



*May 2, 2009*

## **Student Abstracts**

**Abstracts are in order by last name of presenter with the exception of the first abstract for the Civil Engineering Groups**

**Oral Presentations: Classroom Building,  
University of Wyoming Campus  
1:00 – 5:30 PM**

**Poster Presentations: Family Room, Wyoming Student Union  
4:30 – 6:30 PM**

### **Program Acronyms:**

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

**INBRE:** IDeA Networks for Biomedical Research Excellence

**WySTEP:** Wyoming Science Teacher Education Program

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Lillian Wise, UW Honors Program*

### **Moderators for the Oral Presentations**

*Paul Bergstraesser  
Thomas Edgar  
Carol Frost  
Rod Garnett  
H. Gordon Harris  
Barbara Logan  
Stanislaw Legowski  
Catherine Li  
Clifford Marks  
Shawna McBride*

*Kathleen McKinney  
Carlos Mellizo  
Scott Morton  
Diane Panozzo  
Christopher Rothfuss  
Heather Rothfuss  
Scott Seville  
Mark Stayton  
Joseph Stepans  
Jeff Van Baalen*

### **Engineering Judges**

#### **Chemical Engineering**

*David A. Bell, Associate Professor, Department of Chemical and Petroleum  
Engineering, University of Wyoming  
John E. Meyers, Adjunct Professor, Department of Chemical and Petroleum  
Engineering, University of Wyoming  
Brad Pate, HICO, Casper, Wyoming*

#### **Computer Science**

*Pat Malone  
Josef Pohl*

### ***Electrical and Computer Engineering***

*Mark J. Balas, Professor and Head of Electrical and Computer Engineering  
Department at UW*

*Irena W. Stange, Institute for Telecommunication Sciences, US Department of  
Commerce (NTIA), Boulder, Colorado*

*Barry A. Mather, University of Colorado at Boulder, Ph.D. student*

*Andrew A. Catellier, Institute for Telecommunication Sciences, US Department of  
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### ***Mechanical Engineering***

*Don Smith – Professor Emeritus of Mechanical Engineering, Laramie.*

*Naomi Morton Knight – Principal of Knight Technologies, Inc. Gillette.*

*Steve Turner – President, Analogic Engineering. Laramie.*

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***Most important, we thank all of the students and their faculty mentors. Students participating in Wyoming Research Day represent the very best and brightest of UW and the Community Colleges. Without the support and encouragement of dedicated UW and Community College faculty these exceptional students would not have the opportunity to do independent research in such a wide array of exciting areas...we thank you!***



## Dam Alternatives for North Laramie Pumped Storage and Water Supply

### Design Team 1

Steve Hunter

Steve Miller

Christopher Schultz

Aspen, CO

Laramie, WY

Laramie, WY

### Design Team 2

Jeremiah Irick

Jessica Klien

Ashley Roland

Christine Rumsey

Mountain View, WY

Shoshoni, WY

Hemingford, NE

Laramie, WY

### Design Team 3

Jake Edmunds

Loren Eldridge-Looker

Marcus Krall

Jeremy Quist

Meridan, WY

Aurora, WY

Torrington, WY

Sheridan, WY

### Design Team 4

Jeb Bell

Andrew Edstrom

Derrick Thompson

Casper, WY

Centennial, CO

Craig, CO

Faculty Mentor: Thomas Edgar  
CE 5820 – Design of Small Earth Dams  
Department of Civil and Architectural Engineering  
University of Wyoming  
Oral Presentations

A feasibility study has been performed to determine if a site north of Laramie would be suitable for an off-channel pumped storage dam and reservoir. Each team is designing an earth dam based on the site's local hydrology and geotechnical characteristics. The design includes considerations for water routing, outlet works and spillway design.

This course is one of several capstone design courses in the Department of Civil and Architectural Engineering. The capstone design is to synthesize information from prerequisite courses into a significant design effort. In this course, the background information comes from Geotechnical Engineering, Hydraulics, Hydrology and Economics.

