. My presentation will focus on the usefulness of games when used in a classroom as well as when games are appropriate. Games when used appropriately can help get students interested in math and can make going to math class a treat rather than a chore. Connecting having fun with doing math helps students enjoy being in class and can foster a desire to learn more.

Design of Proposed Wind Turbine Tower Testing Facility at the University of Wyoming
Margaret Kimble with Dr. Charles Dolan
Department of Civil and Architectural Engineering and the Honors Program
University of Wyoming
Oral Presentation

A wind turbine tower testing facility at the University of Wyoming has the potential to improve tower design by providing the capability to test new designs and composites. The proposed facility will have the capability to test up to 100 ft tall towers for strength and fatigue. This will allow for the testing of scale models and segments of full-sized towers. While the testing walls must be able to withstand all loads applied to the towers themselves, they must also be able to withstand any natural stresses such as those from the Wyoming wind. Design must take into account the multitude of stresses that the tower might experience under currently anticipated loading and provide for future testing with increased intensity. Additionally, to allow for future growth and current financial constraints, multi-stage construction will be considered.
Why the Palestinian Question Cannot be the Supreme Arab Issue: Finding the Sahrawis
Amanda King with Dr. Seth Ward
International Studies
University of Wyoming
Oral Presentation

Honors Program

The Palestinian question remains the supreme issue in Arab discourse, championing all other issues as more central to the Arab identity, more relevant to the global community, or more pressing as a humanitarian concern. This project dares to question such a casting of the Palestinian question and, without negating its due regard, suggests that this mistaken framing of the Palestinian question has contributed to the neglect of other critical Arab issues for decades. The Sahrawi refugee population of Western Sahara is a little-known humanitarian and political crisis that has haunted the Maghreb Arab world for over thirty years. Despite numerous attempts at brokering a solution between the protagonists, multiple UN resolutions, and uncountable armed exchanges between the parties involved, the Sahrawis are still living as refugees denied the right to self-determination, forcibly displaced from their own homeland by the Moroccan occupation. This project capitalizes on an abundance of anthropological research on the Palestinian and Sahrawi refugee populations to compare and contrast the two and explore the role of the Sahrawi liberation question in Arab and global politics. Ultimately, this project proposes that the difference between resistance and liberation must be given regard, and that the Palestinian question cannot retain its current status as the supreme Arab issue.

Arsenic Removal from Groundwater Wells by Means of Cupric Oxide Nanoparticles
Hannah King¹ and Dr. KJ Reddy²
¹Department of Geology/Geophysics
²Department of Ecosystem Science and Management
University of Wyoming
Oral Presentation

EPSCoR

Arsenic is a trace element that occurs in groundwater naturally as well as through anthropogenic activities. It occurs mainly as arsenite and arsenate in water. Levels of arsenic that exceed 10 ppb (parts per billion) in groundwater can be harmful to human’s health if consumed. Twenty-one groundwater samples from Goshen County were collected and analyzed for arsenic levels. Five liters of each groundwater sample, which exceeded 10 ppb, were passed (1-liter per hour flow rate) through a flow-through reactor containing 1.2 grams of cupric oxide nanoparticles. Samples, before and after flow-through experiments were analyzed for a complete list of water quality parameters including arsenic. Results from those experiments were assessed to determine the efficiency of cupric oxide nanoparticles in removal of arsenic from groundwater samples. The effect of cupric oxide treatment on overall quality of groundwater samples as well as in removal of arsenic will be presented.
Legal Rights of Mexican Female Domestic Workers in the United States
Skylar Kunce with Dr. Lilia Soto
Department of Gender & Women’s Studies
University of Wyoming
Oral Presentation

Mexico is the leading country of origin for documented and undocumented immigration into the United States and continues to increase, particularly the immigration of Mexican women. Upon arriving Mexican men typically go into agricultural work which Mexican women have also taken part in. However, since agricultural labor is typically viewed as a male job, Mexican women find themselves in more gender assigned domestic labor. Since domestic labor has never been considered a job before, meaning housewives have never been paid to do domestic work, it is often not considered a real job even when it is paid. Due to the immigrant status of Mexican domestic workers and the informality of their jobs, the workers often are subject to discrimination and mistreatment in the workplace. The workers are often unaware of their employee rights, or frightened their status will be revealed so they do very little to demand change. My research project includes extensive research on domestic work in the United States performed by Mexican immigrant women as well as content analysis of immigrant employment laws in the United States that could provide protection for immigrant domestic workers whether documented or not.

Portable Solar Panel Charger for Selected Handheld Devices
Kasun Lankananda and Harsha Wattegedara with Dr. Stanislaw Legowski
Electrical Engineering
University of Wyoming
Oral & Poster Presentation

The portable solar panel charger (PSPC) is a charging device which uses solar energy to charge cell phones. The PSPC will take approximately 6 hours to charge fully. Hence, an internal battery will be used for our design. The intensity of sunlight will be displayed on a liquid crystal display or a bar-graph display to ensure the device pointing at the proper sun’s angle. This will increase the speed of the PSPC’s internal battery being charged. The PSPC will also be able to output the internal battery voltage level of the PSPC’s internal battery. This will be done through an LCD panel or a bar-graph display. The device will also be able to identify the voltage and current ratings required to charge the battery of a particular charging device and set the voltage and current required to charge the devices battery in an optimum time. This way, the charging cell-phone will experience the proper voltage and currents it would need to be charged fully. This device will have the ability to charge a wide range of cell-phones. However, other portable devices such as laptops will require more voltage and current than our PSPC can output for them to be charged successfully.
Instructor Interaction Techniques for Immersive Visualizations in the Classroom

Kira Lawrence and Dr. Amy Ulinski
Department of Computer Science
University of Wyoming
Oral and Poster Presentation

A GeoWall is a device capable of presenting three-dimensional (3D) imagery that is viewable by a group. Interaction with a GeoWall is typically done by a single user input device controlled by traditional point-and-click input. However, this input cannot easily provide three-dimensional movement. We hypothesized that a change in the input device and the interface would raise faculty comfort with the GeoWall and increase the likelihood of its use in class. We aimed to implement an alternative input device and interface for use with ESRI geography software, evaluate the usability of this interface, and assess faculty change in attitude towards the GeoWall as a classroom aid. Using an emulator, we wrote a script that allowed a Wii game controller to manipulate the 3D imagery created by the software. We presented three faculty members with evaluations regarding the system’s usability and calculated the averages and standard deviations of the results. Overall, the faculty found the system’s usability neither poor nor excellent, giving us a neutral response to the new system. Faculty who had never used a Wii controller before found the system more difficult to use than those who had, and a variety of connectivity problems caused technical difficulty throughout evaluations.

Biological Function of RMR2 in Maize: Genetic Study through Fluorescent Tagging of RMR2 Protein

Han Li with Dr. Anne W. Sylvester
Molecular Biology
University of Wyoming
Oral Presentation

Recent research in maize genomics shows that heritable chromatin changes contribute to an epigenetic process called gene silencing. A protein called RMR2 (required to maintain repression 2) is useful to study the process because mutations in the gene that encodes RMR2 prevent reversion of the epigenetic change. Phenotypic results of rmr2 mutants suggest the protein may silence maize pigmentation production through transcriptional gene silencing (TGS). This project aims to study the function of the RMR2 protein by localizing its expression during development and in relation to other proteins involved in TGS. The Gateway method for gene tagging is being used to produce a visual marker line. The method uses two cloning recombination reactions: First, BP reactions produce donor vectors for each of the selected segments of the genomic regions of the rmr2 gene, including regulatory regions and the sequence for the fluorescent probe (citrine YFP). LR reactions then recombine the plasmid donor vectors to make the final construct. After sequencing confirmation, the construct is transformed into a bacterial vector for maize transformation. RMR2 protein function and localization will then be studied using a laser scanning confocal microscope. We hypothesize that RMR2 interacts in a protein complex, including RMR1, to facilitate chromatin remodeling.
The Power of a Single Word: “Honneur” in the Heptaméron
Heidi Lichtfuss with Dr. Susan Frye and Dr. Hervé Picherit
Department of English
University of Wyoming
Oral Presentation

UW Honors Program Loveland, CO

The Heptaméron is a French text written during the 16th century by Marguerite, the Queen of Navarre. In the Heptaméron, Marguerite uses ten different characters to tell over seventy stories about gender, love, sex, government, and religion. In the process, she creates a complex commentary on her society. In particular, the Heptaméron demonstrates an interest in gender roles. The purpose of my study of Marguerite’s work is to understand her heavy usage of the word honneur (honor) rather than the more common chasteté (chastity) when she refers to women. For women, honneur was limited to physical chastity, while men could engage their society’s multiple powerful connotations of honneur, including dignities, rewards, and compliments. Marguerite, clearly aware of honneur’s massive scope, manipulates this term in ways that give women power. She does this by using honneur to blur the lines between the public (male) and private (female) worlds, ultimately elevating the interior female world, home of the conscience, as the greatest source of power.

Characterizing Global Precipitation Patterns Using Results from Cloudsat
Jianbo Liu with Dr. Zhien Wang
Department of Atmospheric Science
University of Wyoming
Oral Presentation

EPSCoR Hefei, China

As one of the most obvious atmospheric components, clouds exert fundamental impacts on the global hydrologic cycle, condensing water vapor and forming precipitation when incorporated with aerosols. One of the most important final products - precipitation, however, has been poorly parameterized by the modeling community due to traditional instrumental limitations. In the project, the researcher is trying to characterize global precipitation patterns using data from the NASA satellite Cloudsat. Moreover, the researcher has decided to eliminate the “possible rain” situations, while including only the “certain rain” and the “certain snow” situations for quality purposes. The researcher finds that the precipitation frequency is consistent with our long-time believed results, while the precipitation intensity is, more or less, contradicting to our conventions. In order to analyze the unusual precipitation intensity over the tropics, two regions of equal size are pick out, and their precipitation probability density functions are given and compared. As a result, the researcher concludes that the precipitation of high intensity (usually in tropics) is severely underestimated by the Cloud Profiling Radar on Cloudsat because of wavelength constraints.
Many times fairy tales are dismissed as a literary form because they are considered childish or fantastical in nature, with little to offer. This is one of the grossest misinterpretations of a legitimate art-form in our culture as it dismisses an entire genre which both reveals and informs our cultural conceptions of gender, sexuality, morality, etc. However, despite being undervalued, with the turn of the century there has been a cultural outbreak of fairy tale adaptations that hearken back to their oral ancestors. In my research I have focused on modern horror adaptations of one of these fairy tales – the Little Red Riding Hood myth. The purpose of my study is to identify a cultural shift that the adaptations I examine both reveal and inform through use of psychoanalytical theory, calling on the work of Freud, Lacan, and Kristeva to fuel my theories. The horror adaptations I will analyze in my research paper include the recent films *Hard Candy* (2006) and *Red Riding Hood* (2011), the short story “Wolf” by Francesca Lia Block (2000), and the video game *The Path* by Tale of Tales (2009). In addition to these texts, I will briefly discuss the more widely read versions of the story including the original oral folktales, Perrault’s “Little Red Riding Hood,” the Brothers Grimm’s “Little Red Cap,” and Angela Carter’s “The Company of Wolves” in order to chronicle the shifting social context.
A surface enhance Raman scattering (SERS) spectroscopy reference library was created for over ten Raman active dyes. Dye concentrations ranging from 1 mM to 1 pM were studied using a 785 nm wavelength Raman spectrometer, and the unique Raman spectra were recorded. Surface enhancement was achieved by adsorbing the dye molecules to 60 nm gold particles and the characteristics peaks were identified for each of the Raman active dyes. The dye library has aided with multiplex assay development. Multiplex assays are able to detect and distinguish between multiple analytes at the same time, such as multiple antibodies or antigens. To detect the capture of an analyte, it is necessary to have a unique dye that is specific to each analyte and to be able to distinguish the spectrum of each dye label in the multiplex spectrum. Three dyes were adsorbed individually to 60 nm gold nanoparticles and the dye modified gold nanoparticles were mixed to create a multiplex assay. Three multiplex experiments were run with a combination of three out of a possible six dyes: Nile Blue, IR-792, Malachite Green-ITC, Janus Green and Methylene Blue.

We are working with Frontier Refinery in Cheyenne, Wyoming to reduce benzene concentration in the gasoline pool. Mobile Source Air Toxins, a newly implemented environmental regulation, requires all small refineries to reduce benzene content to 0.62% (v/v) by the year 2015. Current benzene content is greater than 1%. If the content is not reduced, Frontier will be fined for failing to meet the new standards.

HYSYS and Aspen Plus simulation software were used to model the process. A naphtha splitter was modeled downstream of the hydrobon unit to remove benzene precursors from the platformer feed. Three options were considered downstream of the naphtha splitter. Benzene saturation would convert benzene to cyclohexane, but would require an additional hydrogen plant. Benzene marketing would not require a high capital cost but would introduce major revenue and product loss. Alkylation would convert benzene to ethylbenzene, yielding a high octane blendstock.

An economic analysis was completed for each option and alkylation proved to be the most feasible. Further work on optimization, safety and environmental considerations is currently under review. A detailed final report will be provided to Frontier.
Obesity in the United States
Amber Marchus with Dr. Margaret Flanigan
Department of Zoology and Physiology
University of Wyoming
Oral Presentation

UW Honors Program Longmont, CO

The increase in the prevalence of obesity in recent years is both shocking and frightening, causing more and more individuals to have severe health problems that can sometimes lead to death. This project examines the causes, health risks, and cultural aspects of the increasing problem of obesity within the United States, as well as taking a brief glimpse at the epidemic worldwide. Specifically, this project will focus on the obesity epidemic among Hispanic populations within the United States and the underlying reasons.

In order to study and predict obesity, body mass index, is the most convenient and accurate way to indicate overweight or obesity. Having a BMI of 25 or higher classifies one as overweight and a BMI of 30 or higher classifies one as obese. Several studies were examined and most all use BMI to present their results. I intend to bring awareness to the escalating problem of obesity and conclude that the solution is to educate individuals about how to prevent and or solve the issue.

Reversible Electrochemical Behavior of Electrodes Modified with Sandwich Compounds
Kenneth M. Markley with Dr. Rob Milne
Natural Science Division
Sheridan College
Poster Presentation

Sheridan College Greeley, CO

Metallocenes and related sandwich compounds are a class of various substances that contain a transition metal atom bonded to organic ligands. Many of these materials have been shown to be electrochemically active undergoing redox reactions that are often reversible. Reversible redox reaction ability of metallocenes and related sandwich compounds give these novel substances the potential to be useful in storing energy.

Electrodes modified with sandwich compounds were tested for electrochemical behavior using tetrabutylammonium hexafluorophosphate in acetonitrile as the electrolyte.
Links Between Stomatal Conductance and Circadian Rhythms in Mustard Seed Plants

Adrian Martinez with Dr. Brent Ewers

Biology
University of Wyoming

Poster Presentation

EPSCoR Laramie, WY

Measurements of two different genetic strains of mustard seed plants in the genus *Brassica rapa* have revealed responses in vapor pressure deficit and stomatal conductances and by taking the ratio of the vapor pressure deficit to stomatal conductance and plotting the ratio for each of the two main genotypic group of *Brassica rapa*, which are the R and IM strains, as a function of four separate blocks each 1 hour long, can reveal differences in how the ratio varies within a 24 hour period or that the ratio depends on the circadian rhythms and such differences reflect variations in the genotype for circadian controls in plant uptake of carbon dioxide and release of water vapor. Why is this important? There are two reasons why an investigation must be carried out. One is that finding variations in one particular phenotype which is stomatal conductance as a function of circadian rhythms can confirm one of the prerequisites for evolution by natural selection in that variations in a particular phenotype can either help increase fitness or decrease it and since *Brassica rapa* was originally grown in a Mediterranean climate and there are variations in the physical climate such as moisture availability and that has selected for differing phenotypes that allowed *Brassica rapa* to adapt and second since *Brassica rapa* is an agricultural crop, investigations on the variations of stomatal conductance as a function of circadian rhythms could be used to help improve varieties that could adapt to novel changes such as decreased moisture availability.

Lateral Forces on Inertially Focused Microparticles

Josh McConnell with Dr. John Oakey

Department of Chemical and Petroleum Engineering
University of Wyoming
Oral Presentation

UW Honors Program Laramie, WY

Inertial focusing in microfluidic channels has been shown to be an effective means of passively arranging microparticles along specific streamlines of fluid flow and regulating the spacing between particles. Because of high degree of particle ordering that results, there has been significant interest in using microfluidic devices for cell encapsulation, particle-fluid separation, and flow cytometry applications. When tuning the channel dimensions and flow rates in these devices, it is convenient to have a relation between the forces on the particles and lateral spacing. In experiments we perturb particles focused in microfluidic channels using a low flow rate secondary stream and recorded the moving particles with a high-speed camera. Data collected will allow us to calculate the lateral forces on the particles.
The history of design is one of expansive visual change. It has progressed from early image based communication of cave paintings, through the invention of the Greek letter, to the modern system of mixed media. Currently, the trend in use of word and image is reversing to fully image-based communication with the development of mobile technologies. We define ourselves through emoticons and pictures instead of words with our growing use of semiotics, or the study of interpretation in signs, signals, and symbols. Abbreviated writing is becoming the main form of contemporary communication. However, it does not allow us to gather information or educate in detail. Technology has enabled society to move where the use of text is much less important. Within this environment, it is simply impossible to rely only upon images or only upon text to define our world. Without the combination of image and text, a person is not able to understand a complete message, they are forced to rely on associations that are often incorrect. This study focuses on our reliance on images in combination with text and a recently developed method of marketing communication called the QR code.

PhotoVoice in the Elementary Classroom
Katherine McGuire with Dr. Angela Jaime
Department of Educational Studies
University of Wyoming
Oral and Poster Presentation

PhotoVoice is a participatory action research methodology that involves the use of photography and enables people to document, reflect upon, and communicate their ideas. This research project tested the effectiveness of this method with children and was driven by the following goals: to provide students another method to express ideas through the use of photographs and narratives; to reduce language demands by using photographs, so that all students can engage in writing narratives; and to incorporate student interests into learning tasks. Students were provided a camera and they took photographs of places or objects in their school, home, and community. Students then selected their favorite photographs and wrote a short narrative for each one. Their photographs and narratives were displayed on a poster and shared with their peers. All students were engaged and focused on the learning task, and showed improvement in the length and detail of their writing compared to the writing sample collected prior to the project. Students were interviewed after they had completed the project, and they expressed feelings of empowerment and confidence in communicating their ideas. PhotoVoice met all of the set goals and proved to be an effective tool in an elementary classroom.
“Perception of the Self: Alexander Technique and Yogic Philosophies in Indian Epics”
Jacob C. Means with Dr. Barbara E. Logan
Music
University of Wyoming
Oral Presentation

Michael J. Gelb, author of *Body Learning: an Introduction to the Alexander Technique* says, “The Alexander Technique eludes precise definition because it involves a new experience – the experience of gradually freeing oneself from the domination of fixed habits.” The purpose of this study is to identify the history, development, and basic concepts of the Alexander Technique (AT), and to compare these concepts to yogic philosophies found in Indian Epic poetry, specifically the *Bhagavad Gita*. Connections will be made between the AT and yogic philosophies, and the suggestion that binary opposition and monism can possibly coexist. The mind-body connection is a theme found throughout yoga and the AT that is still mysterious to many of us. Are they one, and therefore follow the monist idea of unity? Or can we separate the mind from the body, and define each in binary opposition to one another? Through close readings and analyzations of the *Bhagavad Gita*, and with the application of AT concepts, a greater understanding of these questions will be acquired. The impact of this project is to enlighten reader’s awareness of concepts in the AT and yogic philosophies, and possibly give reader’s a greater understanding of the self.

**Temperature Text Message Alert System**
Travis Midthun with Dr. Stanislaw Legowski
Department of Electrical and Computer Engineering
University of Wyoming
Oral and Poster Presentation

Loss of power, an open door, or faulty machinery can all cause a fridge of freezer’s temperature to skyrocket, causing the contents to spoil and make a giant mess. The Temperature Text Message Alert System can alert a person through a text message when their fridge or freezer’s temperature is not ideal. The device consists of a GSM module, temperature sensor, and an Arduino microcontroller. The system is powered by a rechargeable battery. The GSM module is used to send the text messages and the temperature sensor will be placed inside the fridge or freezer to record the temperature. When the temperature of the fridge or freezer leaves a programmed temperature range, an alert text message will be sent to the user altering them of the problem. This will allow the person to take action and fix the problem. The user can send messages to the device to receive a temperature reading, set the desired temperature range, program phone numbers that will be sent the alert text message, and power on and off the device. My project will let people know when something is wrong with their fridge or freezer and allow them to enough time to fix the problem.
Exposure Therapy in the Media: Does “The OCD Project” Promote Negative Beliefs About Exposure Therapy?
Lindsay Mae Miller with Dr. Brett Deacon
Psychology Department
University of Wyoming
Oral Presentation

Exposure therapy, an empirically-supported technique that is commonly employed in psychological treatments for anxiety disorders, is a relatively recent media phenomenon and was featured in the reality television show “The OCD Project,” in which a group of OCD patients lived together and received exposure therapy from a prominent psychologist. In programs such as this, the therapy depicted is sensationalistic and extreme, forcing participants to emotional breakdowns and to quit therapy. While this makes for entertaining reality television, the effects are largely unknown. In this study, one group of participants watched “The OCD Project” and another watched “Big Brother”. Both groups then completed questionnaires which assessed how much they endorsed negative beliefs about exposure therapy in general and about the therapy if they were diagnosed with Obsessive Compulsive Disorder and were to receive it. Both groups endorsed comparable beliefs about Exposure Therapy in general. However, those who watched “The OCD Project” reported fewer negative self-related beliefs about exposure therapy. These results show that, despite the melodramatic presentation, reality programs about exposure discourage negative beliefs about exposure therapy. This knowledge is an important foundation for the dissemination of exposure therapy to the public, making reality television an aid rather than a hindrance.

Dominant Negative Inhibition in Prion Protein
Arla Mistica with Dr. Yuzuru Taguchi and Dr. Hermann Schatzl
Department of Molecular Biology
University of Wyoming
Oral and Poster Presentation

A prion is a non-conventional pathogen that consists solely of the infections isoform of prion protein (PrP-SC). Prions do not have any nucleotide genome but it causes lethal neurodegenerative diseases including Creutzfeldt-Jakob disease (CJD) in humans, bovine spongiform encephalopathy (BSE) in cattle, and chronic wasting disease (CWD) in cervids. Prion infections occasionally pose threat to human health, for example, BSE in Europe and CWD in North America, whose zoonotic potential is still not fully understood. Currently, there is no accepted treatment for prion diseases. It is understood that the aggregation of PrP-SC, β-sheet rich isoform of the normal cellular prion protein, PrP-C, plays an important role in causing neurodegenerative diseases. Prions replicate by the constituent PrP-SC converting the host-encoded PrP-C into PrP-SC. My project aims to obtain further understanding of PrP-C to PrP-SC conversion. There is phenomenon called “Dominant-negative inhibition,” where a conversion-incompetent mutant PrP-C (mutPrP) inhibits conversion of coexistent, conversion-competent PrP-C, presumably by occupying PrP-SC molecules to prevent it from binding to PrP-C. We utilized this phenomenon to identify the region necessary for the PrP-SC/PrP-C binding by making mutPrPs. As a result, deletions in a certain region of PrP were found to eliminate dominant-negative inhibition effect of the mutPrp.
**Solar Tracking System**  
Austin Mivshek with Dr. Stanislaw Legowski  
Department of Electrical and Computer Engineering  
University of Wyoming  
Oral and Poster Presentation  

The amount of power produced by a solar panel is determined by the amount of sunlight that hits it, and at what angle the light hits the panel. With a fixed panel there is only a small amount of time during the day where the panel is producing at maximum power. For this reason solar tracking systems are implemented to make a solar panel follow the sun throughout the day reducing the misalignment angle of the panel, and producing maximum power for a longer period of time. My senior design project is a single axis tracker that rotates about the vertical axis. The design is fully automated, so once it is set up the user does not need to monitor it, or provide any input. To achieve this design a microcontroller, stepper motor, and three sensors, made using photo resistors, were used. This is just a proof of concept type design, and things such as the motor would need to be bulked up for this system to operate outdoors, in a windy environment. This design can be used to increase the amount of power that can be taken from a solar panel over a full day.