## **Tagging RAB1A with the Fluorescent Protein, CFP, to Test for Localization in Growing Maize Cells**

Evan Abbaszadeh with Dr. Anne Sylvester  
Molecular Biology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Gillette, WY*

RAB proteins are involved in trafficking vesicles within a cell; they are vital to the growth and development of cells. In maize, the genetic sequence of RAB1A is similar to that of RAB2A and the proteins have been found to function together in non-plant systems in a specific sub-cellular location. However, plant RAB1A and RAB2A may have acquired additional functions to accommodate expansion of plant cells during growth. To test the hypothesis that ZmRAB1A co-localizes with ZmRAB2A and function together during cell expansion in new locations in the plant cell, ZmRAB1A will be tagged with the fluorescent protein CFP, allowing visualization under fluorescent and confocal laser scanning microscopes.

Using a PCR method called triple template PCR (TTPCR), the fluorescent protein, CFP, was placed within the full length ZmRAB1A gene, containing introns and native promoters. *E. coli* was then transformed with a vector containing ZmRAB1A-CFP. The plasmid was then purified from positive *E. coli* colonies, confirmed by a restriction digest, and sequenced. ZmRAB1A-CFP will now be used to transform *Agrobacterium*, where the gene can then be transformed into maize. Maize plants containing ZmRAB1A-CFP will then be raised, studied, and crossed with ZmRAB2A-YFP plants for further study.

## **Power Spy: An Expandable Power Monitoring System for the Home**

Andrew Adams, Nick Mahoney, and Travis Kinney, with Dr. Stanislaw Legowski  
Department of Electrical and Computer Engineering  
University of Wyoming  
Oral and Poster Presentation

*Electrical and Computer Engineering*

*Cheyenne, WY, Green River, WY, Arvada, CO*

Current concern about the cost of energy has caused many home owners to examine their own energy use. At the basic level, a homeowner may track their energy consumption simply by way of the monthly electric bill. While this technique is useful for an overall view of household electric use, it is difficult to identify specific high consumption areas. Some current products only allow energy measurements to be displayed near the outlet. In the case of a refrigerator, for instance, these types of products are less than ideal.

Our design for an expandable power monitoring system is meant to address the aforementioned issues. The design consists of at least two separate devices known as a Meter and a Base. The Meter is designed to be used between a standard wall outlet (115V 15A) and an appliance or other electrical device. The Base is a storage and interface device which collects data wirelessly from several Meters and serves as an interface to a personal computer. Our goals in designing this system were that it be compact, easy to use, and as cost effective as possible. It is clear from our research that a future design will require various improvements.

## **Prototype Wind Turbine Tower Crawler**

Tyler Adrian David Atwood, and Alex Mackay with Dr. Dennis Coon and Mr. Scott Morton  
Department of Mechanical Engineering  
University of Wyoming  
Oral and Poster Presentation

*Department of Mechanical Engineering*

*Fort Collins, CO, Cody, WY, Casper, WY*

With the increased interest in clean energy, wind energy has proven to be a very promising candidate. Wind energy on the small scale has also proven itself as a great source for home use. Currently, small-scale wind turbines are expensive to purchase, install, and maintain, and are often unattractive. Guyed wire tower can be unpleasant and truss system towers can be expensive, as well as the need for cranes to service the turbine if necessary. The goal of the tower crawler was to reduce the cost of owning small wind turbines in the 3 to 6 kilowatt range and also make the service of these turbines more convenient. The wind tower crawler is friction driven and has the ability to attach to a variety of tower diameters. The goal is to raise the technician, tools, and turbine to the top and back to the ground safely. This advancement allows the use of mono-tube towers, which are cost effective and aesthetically pleasing. The objective of the scaled prototype was to prove the concept that a friction driven system can efficiently climb a cylindrical tower and potentially replace other lifting equipment.

## **Biomass to Liquids from Pine Beetle Kill via Syngas**

Hussain Alhaji, Yi Ern Cheah, Chris Fogleman, Tyler Norton, and Thomas Tolman with Dr. H. Gordon Harris  
Chemical Engineering  
University of Wyoming  
Oral Presentation

There is approximately two million acres of mountain pine beetle infested forest in the state of Colorado, which poses a potential fire hazard to many of Colorado's recreational and ski resorts. Forestry officials across the state are encouraging use of massive amounts of infested wood to help reduce this risk of wildfires. This abundance of pine beetle killed trees has also given birth to a possible new source of energy. The objective of this project was to design a plant to convert beetle-killed trees near Granby, Colorado, to biofuels via a syngas route, and investigate project financial feasibility. The plant was designed to process 100-tons of beetle-killed trees a day and produce two million gallons of biofuel a year. Two processing schemes were investigated; both involved preprocessing and gasification of the pine wood biomass to produce syngas, but the syngas upgrading stage differed. The first scheme encompassed the use of combined steam reforming and water gas shift reactors (WGSR) to produce clean syngas as a reactant to the Fischer-Tropsch reactors. The Fischer-Tropsch then produces a series of liquid hydrocarbons. The second project involved the use of microorganisms to clean up the dirty syngas from the gasification process, followed by a series of evaporators and distillation columns to obtain a final product of pure ethanol.