**Parameter-Specific Interface System with Standardized Sensor Data Collection**  
for UW’s Section of NASA’s Rocksat-X Payload  
Marshall Moore with Dr. Stanislaw F. Legowski  
Electrical and Computer Engineering Department  
University of Wyoming  
Oral and Poster Presentations  

The purpose of this research is to design a standardized electronic platform capable of interfacing with all existing electronic systems on the 2012 Rocksat-X payload. Existing NASA systems that are being implemented can be categorized into the topics of power and telemetry. A modular interface system will be implemented so that the design can be reused for years to come. The system will comprise of a “multi-decked” or stacked system and components on each individual deck or shield will be used for applications on each specific topic (power, telemetry). The power shield will be designed to regulate received power from NASA and also onboard backup power. The telemetry shield will act as a redundant data system that both accurately transmits data through NASA’s telemetry lines and stores the data on an onboard memory device. A final shield will house the microcontroller. A secondary objective of this design is to accurately characterize specific aspects of the flight by sampling a standardized set of unique data values (temperature, acceleration, etc.) This design will be completed using a series of theoretical and physical tests. These tests will confirm correct operation of the system as a whole.
Technology Use and Intimate Relationships Among College Students: Conflict Styles and Relationship Satisfaction
Sean Moran with Dr. Heidemarie Laurent
Psychology
University of Wyoming
Oral and Poster Presentations

UW Honors Presentation  Milford, OH

As more college students are experiencing intimate relationships for the first time, there are factors that also may influence the relationship. One factor that is not greatly discussed is that of technology and how emerging adults are considered a target audience for the rising technology in the country. Some background utilized for this study included conflict styles such as resolution and avoidance as well as other mediums used in intimate relationships to convey emotions such as written messages. Previous thoughts on technology have been focused on the negative side of how it could harm relationships, but not enough research shows whether this is true or false. The methods will be targeting a group of college-aged students at UW and asking some quantitative and qualitative questions focusing on amount of technology use while with partner, how it was used, and relationship satisfaction. Some of the expected findings include the fact that many students will have had mixed interactions where technology may have proven harmful or has helped in communication. This research will help in better understanding the impact of the technological age on emerging relationships and how it can be better incorporated for positive relationship building.

Elucidating the EBV LMP1 Protein Structure for Drug Design
James “Tom” Moulton with Dr. Krisztina Varga
Department of Chemistry
University of Wyoming
Poster Presentation

INBRE  Laramie, WY

Epstein-Barr Virus (EBV), a human herpesvirus, is one of the few recognized human tumor viruses. B cells are the primary target of EBV. B cells are lymphocytes that perform a hefty part in the humoral immune response. EBV has developed mechanisms to employ antigen-triggered B cell activation pathways to acquire entrance to its site of persistence, B cell memory. These infected B cell abnormally proliferate when there has been a compromise in the immune system, allowing for EBV-dependent lymphoproliferative diseases to develop. Latent Membrane Protein 1 (LMP1), an EBV protein, is a viral oncoprotein that initiates B cell signaling pathways advancing perpetuation and proliferation. This research is aimed at elucidating the structure of the LMP1 protein using NMR spectra and molecular biology probing techniques. The LMP1 protein will be expressed in an Escherichia coli system and purified using High Performance Liquid Chromatography (HPLC). The protein will be tagged with six histidine residues (His-tag) enabling purification using a divalent cation chromatography column. The structure of LMP1 will advance drug design of lead compounds that can inhibit LMP1. This will halt the expansion of a diagnosed cancerous tumor, and possibly in the future prevent the onset of cancer through this pathway.
**Hollywood and the Good Neighbor Policy: The Impact of U.S. Foreign Policy on Latin American Stardom**  
Katie Murphy with Carolyne Ryan  
History  
University of Wyoming  
Oral Presentation

**UW Honors Program**  
In 1933, President Franklin D. Roosevelt enacted the Good Neighbor Policy, which was based on the principles of non-intervention and non-interference in the domestic affairs of Latin America. With the growing threat of war with Germany and the expansion of Nazi influence in Latin American nations, it was imperative for the United States to protect the Western Hemisphere from this impending peril. With the implementation of the Good Neighbor Policy, the United States embarked on a campaign to promote hemispheric solidarity by transforming both the image of the United States abroad and the representation of Latin Americans particularly on film. Hollywood quickly became involved with the government’s defense efforts. The purpose of this study is to investigate the impact that U.S. foreign policy had on Latin American stardom. An analysis of the films *The Three Caballeros*, *Down Argentine Way*, and several episodes from the *I Love Lucy* television series as well as an investigation of the experiences of Carmen Miranda and Desi Arnaz reveal that while the objective of Hollywood’s Good Neighbor Policy was to reconstruct perception of Latin Americans, the Latin American stereotypes were only slightly altered while the featured films continued to fall into line with American imperialism. This study acknowledges the United States’ historically inaccurate portrayal of Latin America specifically through film, and helps to raise awareness of persisting inaccuracies in the present day motion picture industry.

**Hydraulic Fracturing in the Niobrara Formation in Wyoming**  
Jacob Ness, Swayne Redinger, Mohamed Sharker, Daniel Transtrom with Dr. Brian Towler  
Department of Chemical and Petroleum Engineering  
University of Wyoming  
Oral Presentation

**Department of Chemical and Petroleum Engineering**  
Watford City, ND  
Sheridan, WY  
Colombo, Sri Lanka; Arnegard, ND

Petroleum plays a key role in the future of energy in our country, and the process known as hydraulic fracturing has become a key technique in accessing these resources. With the success of hydraulic fracturing, it has expanded to all corners of America and is being utilized in many different formations.

Due to this expansion there has been increasing worry about the potential impacts on the environment, drinking water, and public health. Because of this, petroleum engineers must exercise sound ethical practices to uphold the health and welfare of the public and the environment. The hydraulic fracturing process is actually relatively old, beginning in the 40's. However, increasing use of it recently has made it paramount that safety is addressed by the industry. Also, the lack of much information about the Niobrara has prompted many operators to opt for safer economic alternatives (cheaper fluids) rather than options that may be better for the given scenario.

Our study for this semester should address each of these issues and how they directly affect the frac design in the Niobrara. Our project will analyze the pros and cons of each frac fluid type and make recommendations from safety, ethics, environmental, and economic perspectives.
Dog Behavior: An Evolutionary Perspective
Laura Noel with Dr. Donal O’Toole
Veterinary Science
University of Wyoming
Oral Presentation

UW Honors Program Anchorage, AK

The behavior of the modern domesticated dog is heavily influenced in its evolutionary history. I studied the evolution of the domestic dog from its origins and applied this evolutionary history to understanding the behavior of domestic dogs, and how it differs from undomesticated canine species. I also studied the process of artificial selection implemented by humans in the derivation of the numerous breeds of dog present today. I specifically looked at the modern domesticated dog breed groups, as outlined by the American Kennel Club, and how the evolutionary history of specific groups and breeds has affected the typical behavior of those breeds. This knowledge is important to understanding how and why dogs behave the way they do and has significant application in selecting a dog as a pet, as well as training.

To Do or Not to Do…That is the Question
Erin Oelklaus with Dr. Tucker Readdy
Kinesiology and Health Promotion
University of Wyoming
Oral Presentation

UW Honors Program Juneau, AK

Health care professionals constantly emphasize the importance of exercise to an individual’s mental and physical well being. Despite these constant reminders, many individuals face motivational challenges when attempting to begin and maintain an exercise program. There are numerous theories that strive to explain this phenomenon, and health care professionals can be better prepared to help their clients by understanding and utilizing the most appropriate motivational theory for the situation.

The purpose of this study was to assess how the Theory of Planned Behavior, Self-determination Theory, and Self-efficacy Theory can be used to understand the exercise behavior of a personal training client. The individual answered specific questions pertaining to his motivational and exercise history, as well as his reasons for starting an exercise regime. A qualitative analysis was then conducted to compare and contrast how the different theories explained the person’s exercise behavior.

Results indicate that each theory possessed both weakness and strengths in describing the client’s exercise behavior, and that the most apropos fit is a combination of all three theories. Therefore, due to the variable nature of human care, theoretical and practical knowledge of varying theories best prepares health professionals to motivate their clients.
Success of Nutritional Therapies for Selected Developmental Disabilities

Sarah Oliver with Kristin McTigue
Department of Family & Consumer Sciences
University of Wyoming
Oral Presentation

One in six children in the United States has some form of a developmental disability. The prevalence of these conditions requires that health professionals are knowledgeable of the abundant medical therapies available to increase the quality of life of individuals with developmental disabilities. The term developmental disability encompasses a wide variety of disorders, but this presentation focuses on Down Syndrome, Autism, Cerebral Palsy, and Prader-Willi Syndrome. Many methods can be implemented by health care providers to promote health in individuals who present with these disorders. Nutrition therapies have the potential to be beneficial, but due to lack of practitioner knowledge and education about these approaches, they are often not considered. Health professionals, especially those trained in nutrition such as Registered Dietitians, need to be aware of and educated in the success of nutritional therapies for developmental disorders. This presentation discusses the success of various nutritional therapies in selected developmental disorders as determined through analysis of research articles and other current resources published within the last fifteen years. Through this extensive research, it is clear that nutritional therapies, can play an integral role in improving the quality of life in individuals with developmental disorders.

Introducing Political Philosophy into the High School Curriculum: A Module Approach

Matthew Parish with Brian Eberhard and Dr. Teena Gabrielson
Department of Secondary Education; Department of Political Science
University of Wyoming
Oral and Resource Presentation

The skill of critical thinking is slowly being lost as Google and YouTube become the all-purpose solution for answers unknown. The expectations of rigor between college and high school are increasing. In an effort to better prepare high school students for college. My project contains six lesson modules that any social studies teacher can assimilate into their curriculum. The module is developed for upper classmen who have an interest in political science. Each module contains a different concept of political philosophy: justice, utopia, factions, negative/positive liberty, general will/will of all, and free rider vs. ideal citizen. The six concepts are explored in six different lessons, each with meaningful and straightforward activities designed to promote student exploration and understanding. Each lesson is backed by readings from political philosophers ranging from Plato to John Locke, challenging students with advanced primary source work. The discussions intend to move students beyond the mindset of right and wrong. Students will learn to make arguments, for and against, using textual evidence for support. Several of the lessons were tested in a European History class and were successful at exposing students to concepts of political philosophy as well as promoting critical thinking skills.
Wildfires present a major societal concern, and the effects of climate change on fires within subalpine forests raise unknown challenges. Fires in the Rocky Mountains are thought to be determined by local (vegetation, topography, random lightning ignitions) and regional (climate variability) controls, but the majority of studies of fire-climate interactions span only the last few hundred years when climate has been relatively stable. The charcoal that is buried in lake sediments provides a unique opportunity to examine how often fires have burned over past millennia during periods of climate change. By processing lake sediment cores and counting layers of charcoal, I have been able to reconstruct the forest fire histories at a series of sites in northern Colorado both during millennia with climate conditions like today and periods that were warmer and drier than today, such as from 3700-1200 years ago. Initial results from two lakes in the Park Range of Colorado indicate that wildfires were more common during this prolonged dry interval than during the past few centuries.

Teaching Performance Assessment: Secondary World Language
Jordan A. Parry with Carol Bryant
Department of Secondary Education
University of Wyoming
Oral Presentation

The Secondary World Language Teaching Performance Assessment (TPA) is a standardized assessment of world language student teachers’ progress. It is assessed by the Stanford Center for Assessment, Learning, and Equity. The assessment is judged on five dimensions of teaching: planning, instruction, assessment, reflection, and academic language. In the assessment, student teachers describe, analyze, and evaluate the teaching of a 3-5 lesson unit of world language instruction. The assessment is built around the proposition that successful teaching is based on a knowledge of subject matter and subject-specific pedagogy, developing knowledge of one’s students, reflecting and acting on evidence of the effects on student language acquisition, and considering research/theory about how students learn.

The TPA assessment is clearly focused on student language acquisition. To complete the assessment, student teachers describe their plans to achieve student language acquisition, provide a rationale for those plans and an analysis of the effects of their teaching on the students’ language acquisition, and analyze and reflect on the resulting student language acquisition to plan next steps in instruction or improvements in their teaching practice.

Student teachers completing the TPA must submit artifacts (evidence of teaching practice, including lesson plans, copies of instructional and assessment materials, one or two video clips of your teaching, and student work samples) and commentaries describing their plans and practice, explaining the rationale behind them, and analyzing and reflecting on what was learned about teaching practice and the students’ language acquisition.
Is the carbon in dietary lipids routed to tissue protein in mice with high-fat diets?
A physiological experiment with ecological implications.
Jacob Peters with Dr. Carlos Martínez del Rio
Department of Zoology and Physiology
University of Wyoming
Oral Presentation

UW Honors Program, EPSCoR
Buffalo, WY

Diet is one of the most fundamental elements of an animal’s ecology. However, obtaining adequate observational data to characterize an animal’s dietary preferences often impossible. Limitations associated with conventional proxies, such as fecal and gut content sampling, have spurred ecologists to develop a new method of diet characterization through stable isotope analysis. Because the elements in a food source are assimilated into a consumer’s tissues, the relative abundance of carbon and nitrogen isotopes (\(^{13}\text{C}/^{12}\text{C},^{15}\text{N}/^{14}\text{N}\)) in a food source are reflected in that of the consumer. Therefore, biologists can estimate the prey-makeup of a consumer by comparing the isotopic composition of their tissues to that of potential prey items. Recent evidence suggests that the faithfulness with which the isotopic composition of diet is transferred to consumer tissues is dependent on the lipid-to-protein ratio in the diet, because lipids tend to be enriched in \(^{13}\text{C}\) relative to proteins. We fed four groups of mice diets of variable lipid:protein ratios (high-fat to low-fat) for 4 months. Upon analyzing the isotopic composition of hair, muscle, liver and adipose tissues of the mice, we discovered that, indeed, lipid:protein ratios drastically affect carbon routing and ultimately, variation in the isotopic composition of consumer tissues.

Gender differences in AMPK activation in the heart and white quadriceps muscle following exercise training in mice.
Matthew Peterson with Dr. Paul Thomas and supervised by Kevin Brown and Ed Waggy
University of Wyoming
Oral Presentation

EPSCoR
Guernsey, WY

AMP-activated protein kinase (AMPK) mediates glucose uptake through expression of GLUT-4 on cell membranes and its use as a fuel, thus preventing injury and apoptosis. Mice were randomly assigned to be trained (T), sedentary and resting (SR), or sedentary and exercised to exhaustion (SE) immediately prior to sacrifice. Samples were taken from the heart and quadriceps. Males had higher activation of AMPK among all groups in the heart. TE groups had higher activation than SR and SE. SR groups had higher activation than SE groups. In quadriceps, the females showed higher AMPK activation in the TE and SE groups. Gender discrepancy between controls did not exist. TE and SE groups had higher activation than SR controls. The SR groups had higher activation in the heart than the SE group. This was not found in the quadriceps. Gentle handling of the SR group could induce a fright response, thus activating AMPK in that group. Our findings support prior studies showing a graded response to exercise. Discrepancy between genders was more substantial than graded training effects in the heart, but not the quadriceps. This study suggests the training effect is more dramatic in the males’ heart and females’ quadriceps.
Mapping aspen phenology with MODIS 8-day composites
Jason Pindell\(^1\) with Dr. Ramesh Sivanpillai\(^2\)

1. Department of Ecosystem Science and Management and 2 Department of Botany
University of Wyoming
Oral Presentation

WyomingView              Wheatland, WY

Aspen stands in the Medicine Bow National Forest (MBNF) and are an important source of habitat and food for several wild animals ranging from large ungulates to birds to small mammals and insects. Aspen leaves emerge between April and May, reach max leaf area around mid-June, and change color in autumn just before the leaves senesce. However recent phenological studies have reported changes in the timing of aspen’s green up and senescence. Phenology is the study of the timing of biological events. Remotely sensed data collected by satellites can be used to monitor phenology of deciduous trees such as aspen. Using 8-day MODIS composite data, this study monitored the phenology in several aspen stands in the Sierra Madre region of the MBNF. This presentation will highlight the potential of 8-day MODIS composites to map and monitor aspen phenology.

Sequence Specific Condensation and Isolation of Short Oligonucleotides
Ashlin Porter with Dr. Milan Balaz
Department of Chemistry
University of Wyoming
Poster Presentation

EPSCoR

Rock Springs, WY

Deoxyribonucleic acid (DNA) contains the genetic information for almost all living organisms. The main goal of my project is to explore the metal cation induced sequence specific DNA condensation of short well defined oligonucleotides and subsequent separation of condensed oligonucleotides from their non-condensed counterparts. I am using different spectroscopic (e.g. circular dichroism, UV-vis and emission spectroscopies) and isolation (reverse-phase HPLC, PAGE) techniques to study the efficiency and selectivity of DNA condensation. I have succeeded to find simple elution conditions that allow evaluating the efficiency of condensation of CG DNA sequence in the presence of AT DNA sequences. AT48mer was eluted with retention time 6.2 minutes while CG36mer needed only 4.3 min. I will further explore the importance of Z-DNA formation in the DNA condensation for which I will employ oligonucleotide that do not adopt Z-conformation. This research may be a gateway into the understanding of many concepts that span throughout many different fields of work, from biomolecular recognition to the understanding of genetic mutations.
Production of Polyclonal Antibody against *Mycoplasma ovipneumoniae* in Rabbits
Saroj Poudel with Dr. Jeffrey J. Adamovicz
Department of Molecular Biology
University of Wyoming
Oral Presentation

UW Honors Program Kathmandu, Nepal

The objective of this study is the generation of up to 1g rabbit polyclonal antibody in response to membrane protein derived from *Mycoplasma ovipneumoniae*. *M. ovipneumoniae* is a respiratory pathogen of domestic sheep, goats, and a special concern in big horn sheep. It causes atypical pneumonia and predisposes animals to other viral and bacterial infections such as *Mycoplasma haemolytica* which causes secondary pneumonia resulting in death. Membrane protein comprises the attachment organelle of the pathogen. It helps bacteria to attach to the host cells. Our intention is to create rabbit polyclonal antibody to membrane protein. Membrane proteins are believed to be a good diagnostic candidate antigen as it is expressed on the surface of the bacteria and likely is a strong immunogen in the right context. This polyclonal antiserum will be processed, characterized and developed as an immunohistochemistry (IHC) reagent for WSVL. It is hypothesized that this polyclonal serum will be sufficiently sensitive and specific for diagnosis of the pathogen in tissue sections derived from suspect *M. ovipneumoniae* cases and/or play a useful role in differential diagnosis of other related caprine diseases.

Implementing Efficient Classroom Interaction Technique for 3D Geo-Spatial Visualization in a Stereoscopic Display
Neera Pradhan and Dr. Amy Ulinski
Department of Computer Science
University of Wyoming
Oral and Poster Presentation

3-Dimensional visualization is a growing technique and its implementation for the educational purpose is also rapidly increasing. Spatial relationships are a key concept to understand Earth Sciences and user interaction with the display can help to understand the scientific phenomenon better. Geowall, a stereoscopic display, is one of the immersive technologies used for Earth Science education. Traditional 2D mouse is typically used for interaction with Geowall. However, because of its limited range, single use and reduced degree of freedom, collaborative interaction is not supported. In our research, we aimed to find solutions for efficient interaction and evaluate its implications in a classroom environment using the current software for Geowall. We designed and developed interaction techniques which can be used with commodity 3D input devices such as Wiimotes. We evaluated our proposed system using six student volunteers: three PhD candidates, one Master’s and two Undergraduate students. The results derived showed that ease of use and comfort from using Wiimote is above average 4.0 in the scale of one to seven. Students familiar with the device favored for its use, while except for one, rest of the students without any Wiimote background were enthusiastic to learn using the new interaction technique.
Crayonman: 2-D Game Engine and Level Editor
Thomas Propst with Dr. Ruben Gamboa and Dr. Amy Ulinski
Computer Science
University of Wyoming
Oral Presentation

Department of Computer Science Laramie, WY

The intention of this project was to create a framework for users to build and customize their own games without requiring knowledge of computer programming. The project consists of two components, the level editor and the game engine. The level editor allows users to design their own levels for the game by placing blocks into a blank canvas and allows them to select one of several predefined backgrounds. The game engine allows users to play pre-made levels or to play the levels they designed in the level editor.

In developing this project, the main focus was to gain experience in programming 2-D graphics and real-time applications. Major concepts built into the project were object oriented programming, event driven programming, and real-time animation and interaction. This project was coded using Java, and the level files were written using XML. The concepts built into the project make it powerful, extensible, and portable, while still allowing users with minimal programming experience to easily customize their gaming experience.

Wyoming Public Radio into Media: Embracing the Power and Potential of Digital Media
Anna Rader with Dr. Michael Brown
Communication and Journalism
University of Wyoming
Oral Presentation

UW Honors Program Cheyenne, WY

Over the last few years, radio has undergone changes that are inevitable in the world of new media and digital technology. National Public Radio has extended their focus to build a compelling service on NPR.org, as well as mobile sites and apps. These digital platforms offer more ways to listen learn and experience NPR and stations. Wyoming Public Radio has is undergoing these changes as well. Their name for instance has changed to Wyoming Public Media (WPM), showing their internal mechanisms to listeners externally.

However, WPM’s funding is far less than many member stations across the United States. A few of these problems include Wyoming’s lower population as well as the generational gap of listeners who tune into WPR. This proves challenges that many other stations don’t face. Our world is experiencing another era of innovation; a world that is much faster, more chaotic and dynamic. Through audio interviews, experiencing the inner workings of Wyoming Public Media, this study shows the positive and negative changes and challenges that WPM faces. The impact of this study is to show that radio is a strong foundation upon which to build, as WPR is actively embracing the power and potential of digital media.
An Investigative Look into Improving Sustainable and Profitable Livestock Production in Rwanda and Burundi: A Future Veterinarian’s Perspective
Julia Ransom with Todd Cornish
Animal Science
University of Wyoming
Oral Presentation

UW Honors Program

Cody, WY

The countries in Sub-Saharan Africa are among the poorest and most malnourished in the world, specifically Rwanda and Burundi, which are the focus for this project. The purpose of this study is to identify the needs that exist in these countries in order to create a non-profit that focuses on bettering livestock management practices and veterinary care and training. The goal is ultimately to establish such a program in the attempt to generate a more profitable and sustainable animal crop for the people of these countries.

The needs will be determined through an investigation of the livestock diseases that have the greatest economic impact in the respective areas. Providing practical treatments for affected animals will best be achieved through projects that aim to deliver more accurate diagnoses, greater accessibility to vaccinations, proper water sources, and other simple treatment solutions. These projects will reduce both mortality and disease in the region’s livestock, thus increasing profits and sustainable food reserves. This project will demonstrate the need for a non-profit organization such as described and the role in which it will play in reducing poverty and hunger in Rwanda and Burundi.

Differences in Exercise Economy between Minimalistic and Conventional Footwear
Tyler Renner, Gary Werhonig, M.S.
Department of Kinesiology
University of Wyoming
Oral Presentation

UW Honors Program

Cheyenne, WY

Background: Barefoot running has been thought to be more metabolically economical than conventional, shod running. However, some studies have suggested that only experienced barefoot runners may benefit due to biomechanical changes the body must first adopt. As an experienced barefoot runner, I tested the theory on myself to determine metabolic economy in barefoot and shod running. Methods: After establishing VO_{2max}, treadmill tests were conducted on three separate days on a single subject trained in the barefoot running style. On each test day, two 15-minute running sessions were conducted, spaced by a rest period of at least 15 minutes. Sessions were identical at 7.0 mph and 0% grade. Subject was always shod in the first session and “barefoot” (wearing very minimalistic Vibram FiveFingers) in the second session. Heart rate and rate of perceived exertion were recorded, as well as oxygen uptake measured by a metabolic cart, each minute to determine average oxygen consumption relative to VO_{2max}. Results: Running the “barefoot” style was found to elicit an average oxygen consumption savings of 3.41% compared to running shod. Conclusion: Running “barefoot” (including very minimalistic footwear) offers a metabolic advantage over running shoes in a runner who is accustomed to the biomechanical variance of barefoot running.
The performance of 1-ethyl-3-methylimidazolium chloride (EMIM-Cl), a novel ionic liquid inhibitor for gas hydrate, in inhibiting methane hydrate at high ionic liquid concentrations up to 40 wt% is investigated. Experiments on methane hydrate dissociation conditions in the presence of mixed ionic liquid and conventional inhibitors are also performed to investigate any possible synergistic effects. The conventional inhibitors used are sodium chloride and monoethylene glycol. The combination of two ionic liquids is also investigated by combining EMIM-Cl with 1-ethyl-3-methylimidazolium bromide (EMIM-Br). For these inhibitors, a high-pressure micro-differential scanning calorimeter is used to measure the effects on the equilibrium methane hydrate dissociation curve in a pressure range of 95 – 305 bar. It is observed that single component solutions of EMIM-Cl demonstrate an exponential increase in inhibition effect with increasing concentration. Of the mixtures tested, it is also found that the thermodynamic inhibition performance is below that of the average performance of the individual components.