## ***Histophilus somni* myocarditis: An important cause of fatal disease in feeder cattle in Wyoming.**

Travis H. Allen with Dr. Randy Hunter and Dr. Donal O'Toole

Department of Veterinary Sciences

University of Wyoming

Oral and Poster Presentation

*NSF EPSCoR*

*Cheyenne, WY*

A large cattle backgrounding facility in eastern Wyoming identified a recurring septicemic syndrome responsible for 42.5% of all deaths between November and January 2007. This study quantified losses during the risk period (Oct 2008 – Feb 2009), and established its basis. Whole hearts and lung samples were examined from 20 animals in which the syndrome was diagnosed clinically. Tissues were examined by bacteriology, histopathology, ultrastructure and immunohistochemistry (IHC). Septicemic *H. somni* infection of one or both papillary muscles in left ventricular myocardium was present in 10, based on IHC and histology, and confirmed by bacterial culture in 7. Isolates had typical antigenic profiles and virulence motifs of *H. somni* (Dr. L. Corbeil, UC San Diego). A gene unique to *H. somni* was identified which encodes an integral membrane protein HS\_0311 (Dr. G. Andrews, UW). The gene was cloned for use in production of antibody for the IHC procedure. Ultrastructural examination established that bacterial emboli caused acute necrosis of microvascular endothelium. Other causes of death were pyelonephritis, bacterial and viral pneumonia, and brisket disease. We conclude that septicemic histophilosis with myocarditis occurs in the United States as a major cause of mortality. The disease will be overlooked unless incised hearts are examined post-mortem.

## **Proteomic Analysis of Methanogens**

John Allhusen with Dr. Franco Basile

Chemistry

University of Wyoming

Oral Presentation

*School of Energy Research REU*

*Casper, WY*

Due to the ever increasing energy needs of our nation alternative fuel sources are being investigated to fulfill these needs. One type of fuel that could help offset the dependence on fossil fuels is methane. Methanogens are a strain of bacteria that produce methane as a bi-product of normal cellular respiration. To increase the efficiency of methane production, the proteins of these bacteria need to be identified. *Escherichia coli* bacteria were used as a template organism to test a rapid microwave cell lysis and peptide identification method. Scanning electron microscope (SEM) images provided evidence of cell lysis and matrix-assisted laser desorption ionization (MALDI) provided mass data of the lysed products. This method was then used to analyze the protein products of the lysed methanogen bacteria. The SEM images of the methanogens provided qualitative data that the cells were lysed by the microwave technique. However the mass spectral data obtained using MALDI was inconclusive. The images of the lysed *E. coli* bacteria provided very strong evidence of cell lysing. The MALDI data supported the images in that peptides were obtained through this method of lysing.

## **Temporal Coordination of Development of Cardiac Hypertrophy and Baroreflex Abnormalities With Iron Deficiency**

Bethelhem Almaw, KC Gandy, Ricky Oh, and Matt Tolhurst with Dr. Bud Chew  
Biology  
Western Wyoming Community College  
Oral Presentation

*INBRE*

*Rock Springs, WY*

Iron deficiency causes numerous cardiovascular and neurological changes. We have previously demonstrated alterations in the baroreflex (mechanism for regulation of blood pressure) with iron deficiency, involving both the sympathetic and parasympathetic nervous systems. Iron deficiency is also associated with development of cardiac hypertrophy. Prolonged iron deficiency leads to an apoptotic failing heart, but early development of hypertrophy, while not well understood with iron deficiency, is believed to be a positive adaptation, perhaps mediated by the sympathetic nervous system. We are currently examining temporal aspects of baroreflex changes and cardiac hypertrophy development with iron deficiency. We hypothesize that iron deficient, hypertrophic hearts will produce greater than normal contractile force on a Langendorff apparatus after two weeks of iron deficiency, but less than normal force after four weeks of iron deficiency. We further hypothesize that alterations in baroreflex function will occur within two weeks of iron deficiency, independent of the hypertrophy development process. Data collection is underway at time of abstract submission, with at least pilot data to be presented at the symposium.