Predicting the impacts of climate change on fishes in the Laramie River
Kathryn Riggs with Dr. Frank Rahel
Zoology and Physiology Department
University of Wyoming
Poster Presentation

Coldwater fish species, such as trout, have been predicted to suffer large habitat loss in streams as summer water temperature increases due to climate change. I investigated the extent to which warmwater fish species, whose current upstream distributions are limited by cold water temperatures, will expand their range upstream as temperatures increase. Throughout the Laramie River, temperature recorders were installed and fish populations sampled by electrofishing. With data from literature and my own field sampling through electrofishing, I related the current elevational limit of each fish species to the mean July water temperature at that elevation. The difference between the location at which a limiting temperature currently occurs and where it will occur under a given level of warming allowed me to predict the potential range expansion or contraction for each species. Results of this study will predict how much habitat will be lost for coldwater fishes and how much habitat will be gained by warmwater fishes due to a warming climate. Information from this project has important implications for the management of fish populations including how the trout fishery in Laramie will be affected and if some native warmwater species of conservation concern, including the brassy minnow (Hybognathus hankinsoni), will benefit by having additional thermally-suitable habitat in the Laramie River.
Teaching Poetry In High School
Carla Rust with mentor Kate Northrop
English
University of Wyoming
Oral and poster presentation

UW Honors Program Montrose, CO

My presentation will suggest a new approach to teaching poetry in high school with a primary focus in contemporary poetry, and introducing students to the relevance of poetry. My project is founded on the idea that high school poetry curriculum tends to focus on format and tradition, which often fails to catch students attention, and leads to a disinterest in poetry later in life. My idea for the project was inspired by my own experience in high school, which was sub-par, compared to my experience in college, particularly under the instruction of Kate Northrop. Her ability to introduce students to poetry in an interesting and unintimidating way led me to believe that the reason many students dislike poetry could be the way it is introduced to students. Through examination of existing curriculum and through surveys, the problems with the current method will be identified. Through work with Vista Charter School, a school for non-traditional and high-risk students in my hometown, as well as work with Kate Northrop and the selection of poems and exercises, I will outline strategies for improving curriculum, as well as offer a justification for why an interest in poetry is important in the first place.

Dale Creek Storage Augmentation Dam
Loren Ruttinger with Dr. Thomas Edgar
Department of Civil and Architectural Engineering
University of Wyoming
Oral Presentation

UW Honors Program Sheridan, WY

Dale Creek is located southeast of Laramie, WY near Tie Siding. The site of the old Union Pacific railroad abutments makes for an ideal location to build a dam to augment water storage for the City of Cheyenne, WY. The stream channel is narrow and deep at this point, while widening considerably upstream. This presents the opportunity to construct a relatively small dam in comparison to its volumetric storage. In conjunction with Taylor Kasperick and Jacob Wilson, I intend to determine if building a dam at this location would be a beneficial and economical option to augment water storage for Cheyenne. We will use a combination of hydrologic analysis, hydraulic analysis, common small earthen dam design, emergency spillway design, and storage capacity analysis to determine if the proposed dam site is feasible. This benefit/cost analysis will compare the volumetric storage of the dam to the total expense of construction. Based upon this final study, our design team will make an educated and practical suggestion as to whether or not a dam should be constructed at this site.
Biomass Steam Gasification Using Concentrated Solar Radiation with an Emphasis on Carbon Sequestration
Austin Rykhus with Dr. Yuan Zheng
Mechanical Engineering Department
University of Wyoming
Oral Presentation

EPSCoR
Evanston, WY

The primary focus of the proposed research is biomass Steam gasification using concentrated solar radiation and the effects that Wollastonite (CaSiO₃) has on carbon absorption. Gasification is the process of converting fuel, for example biomass, to a useful byproduct in the form of a gas known as syngas using a high temperature heating process. Steam gasification utilizes H₂O and fuel to produce a hydrogen rich syngas. Syngas can then be used as a standalone fuel or an intermediary building block for other fuels like synthetic natural gas. Research in solar steam gasification and carbon sequestration is an important step towards reducing carbon emissions. The Advanced Combustion and Gasification Laboratory located in the Mechanical Engineering department, where Dr. Yuan Zheng is the principal Investigator, has been conducting research focused on steam gasification using solar radiation as a heating source. The goals of my research project were to test the concept of using Wollastonite (CaSiO₃) to capture carbon through a steam gasification process using beetle killed pine trees as fuel and solar radiation as the heat source.

Infodemiology: Using the Internet to Benefit Public Health Efforts
Amber Savage with Jeremy Weaver
UW Honors Program
University of Wyoming
Oral Presentation

UW Honors Program
Lovell, WY

Infodemiology, the analysis of aggregate search query data, has the potential to positively impact public health by providing the means whereby trends in search query data can assist in identifying disease outbreak. Because disease outbreaks create population vulnerability, early detection is crucial in maintaining the highest level of intervention, preparation, and response to such outbreaks, thus curbing negative effects on individuals. This paper presents a literature review on current research surrounding the Infodemiological methodology. Current research is working to identify and create a viable methodology whereby disease outbreak can be identified. Studies conducted by Google, Inc., Yahoo!, and specialists within the field have shown that by using Infodemiology, identification of disease outbreak can be detected one to two weeks before the Center for Disease Control. This methodology has the potential to establish effective interventions so the burden of disease outbreak can be lessened in the United States and eventually throughout the world.
HOW DO MICROBIAL ASSEMBLAGES FROM DIFFERENT FRESHWATER ECOSYSTEMS RESPOND TO CHANGES IN DISSOLVED ORGANIC CARBON SOURCES?

Amy L. Saville, Erin R. Hotchkiss, Noah Berg-Mattson; Dr. Robert O. Hall
Department of Agriculture and Environmental and Natural Resources
University of Wyoming
Oral presentation

EPSCoR Cody, WY

Dissolved organic carbon (DOC) is a dominant carbon flux in freshwater ecosystems. It is unknown how different microbial assemblages respond to a range of DOC source. Our research objective was to quantify how microbial assemblages from sites with different DOC sources respond to DOC of higher or lower biological availability. By cross-inoculating bioassays with microbes and DOC from Spring Creek or Beaver Pond (WY), we compared potential shifts in DOC uptake by microbial assemblages given native or non-native site DOC and/or dextrose and nutrients. Site-specific DOC uptake was significantly higher in Spring Creek bioassays compared to Beaver Pond bioassays (0.0765 versus 0.0181 day⁻¹, p=0.011). Contrasting with previous cross-inoculation studies, different microbial assemblages had no effect on DOC uptake in bioassays with the same DOC source (Spring Creek, Beaver Pond, or dextrose). While dextrose additions removed any site effect on bioassay DOC uptake (p=0.79), additions of dextrose and nutrients drastically increased the site effect on DOC uptake (p<0.001). Future research will investigate whether increases in site effect for bioassays with dextrose and nutrients are driven by priming.

Mapping Changes in the Surface Area of Woodruff Narrows using Landsat Images

Brandt Schiche¹ with Dr. Ramesh Sivanpillai²
1. Department of Ecosystem Science and Management 2. Department of Botany
University of Wyoming
Oral Presentation

WyomingView Buffalo, WY

Remotely sensed images are used for mapping large areas of the earth’s surface. Images acquired by satellites can be effective for quantifying changes that are occurring in specific areas, which can provide valuable information for resource managers. Woodruff Narrows Reservoir, located in the Uinta County, Wyoming, is an important resource for irrigation of croplands and livestock alike, as well as for recreation such as fishing and boating. Until 1997, gauges were used to collect water inflow and outflow data, and these data were used to compute the total volume of water stored in the reservoir. However, these gauges are not operational after 1997, and therefore, no records are available. The primary objective of this research is to map the water surface area using images collected by the Thematic Mapper sensor mounted on the satellite Landsat 5, and relate the images to the total volume of water stored in this reservoir (between 1986 and 1997). The strength of this relationship would enable us to predict the volume of water in the reservoir since 1997. The results from this study would provide valuable insights to lake managers about the changes in a) surface area, and b) water stored since the gauges have been removed.
Polymer Characterization for Soft-Tissue Fixation Devices
Jonathan Schlotthauer with Dr. Carl Frick
Department of Mechanical Engineering
University of Wyoming
Oral Presentation

Department of Mechanical Engineering Cheyenne, WY

The overall goal of this study was to fabricate and mechanically characterize a high-strength porous polymer scaffold for use as an orthopedic soft-tissue fixation device. Orthopedic soft-tissue fixation devices are used in a wide variety of medical procedures to reattach a torn tendon or ligament to a bone (over 2 million procedures performed in 2011). Currently used devices are either incompatible with medically relevant imaging techniques (most metals) or lack the mechanical strength for soft-tissue fixation (most polymers). Our fundamental hypothesis was that the exceptional strength, stiffness, and toughness of newly developed self-reinforced polyphenylene (SRP) allows for a porous structure appropriate for osteointegration that can match the stiffness of bone, while maintaining suitable mechanical properties for soft-tissue fixation. Powder-press sintering followed by particle leaching was used to fabricate porous SRP specimens containing an average pore size of approximately 400 µm, with systematically varied pore volume fraction from 55 – 85 % vol. Mechanical testing and scanning electron microscopy was used to measure and visualize deformation behavior, and results were critically evaluated relative to existing theory used to describe foams. Results showed that porous SRP matched the stiffness of trabecular bone at pore volume fractions ranging between 75 - 85 % vol.
With growing global demand for olefins, mainly polymerization products used in plastics, the utilization of ethylene to produce higher olefins is of considerable interest and has become a large focus of research. Currently Ziegler-Natta metallocene complexes of Ti, Zr, or Hf are used on an industrial scale. These systems typically have a turnover rate greater than $6 \times 10^4$ TO hr$^{-1}$ g$^{-1}$. Recently Brookhart and Templeton showed that, while nickel and palladium diimine systems are highly active late transition metal catalysts, the platinum analog (diimine)Pt(El)(C$_2$H$_4$)$^+$ only slowly dimerizes ethylene into butenes at $\sim 0.1$ TO h$^{-1}$ at 100 °C. The Roddick group recently showed that the more electrophilic fluorophosphone complex, (dfpe)Pt(Me)(NC$_2$F$_3$)$^+$ (dfpe= (C$_2$F$_5$)$_2$PCH$_2$C-H$_2$P(C$_2$F$_5$)$_2$ ), catalyzes the dimerization of ethylene into butenes at a rate of $\sim 150$ TO hr$^{-1}$ at room temperature. In light of this finding, we have begun a systematic study to determine how sterics and electronics in the general class of complexes (PP)Pt(Me)(L)$^+$ (PP = chelating phosphine) affect C$_2$H$_4$ dimerization and oligomerization activity.

We have found that both sterics and electronics play a key factor in the turnover rate for butane production. By changing our chelating ligand we can control the rate at which turnovers occur. Further investigation in the tuning of the chelating ligands on other metals may lead to higher turnovers.
**Controlling Proteins with Light: Infrared-Light Activated Adenylate Cyclase**

Steven Schoeber with Dr. Mark Gomelsky  
Department of Molecular Biology  
University of Wyoming  
Oral Presentation  

The goal of this research project is to take an already engineered light activated adenylate cyclase and improve its functioning by making it completely inactive in the dark and highly active in the presence of near-infrared light. In doing so, we may be able to optimize a construct which will allow us to control other proteins with light in the future. This will offer many medical advantages such as spatial and temporal specificity in the human body that drugs cannot offer. We will accomplish our goal by mutating the gene which encodes for the protein a few base pairs at a time using random PCR mutagenesis. Once the protein is mutated, we insert it into *E. coli* cells and grow them on solid media containing X-gal. The media that we use allows us to observe the activity of the protein based on the color of the bacterial colony in which it resides. An inactive protein will yield a white colony while an active protein will yield a blue colony. So far, we have been able to achieve a five to six fold activation difference in our infrared light activated adenylate cyclase.

**Mapping and Navigational Control for an Automated Wheelchair**

Dana Schultz and Kathleen Shea with Dr. Steven F. Barrett and Dr. Stanislaw Legowski  
Department of Electrical and Computer Engineering  
University of Wyoming  
Oral and Poster Presentation  

Laramie, WY

Typical powered wheelchairs provide a means of transportation for many with limited mobility. However, the traditional joystick requires full mobility of the hand and wrist in order to be operated safely, leaving those without this dexterity no viable transportation option. “Smart” wheelchairs attempt to fill this hole.

A “smart” wheelchair is a semi-autonomous device; capable of navigating through a person’s home or office with little user-input. “Smart” wheelchairs are designed to work with a variety of interface options, providing those with limited dexterity alternative means to control their wheelchair.

The flexibility and complex design of “smart” wheelchairs have made those currently available expensive. Ongoing research has been aimed at designing a cheaper, alternative control system that could be easily attached to a powered wheelchair. The goal of this project is to determine methods for mapping and navigational control for the wheelchair. The control system acquires data from eighteen sensors and uses the data to navigate around a pre-programmed map. The map is stored on a micro SD card. The control system also provides user interface in the form of a touchscreen LCD. This designed system will be an easy to use and cost effective alternative to current “smart” wheelchair technology.
Continuous delivery of gonadotropin-releasing hormone (GnRH) agonists suppresses sex steroid synthesis in most male mammals. As GnRH agonists are extremely effective in humans, they offer a powerful alternative to surgical orchidectomy for contraception and gonadal steroid-dependent disorders, particularly prostate cancer; approximately 600,000 men were receiving GnRH agonist therapy in 2007 for prostate cancer. GnRH agonist therapy (ADT) for prostate cancer is accompanied by various side effects (e.g., hot flashes), and has recently been associated with an overtly increased cardiovascular risk, an effect that does not appear androgen dependent and has resulted in an FDA warning (10/20/2010). There is also evidence of significant metabolic changes in men following ADT that may be co-factors in cardiovascular disease. This study has been developed to investigate the long-term effects of ADT (provided by constant release deslorelin) in the male rat and determine whether comparable metabolic/weight changes are evident in other species. Our preliminary studies have revealed a highly significant effect of ADT on weight gain, an effect that is not altered by androgen replacement. Following cessation of treatment, weight is rapidly restored, further supporting a specific GnRH agonist-mediated effect. The mechanism involved remains undetermined but our evidence that GnRH affects cardiomyocyte contractility may suggest that effect may be directly on myocytes.

Creation and Evaluation of an anti-Salmonella Bacteriophage Cocktail

Becca Shahi with Dr. John Willford
Microbiology & Molecular Biology
University of Wyoming
Oral Presentation

Salmonella is a bacterium that continues to be a health risk in our world today. A rise in the rate of antibiotic resistant Salmonella isolated from patients has been observed and alternative therapies need to be researched. Bacteriophages are viruses that are host-specific and only attack specific strains of bacteria. In this research, we first isolated and characterized anti-Salmonella bacteriophages from environmental samples. A cocktail of six of these newly isolated phages was created for biocontrol purposes. The cocktail was tested in a broth trial at a multiplicity of infection of 1.0 and 0.1 against Salmonella strain PT30 which demonstrated an elongated lag phase, but not complete clearance of the Salmonella. Despite the lack of full clearance, the developed bacteriophage cocktail shows potential to be an effective biocontrol method.
In Woodsball, a variant of paintball, players form teams and attempt to accomplish various objectives while in the middle of wooded areas. Since the area of play can be vast, team members have the potential to get lost or take a suboptimal route that leads them the longer way to an objective, thus making it hard for strategies to be executed properly. This can be avoided if every team member knows where each other is for the duration of the game. Rather than spending time training members of a team on how to use a map and compass, a more efficient method would be to use a GPS enabled device that can not only track one person’s position but also the positions of the other party members as well. Such a device will use GPS to track its own coordinates and send that same information, using wireless communication, to similar devices. Information received will be processed by a microcontroller and displayed on a screen as dots, giving the player a better sense of where their teammates are, in relation to themselves. Our proposed system will help to prevent players from getting lost and allow for better execution of strategies.

Various Roman Views On the Nature of the Soul
Ethan D. Slaton, Laura Ann Delozier (mentor)
Modern and Classical Languages
University of Wyoming
Oral presentation

This paper examines how three Roman philosophers, Titus Lucretius Carus, Lucius Annaeus Seneca, and Marcus Tullius Cicero explained the relationship between mortality and the human soul. Specifically, this paper focuses on whether the soul is the seat of identity in a human being, whether it is immortal, and whether it is immutable (that is, it cannot be transferred into other bodies than the one in which it first resides). My research draws from book three of Lucretius' De Rerum Natura, selections from Seneca's Epistles and Consolatione Ad Marciam, the “Dream of Scipio” passage from Cicero's De Re Publica, as well as secondary scholarship.

Lucretius, an Epicurean, states that the soul is as mortal as the body. Seneca, a Stoic, states that the soul is everlasting, though sometimes he declares its immortality irrelevant. Cicero, though a Skeptic prone to argue both sides of an issue, states also that the soul is immortal. All three authors agree that the soul is the seat of identity, and that it is thus immutable, inasmuch as it cannot be transferred between bodies.
Sexual dimorphism (distinctive differences between different sexes of an individual species) is observed in every taxa of vertebrates known to date. In the Zebra Finch, the song system is highly sexually dimorphic and testosterone (T) has been found to play an important role in this differentiation. Thus far, the only way to regulate testosterone levels in the zebra finch is through castration. Although castration is helpful, its potential is limited due to age restrictions and an “all or nothing effect”. By the time castration is possible in young birds, the song system is already mostly developed. Deslorelin is a gonadotropin releasing hormone (GnRH) agonist, which acts by blocking the production of T in the body. Deslorelin has not yet been tested on birds, thus its efficacy in birds is unknown. In this experiment, Deslorelin will be implanted into the birds via a very small subcutaneous implant. The mass, endogenous T levels, skeletal muscle mass and bone mineral density of the birds will be measured. T levels will be measured using a blood draw and a Dual Energy X-ray Absorptiometry (DEXA) scan will quantify the remaining parameters mentioned. Additional data will be collected from the brain and production of song.

Vacuum-tube Preamplifier Design for RIAA Equalization and Solid-state Design for Sound Comparison
Charles Smith with Dr. Stanislaw Legowski
Department of Electrical Engineering
University of Wyoming
Oral and Poster Presentation
Casper, WY

Interested in analog audio electronics, I will build a preamplifier for my senior design project. This device is necessary for playback of frequency information contained in the grooves of 33 \(\frac{1}{3}\) rpm records which is “read” and converted into electrical signals for transmission to the power amplifier. Higher frequencies require smaller groove modulation while lower frequencies require larger groove modulation. This difference caused two related problems: excessive modulation at low frequencies which resulted in high frequencies buried in surface noise.

Recording engineers filtered the signal to reduce the amplitude of low frequencies and increase that of high frequencies and the Recording Industry Association of America endorsed a standard re-emphasis filter for playback of recordings. This filter was called a preamp and was built into stereo devices at the time. Higher-quality vintage products are still in demand and newer brands continue to build preamplifiers. Vacuum-tube models, which their makers claim provide superior sound, can cost between $1,000 and $40,000 or more. I will attempt to design a preamplifier with sound output as close to these as possible and will also construct a second preamplifier using solid-state devices for comparison of sound quality between the two.
Namasté Yoga and Massage Therapy
Jessica Snell with John Dick
Assistant Director at the Wyoming Technology and Business Center
University of Wyoming
Oral Presentation

This study has focused on the necessary steps of research that would go into starting a business built around bringing yoga and massage therapy into the workplace. It has addressed the problem, my solution, the customer, the market, the competition, marketing and sales, a revenue model, cash flow projections, and the next steps. Namasté Yoga and Massage Therapy is a business to business service that offers employers an alternative wellness option for their employees. Stress is one of the most cited sources of complaint in the workplace, and can quickly lead to more serious health risks down the line. When a company begins offering an employee benefits program that brings in massage therapy and a regular yoga practice to the work place, employers are not only taking care of their employees’ health, but they are instituting preventative measures that will lead to lower insurance costs and reductions in claims in the future. For employer and employee alike, benefits like these are substantial and could be expanded through this business.

La revista de estudios sobrenaturales (The Journal of Supernatural Studies)
Kathryn Snyder with Dr. Emily Hind
Spanish
University of Wyoming
Oral Presentation

My senior project consists of a compilation of works dealing with the supernatural, in particular zombies, demons, and vampires. All of the papers are written as non-fiction and deal with various topics such as discrimination against zombies, demon sightings, and the evolution of the vampire species among others. For my project I researched various supernatural creatures as well as techniques for new writing styles including transcriptions and screenplays; each of the pieces is written in a different style. One composition also involves a literary analysis of three major vampire novels: Dracula by Bram Stoker, Interview with the Vampire by Anne Rice, and Twilight by Stephenie Meyer. My final project includes five works written in Spanish, presented in the format of an academic journal, as well as English translations of those works.
Writing is a passion I have had ever since I was in elementary school. Because of this, I decided my senior honors project would be a creative writing project. I read a variety of books for this project that I chose from a list my mentor provided. As I read, I studied how the various authors conveyed their messages—I took notes on each text. This project lead me to research the career of an author. I looked into information about the publishing process. Furthermore, I looked to authors I admire to obtain advice and to inspire me when I encountered writers block.

In addition to my research and reading, I started writing my own book. I outlined novel ideas and wrote scenes for a book that I plan to finish in the future. With my mentor, I worked on improving my writing at the sentence level. My ultimate is to become a published author of young adult fiction novels. This project has given me the knowledge and foundation in writing fiction that I need to be successful.

Carbide Nanowires as Fuel Cell Catalysts
Jack Stacy with Dr. Brian Leonard
Chemistry
University of Wyoming
Oral and Poster Presentation

I, along with the rest of the Leonard Research Group, am attempting to synthesize bimetallic carbides for use as catalysts in Proton Exchange Membrane (PEM) fuel cells. PEM fuel cells convert fuel (usually H₂) into energy by separating protons from electrons, running protons through an electrolyte membrane, and running electrons through a circuit outside of the cell. The protons and electrons reunite on the other side of the cell and combine with Oxygen to create the clean byproduct of water. The field of PEM fuel cells is a promising one in terms of replacing the environmentally damaging industry of fossil fuel consuming internal combustion engines (the automobile industry). However, Platinum is the current catalyst for fuel cells (the substance used to split the electrons from the protons), and its high price is preventing PEM fuel cells from becoming economically viable options. Our research focuses on creating cheaper Carbide catalysts that possess equal or superior catalytic efficiency to that of Platinum.
An Experimental and Theoretical Study of Flows in a Twin-Screw Extruder for Vehicular Hydrogen Storage
Talysa Stockert with Dr. Yuan Zheng
Department of Mechanical Engineering
University of Wyoming
Poster Presentation

McNair Scholars Program
Greybull, WY

This study will investigate the transportation of Low Density Polyethylene (LDPE) (a surrogate material for ammonia borane, NH$_3$BH$_3$, as a hydrogen storage material) using a co-rotating twin screw extruder. The implications will be used of the fuel transportation for a vehicle equipped with a hydrogen fuel cell. The objective of this study experimentally and theoretically assesses the functionality of the extruder for transporting the hydrogen storage material of ammonia borane. This material will be in need of transportation to and from the hydrogen extraction component of a vehicle for the generation of electrical energy within the hydrogen fuel cell. In this study, we will establish theoretical relationships for the flow of the co-rotating twin screw extruder then develop experimental procedures from the resulting variables parameters. The development of a functional transportation mechanism for ammonia borane to the hydrogen extruder may create or improve the hydrogen fuel cell’s adaptation in to commercial use.

The anti-cancer effects of the *Ganoderma lucidum* and *Lentinula edodes* mushrooms.
Carolyn Swift with Dr. Daniel Tinker (Botany)
Biology
University of Wyoming
Oral Presentation

UW Honors Program
Cheyenne, WY

Mushrooms have been used in Chinese medicine to treat cancer for many centuries; however, it is only recently that scientists all over the world have begun to fully understand the capabilities of these mushrooms. Both *Ganoderma lucidum* (the reishi mushroom) and *Lentinula edodes* (the shiitake mushroom) have now shown, in experiments, the capability to induce apoptosis, cell cycle arrest, and prevent metastasis among different cancer types. Most notable of the effects of these mushrooms is macrophage activation, stimulating the patient’s immune system to effectively fight the malignant cells. However, little analysis has occurred as to whether or not these mushrooms are able to successfully and completely replace chemotherapy. By analyzing current research to discover the pathways and mechanisms these mushrooms operate through, it can be determined if the reishi and shiitake mushrooms posses the ability to cure cancer. After careful research and analysis, it is evident that more clinical trials are needed. However, these two potent mushrooms will be able to replace chemotherapy and radiation as an alternative cancer therapy without any of the complications and side effects of chemotherapy and radiation.
Effect of Autophagy on Primary Prion Infection
Carissa Tasto with Dr. Hermann Schatzl
Veterinary Sciences
University of Wyoming
Oral Presentation

Prion diseases are infectious fatal neurodegenerative disorders, affecting multiple species. Prion diseases are caused by a normal prion protein (PrP\(^{c}\)) native to the body, which becomes misfolded to form a pathological isoform (PrP\(^{Sc}\)) that aggregates resulting in disease. A cellular process known as autophagy has been discovered by us to aid in the clearance of this protein. It was also found that infected cells react to primary prion infection by transient up-regulation of autophagy. This let us to conclude that basic autophagy in cells might be a cellular co-factor for primary and possibly persistent prion infection. To test this assumption we infected mouse embryonic fibroblasts (MEF) deficient in autophagy (MEF -/- Atg5) with prions and compared prion propagation to that of wild-type (MEF wt). In addition, we infected MEFs in which we had reconstituted Atg5 expression by lentiviral transduction. These studies showed that cells deficient in autophagy are significantly hampered in cellular prion propagation. We hypothesize that basal autophagy is needed for primary prion infection in cells.

Polarization and Moderates in the American Political Aggregate
Zachary Taylor with Dr. Andrew Garner
Department of Political Science
University of Wyoming
Oral Presentation

It is widely accepted that polarization is occurring in America. However, the exact nature and extent of this polarization is constantly in question. Empirical research has returned results ranging from practical denial to full support to case specific. The examination of polarization in the mass public creates an image of the moderate voter who varies little from the center but is presented only with polarized choices. This project will review the evidence previously put forth on elite polarization and the trickle-down effect with the masses. It will also establish the difference between consistent moderates and inconsistent moderates, which builds off of the Pure and Leaning Independents, and the theoretical impact of these definitions on data collection. Finally, through an ideology skim of issues, it will seek to confirm the existence of bimodal Moderates as a major influencing force in today’s politicized America. The data reveals a different story from the popular image: Moderates constitute more than half of the American electorate and defy the conventional identifiers of uninformed and disinterested.
**Sensorimotor Integration in Service of Behavioral Learning: Effects of Altered Auditory Feedback on Vocal Output in Songbirds**

Juliann Terry with Dr. Jonathan Prather
Department of Zoology and Physiology
University of Wyoming
Oral Presentation

Human speech is an example of a learned behavior where speakers check for accuracy and modify performance by comparing their auditory feedback to a template goal. Maintenance of speech relies on continued comparison of auditory feedback as shown by speech deterioration with hearing loss. The integration of sensory motor signals in speech and its disorders is important in the understanding of neural circuits that encode those processes. Songbirds are an established model of human speech learning. Bengalese finches were used to examine the specific changes in vocal output associated with specific features of altered auditory feedback. They were placed in sealed chambers with controlled atmospheric conditions (20-80 oxygen to gas) to alter the speed of sound, and thus auditory feedback. Birds remained in the altered and normal atmosphere for 24 hours while songs were recorded using Sound Analysis Pro. The sequence of the songs and the formant ratio of stacked notes (frequency) were analyzed for changes in each medium. Heliox atmospheres increased the speed of sound, and sulfox decreased the speed of sound. Preliminary results show that altered auditory feedback has facilitated changes in both sequence and frequency of vocal output in Bengalese finches.

**Mapping wheat growth in dryland fields in SE Wyoming using Landsat images**

Matthew J. Thoman1 with Dr. Ramesh Sivanpillai2
1. Department of Ecosystem Science and Management and 2 Department of Botany
University of Wyoming
Oral Presentation

Zoning fields and crops is a pre-requisite for strengthening precision agriculture practices. Remotely sensed data collected by Landsat satellites can be used for monitoring crop growth and consistency within and between growing seasons. Information quarried from monitoring can be used to delineate management zones within a field. In this study Landsat images acquired in 2007 and 2009 were used to monitor wheat growth in several dryland fields in SE Wyoming. Results from this study reveal the patterns of wheat growth in these fields. This presentation will highlight the potential and limitations of Landsat data for monitoring wheat growth and developing management zones.
One of the largest issues currently in the agriculture sector is communication with the public. Farmers and ranchers have pride in the service they provide their fellow man but most consumers are so far removed from production that they may not understand or appreciate the service being provided. This disconnect between the producers and the consumers is proving to be problematic and potentially costly for both parties. Farmers and ranchers are being criticized for their practices but refuse to discuss what they are doing; consumers are doing the criticizing and may not necessarily be making “educated” choices. What is being done to change the public’s perception of agriculture?

This senior project takes a look at scientific studies that have measured information transfer, polls, public comments and discussions, personal experience through meetings and conventions, as well as looking at what agencies such as the National Pork Board and National Corn Growers Association are doing to address public concerns and questions. Awareness of the issue has been raised and information transfer is slowly improving, but is it enough? Adaptation is the key to survival, now consumers and producers must adapt and work together in order to understand the role they both play.

The short story is an often underestimated form of literature. By using certain writing strategies, the short story can be utilized as an effective tool to represent the cultural confusions of a modern, globalized, and increasingly digitized America. The short stories of Dennis Johnson, William Gay, and Melanie Rae Thon, all written in a culturally transitional period in modern America, have surprisingly similar themes of human redemptions and connections despite their disjointed narratives, characters, and settings.

The project was a combination of research-based, analytical, and reflective writing along with personal creative writing in the form of short stories based on the research conducted throughout the semester. Both the analytical and creative aspects of the project were product of an extensive exploration of short stories written by the selected authors that stylistically create complex and disorienting versions of reality in their short stories that reflect the disorienting culture of a modern America.
Growing MnOₓ Thin Films on Ruthenium (0001)

James Thorne with Dr. Jing Zhou
Department of Chemistry
University of Wyoming
Oral and Poster Presentation

EPSCoR Whitehall, MT

Manganese oxides are materials of interest in a variety of applications including heterogeneous catalysis due to their rich structural, electronic and magnetic properties. Ultrathin manganese oxide films can exhibit unique physical and chemical properties compared to their bulk counterparts due to the reduced dimensionality. In this paper, we focus on the detailed study of the growth of well-ordered manganese oxide films in the nanometer range and the fundamental understanding of their surface structures. MnOₓ films were prepared on Ru(0001) at 700 K by vapor-depositing Mn in the presence of O₂ under ultrahigh vacuum conditions. During the growth, Mn coverage and oxygen pressure can be controlled. At sub-monolayer coverage, two-dimensional individual MnOₓ islands are formed on Ru with a diameter of ~1.0 nm and a height of ~0.2 nm. X-ray photoelectron spectroscopy data suggest that these manganese oxide islands contain Mn²⁺ as the predominant species.
Quantum Dot Sensitized Solar Cells
James Thorne with Yongqi Liang and Bruce Parkinson
Department of Chemistry
University of Wyoming
Oral Presentation

School of Energy Resources, Nielson Fellowship Whitehall, MT

My research was focused on new type of photovoltaic solar energy conversion device that has the potential to be scaled rapidly to large areas at low cost. The device consists of a low-cost high surface area large band gap semiconductor, such as titanium dioxide or zinc oxide that does not absorb solar energy, covered by a material that absorbs a large fraction of the solar energy. Small semiconductor particles, called quantum dots (QD) have been introduced as a solar absorber material, or sensitizer. The absorption properties of QDs can be controlled by varying the size of the particle, making QDs particularly interesting. QDs such as PbS or CdSe were used for these experiments with a ZnO semiconductor. CdSe has been successfully used to sensitize ZnO and PbS has shown promise. The stability of the QDs in solution has also been an area of interest as it relates to the amount of QDs capable of binding to the ZnO surface. In particular for CdSe we have been able to improve this stability.

Microfinance and Capital Flight in Africa
Laura Vanatta with Dr. Anne Alexander
Department of Economics and Finance
University of Wyoming
Oral Presentation

UW Honors Program Cheyenne, WY

While microfinance often carries with it the hope of money flowing into a community, staying in that community, and developing it, this study analyzes the possibility of microfinance creating a macroeconomic environment which encourages capital fleeing that country. This analysis of thirteen African countries discusses the potential that microfinance holds as a strong agent for development or conversely, as an agent which increases the risk of opening capital markets and causing money to flood out through capital flight. The development of this econometric model uses classical developmental economic theory and monetary theory as its guide. The rise of interest in microfinance as a method for welfare development has gained a great deal of popularity in recent years, yet, the effects on the long-term goal of macro stability and development have not been as obvious due to the numerous variables in the macro environment of an African country. An in depth analysis of other macroeconomic factors is needed for stronger results but is beyond the parameters of this study. Nonetheless, it is evident that a correlation does exist between the presence of microfinance and capital flight.
Chronic Wasting Disease (CWD) is a neurodegenerative affliction, initially resulting in progressive weight loss and ataxia, and proving invariably fatal. It spreads by infection with prion proteins and therefore, it can neither be treated, nor vaccinated against. Currently, its occurrence is limited to cervids, such as farmed or wild deer and elk. However, there exists a common fear that it may jump species, from cervids to bovines. Should it ever enter the domestic cattle population, the economic impact would be tremendously deleterious, to say nothing of the further effects, were this incurable, untreatable, “unvaccinable” disease to cross the species barrier to humans. There is a fair amount of information suggesting either that such events are all-but-impossible, or that such events are likely, even inevitable. My senior project will analyze the merits of both views. That analysis consists of a determination of the current density-dependence of the disease, focusing on the ease of horizontal and or vertical-transmission. In a more pointed approach, studies have been performed, wherein CWD has been introduced to isolated bovine populations, with the intent of monitoring the potential degeneration of said populations. Additional studies have involved the infection of transgenic “humanized” mice, with the CWD causative protein.

“Role of Turkish Foreign Policy in the Middle East under the Justice and Development Party”
Roxanne Vigil, Dr. Marianne R. Kamp
Department of History
University of Wyoming
Poster and oral presentation

Since the Justice and Development Party (AKP) has come to power in 2002, Turkey’s foreign policy has changed its relations with the Middle East. Turkey is becoming a significant player in all regions of the world because it has taken on the role of mediator between western-centered States such as Israel and Shia-centered States such as Iran. Moreover, its reputation as a functioning Islamic democracy is a model for Egypt who is currently going through a leadership and government revolution.

The focus of this paper is to discuss Turkey’s foreign policy toward Israel, Iran and Egypt under the AKP party and discuss Turkey’s diplomatic role as mediator in guiding the actions of Israeli, Iranian and Egyptian governments. Turkey’s foreign policy and the major events that have shaped relations with each country will be discussed in order to understand the level of diplomatic power the AKP has obtained. The foreign policies and actions that the AKP have developed since elected have allowed it to balance relationships with the world and given it the power to dictate rules within Middle Eastern issues because of its popularity among these countries who have invested interests in the ideals and goals of the AKP.
The relationship of feed efficiency and visceral organ size in growing lambs fed a concentrate or forage-based diet

Rebecca Vraspir with Dr. Allison Meyer
Department of Animal Science
University of Wyoming
Oral Presentation

College of Agriculture and Natural Resources
Emerson, NE

We hypothesized that some individual differences observed for feed efficiency can be attributed to gastrointestinal tract size, which would vary based on diet. Wethers (n = 77) were fed a concentrate (CONC) or forage-based diet (FOR) for 49 d and individual intake was measured to determine feed efficiency (RFI). The 20% most (low RFI) and 20% least (high RFI) efficient lambs from each diet were slaughtered, and viscera was dissected and weighed. Data were analyzed as a 2 x 2 factorial of RFI class and diet type. No RFI class x diet type interactions were observed. Low RFI lambs tended to have greater (P = 0.09) pancreas and spleen mass than high RFI, although RFI class did not affect (P > 0.15) other organ mass. Lambs fed FOR vs. CONC had greater (P ≤ 0.01) actual (g) and proportional (g/kg BW) reticulum, omasum, large intestine, and kidney mass and tended to have greater (P ≤ 0.09) actual and proportional small intestine mass. Lambs fed CONC had greater (P ≤ 0.05) rumen, heart, liver, and proportional rumen mass than FOR. Results of this study suggest that visceral organ size in lambs is more affected by diet type than individual feed efficiency.

Bimetallic carbides as fuel cell catalysts
Greg Waetzig with Dr. Brian Leonard
Department of Chemistry
University of Wyoming
Oral and Poster Presentation

Department of Chemistry
Gillette, WY

In the last 20 years, transition metal carbides have been investigated as replacement materials for noble metal catalysts. Because the starting materials for the synthesis of metal carbide compounds are inexpensive and abundant, and the reactivity and stability of the catalysts are both suitable, it is possible that these carbide materials can replace noble metal catalysts in fuel cell applications. Moreover, the carbide catalysts are expected to constrain carbon deposition and poisoning, therefore increasing the stability and reactivity of the catalyst. We are investigating a variety of bimetallic carbide catalyst materials as possible replacements for platinum. Carbides have very high melting points which makes them difficult to synthesize as high surface area nanomaterials. To circumvent this problem, we use salt flux reactions to transport the metal from the bulk material to the carbon source. This technique allows for composition control and manipulation of electronic and geometric properties of the catalyst.
Many musicians prefer to enhance the sound of their instrument by using effects processors to modify the sound in such a way as to produce new and interesting sounds. The goal of this senior design project is to create a device to modify the sound of the human voice to produce a sound similar to multiple vocalists singing different vocal harmonies at the same time. The device is intended to work in a professional audio setting using microphones and audio mixers. The device is also intended to work in a real time setting with no noticeable delay in the audio output. Other design considerations include scaling the input vocal signal while retaining a correct formant shape and harmonic scaling, and reducing the amount of distortion created from the audio processing. The final design consideration is that the device needs to be familiar to existing products and needs to be easy for the user to use. Many vocal effects processors are commonly used to create delay and reverb but few include the function of creating additional voices. This device is intended to enhance the sound of a vocalist by producing these extra vocal tracks with limited number of vocalists.

Impact of diet reduction in obese ewes during early pregnancy on placentomal type and cotyledonary vascularity in the ewe
Tori Walsh with Dr. Stephen Paul Ford
Center for the Study of Fetal Programming
University of Wyoming

An ovine model of over-nutrition during pregnancy is currently in development at the Center for the Study of Fetal Programming at the University of Wyoming. In 2007, an estimated 54.5% of women of childbearing age (20-39 years) are overweight or obese. This model examines the effects of maternal obesity on the health and lifespan of the offspring. Sheep were used to examine these health risks and effects, as fetal development sheep and humans is similar. In the sheep, the nutrient transfer site of the placenta is called a placentome, with both a fetal cotyledonary (COT) and a maternal caruncular component. Obese and control fed ewes were necropsied at day 135 of gestation and placentomes collected. The COT vascular bed of Type A placentomes from each ewe was perfused with a latex medium and the resulting vascular cast examined via a 3-D Scanning Electron Microscope. This allowed us to obtain an accurate measurement of COT vascularity to estimate group differences in blood flow and therefore nutrient transfer from maternal to fetal tissues. These data will be used to understand the impacts of maternal obesity on placental vascularity which may contribute to deprecating health effects of offspring later in life.
Cryogenic Composite Fuel Tank Design
Tal Wammen with Dr. Rob Erikson
Civil Engineering
University of Wyoming
Oral Presenation

EPSCoR

The research conducted investigates the structural and mechanical properties of composite materials to be used in cryogenic fuel tank designs. First, the characteristics of different composite materials are discussed in comparison to present day metallic materials, while particular composites are then studied subsequently. Specifically, glass/polyester and carbon/epoxy composites are examined to show the effects that extremely low temperatures have on the mechanics and structural integrity of the material. The information in this project was obtained through research found in open literature, as well as experiments performed by other sources of academia. Furthermore, this research was conducted under the guidance of Dr. Rob Erikson of the University of Wyoming and Pamela K. Strong, an expert in material engineering and Technical Fellow of United Launch Alliance.

ALTERED CLAYS AT LOST CREEK MINE AS A SPATIAL CONSTRAINT FOR URANIUM DEPOSITS
William White with Dr. Susan Swapp
Department of Geology and Geophysics
University of Wyoming
Poster Presentation

McNair Scholars Program
St. Ansgar, IA

This study will examine whether crystal lattice alterations in clays taken from drill cores from in front of and behind the roll-front deposit at Lost Creek ISR uranium project correlate with the location of the uranium deposits. This study will also look at swelling clays from the core samples to determine possible lixiviant choices. The objective of this study is to determine if altered and unaltered clays spatially constrain the location of the nose of the roll-front (the actual location of the economically valuable ore deposit). To accomplish the goals of this study, samples are taken from cores drilled in front of, behind and through the nose of the roll-front. Samples are crushed, clays separated and then analyzed using x-ray diffraction. If systematic variation in clay mineralogy with position relative to the ore body can be recognized, these observations could be valuable in both exploration for and exploitation of roll-front type uranium deposits in Wyoming.
Developing a Theory on Quality Music Using American Popular Music
Ben Wiebers with Jeremy Weaver
Honors Program
University of Wyoming
Oral Presentation

Music represents a significant component of culture yet is difficult to objectively study. Several theories exist regarding quality in music, but none accurately describe all aspects of a song. Due to the importance of music within American society, a method must be formulated in order to understand what makes quality music and conclude how well a song reaches its societal goal. Criteria are utilized to capture the full effect of listening in order to determine quality. These criteria are: Emotional stimulation, intellectual appeal and understanding of musicality. Combined, they create a working theory, by which given songs can be objectively studied to determine the level of their quality. Using a list of Grammy "Song of the Year" winners, the theory tested. The results showed that the data set did not display a true, uniform standard of quality and limitations were found within the criteria, but also that the experiment contained consistency of testing between criteria for individual songs and that 53% of the data set meeting the quality mark. This consistency and majority success rate for songs shows the successful application of the experiment in determining song quality.

The State of Special Education in the United States
Michelle Winthrop with Dr. Michelle Jarman
Wyoming Institute for Disabilities
University of Wyoming
Oral and PowerPoint Presentation

Special education has a very brief history in the public school systems in the United States. Beginning with the passage of the Individuals with Disabilities Education Act (IDEA) in 1975 and resulting policies such as free and appropriate public education (FAPE) in a least restrictive environment (LRE), special education has become a platform for giving all children the opportunity to receive a quality education to the best of their abilities. These groundbreaking ideas brought literally millions of new learners into the public school system and created a whole new category of learner to be educated.

Through my research of and participation in directing special education classes it seems that practices and theories surrounding special education can be both conflicting and confusing. Additionally, many practices within the discipline, while endeavoring to create optimal learning conditions for these students, also serve to segregate and stigmatize students with disabilities. My research aims to identify and address these issues while also providing different ways of viewing the topic of special education on the whole. Research in this field and well as my personal observations of the special education environment will serve as supports for my alternative ideas and opinions regarding this important topic.
An Analysis of Plants Traditionally Used by Plains American Indians as Topical Antiseptics for Antimicrobial Effectiveness
Shana M. Wolff with Anne Wolff
Microbiology
University of Wyoming
Poster Presentation

UW Honors Program

The purpose of this study was to examine the effectiveness in the laboratory of Plains Indian plant remedies traditionally used as topical antiseptics to prevent or treat infections of the skin. Thirty different medicinal plants that Plains Indians used as antiseptics found growing in southeast Wyoming were tested. Extracts of each plant’s fluids were filter sterilized, and then tested against nine different bacteria and one yeast. I concluded that 50 percent of the native plants isolated from southeast Wyoming that were historically used by Plains Indians as topical antiseptics did exhibit some antimicrobial properties in vitro.

Elucidating the function of the novel protein PHA-1 in C. elegans pharynx development
Olivia Wolpert with Dr. David Fay
Department of Molecular Biology
University of Wyoming
Oral and Poster Presentation

UW Honors and INBRE Programs

lin-35 is a conserved gene found in both Caenorhabditis elegans’s growth/development and humans’ tumor suppression pathways. One such pathway is involved with the formation of the C. elegans pharynx, along with the gene pha-1. Though important, pha-1 is of unknown function. Using the yeast two-hybrid assay and co-immunoprecipitation, protein interactions can elucidate pha-1’s function in organ formation/disorders and thus contribute to the overall understanding of lin-35. In the yeast two-hybrid assay, a PHA-1::LexA “bait” is used to reveal interactions with a “prey” cDNA library::GAD-HA fusion through reporter expression. The second approach using Co-IP exploits an integrated PHA-1::GFP fusion in worm lysate and anti-GFP antibodies conjugated to beads. The yeast-two hybrid “bait” construct was found to be self-activating, a property to be addressed with the inhibitory compound 3’AT. The same construct was then found to be 20 kDa too small, despite sequence-verified ORFs and codon frames. Current work using a His-tag is exploring the size discrepancy. Work with Co-IP has shown successful application of the primary antibody to be elusive; optimization of the antibody requires further attention. Despite inconclusive results, the foundation has been laid to continue working with the assays towards obtaining an understanding of potentially therapeutically important pathways.
**Self-Determination Theory and Coaching Styles**  
David Woodard and Dr. Tucker Readdy  
Kinesiology and Health  
University of Wyoming  
Oral Presentation

Understanding athletes’ motivation is the key to unlocking success in sport. Self-Determination Theory (Deci & Ryan, 1985) can be used to describe the nature of the coach-athlete relationship as well as the methods coaches can use to encourage athlete motivation. In short, Self-determination Theory suggests that when an individual’s basic psychological needs of autonomy, competency, and relatedness are met during an activity, greater intrinsic motivation will occur, helping to produce optimal performance outcomes. The purpose of this project was to identify relevant research on Self-determination Theory, coaching styles and, athlete motivation. A literature search using identified about 100 articles that examined the coach-athlete relationship in the context of sport and exercise; further examination resulted in about ten articles met the specific criteria for the project. Overall, results consistently show that coaches who embrace an autonomy-supportive style as opposed to a controlling style better foster and develop athletes basic psychological needs and self-determined motivation. Thus, coaches should employ specific strategies implied by Self-determination Theory to effectively enhance athletes intrinsic motivation, including providing rationale for athletes’ tasks, providing athletes with meaningful choice, and using non-controlling feedback.

**Zombies, plagues, and bioterrorism: Human preparation and resilience in times of pestilence**  
Jenna E. Woodard with Linda E. Johnson  
Department of Nursing  
University of Wyoming  
Oral and Poster Presentation

Running rampant throughout the ages, such scourges as the Black Death, smallpox, Spanish flu, and Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome have wreaked havoc upon populations and entire social systems. Studying how nations prepare for and react to compromised public health provides a guideline for appropriate provisions to impending pandemics in the future. With the accelerating societal and technological advances occurring today, pandemics have a greater capacity to leave a population maimed and society restructured.

In examining the development of diseases throughout the centuries, it may be argued that humans have, yet again, set their species up for a pandemic. What if this next disease bent on killing the human populace is not one we have encountered before? What if the emerging pandemic is of more obscure and morbid origins?

Zombiism has infected nearly every aspect of popular culture, stealing the hearts of many avid survivalists and science-fiction connoisseurs alike. Predicted to be transmissible through droplets, bodily fluids, or another mode of transmission yet unknown, we are left to wonder if preparations by the United States and the world would be enough to ward off the undead. If zombiism were to manifest in reality, infiltrating society as so many other plagues have done before, it would not be the hearts of mankind that we worry about, but their brains.
My research project about CO₂ capture over the solid sorbents is to measure the adsorption capacity and regeneration property, over a range of low temperatures, of the alkali metal-based sorbent K₂CO₃, which is supported on the nano-structured porous material AlOOH. Due to the economic and energy consideration, this chemical adsorption method was chosen over the preference of other conventional technologies, such as membrane separation. The process of CO₂ capture goes under a simple chemical reaction K₂CO₃ + CO₂ + H₂O = 2KHCO₃. The characteristics of the nano-porous supporting material providing a high contact surface area for CO₂ to react with K₂CO₃ essentially enhance the chemical adsorption capacity. Moreover, the potassium bicarbonate decomposes easily at a relatively low temperature, which, consequently, reduces the amount in energy consumption. In all, this project confirms a theoretically feasible way of eliminating CO₂ from the post-combustion flue gases, and designs a low-energy consumption inorganic solid sorbent.