## **Natural Gas to Diesel**

Abdulaziz Alzanan, Kristin Carter, Max Fahrenkopf, Kigen Limo, Titus Reed with Dr. H. Gordon Harris  
Chemical Engineering  
University of Wyoming  
Oral Presentation

Natural gas is a common fuel that is increasing in value. Abundant natural gas reserves have prompted a large body of research to convert natural gas into value added, easily transportable products. The Fischer-Tropsch process affords one such route, and utilizes common metal catalysts, such as iron or cobalt, to convert methane (the primary component of natural gas) to a heavier hydrocarbon mixture. These hydrocarbons can then be separated into common fuels such as diesel, naphtha, and light fuel gases. The separation and reaction equipment used in the process employs various designs to achieve required product specifications. For instance, part of the process requires efficient separation of synthesis gas into carbon monoxide and hydrogen. This separation is achieved using a polymer membrane unit to avoid the cost of cryogenic cooling. This process is economically feasible when the price of oil is above \$50/bbl. Economic analysis reveals that compressors and catalyst comprise the bulk of required investment. Future work will be aimed at improving the Fischer-Tropsch reaction modeling, improving component physical property information, and detailed analysis of the sensitivity of the process to various variables.

## **Methanol Production from Black Liquor via Syngas**

Benjamin Anderson, Brett Davis, Christina Piroutek, Ian Grosulak,, and Diem Pham with Dr. H.  
Gordon Harris  
Chemical Engineering  
University of Wyoming  
Oral Presentation

Black liquor is a toxic slurry produced by paper pulping mills, and is composed of hydrocarbons and sodium based salts. Currently paper pulping mills burn this black liquor to produce energy. This process emits toxic chemicals into the environment and is often very costly. Woody's Black Liquor proposes an alternate process that will be more environmentally friendly and cost effective. In this process, black liquor is gasified via combustion to produce synthesis gas (a mixture of CO and H<sub>2</sub>) and green liquor (a mixture of the incombustible chemicals found in black liquor). Methanol is then produced from the synthesis gas and sold. In this presentation, Woody's Black Liquor will describe the process in detail, provide an economic analysis, list environmental concerns, and give final recommendations.

## **Building Our Neighborhoods: Laramie as a Model of Early 20th Century Construction**

Carly-Ann Anderson with Mary Humstone  
Biology  
University of Wyoming  
Oral Presentation

*American Studies*

*Cheyenne, WY*

As a town fostered by the growth of the transcontinental railroad, Laramie has been exposed from the beginning to popular trends and technology of the time. Unlike towns on the East Coast of the United States that often grew quickly and lacked planning, Laramie and other railroad towns were founded as square grids in vast open areas, and therefore tailored for the growth. Increasing technology as well as pattern books, prefabricated kit homes, and affordable architect-designed homes helped the middle class build the stylish neighborhoods we see today.

This paper examines the houses built in Laramie's neighborhoods in the early 20<sup>th</sup> century, focusing especially on the the Laramie Home Builder's Association (LHBA). The LHBA brought together prominent Laramie Architect W.A. Hitchcock, prominent businessman W.H. Holliday, lumber and building supply companies, and loan associations to build affordable homes for Laramie's middle class. Collections of Hitchcock's and Holliday's papers at the American Heritage Center reflect that this Association, though short-lived, impacted style and development in the town.

## **An Analysis of the Fundamental Vibrations of Non-Convex Shapes**

Nick Anderson with Dr. Jeff Selden

Department of Mathematics

The University of Wyoming

Oral and Poster Presentation

The vibrations of a drum head can be understood as being built up from more basic vibrations and the specific point which “travels” the farthest on the drum is called the maximum. Much is known about the properties of maximum when we consider drum heads that are convex, but when we force the drum head into a shape that is no longer convex there is very little known about the properties governing this maximum. This research project has been concerned with analyzing this maximum within non-convex shapes through the use of differential equations and computer modeling software, in order to better understand the principles behind this maximum. This is accomplished by initially modeling convex shapes through software such as Matlab or FlexPDE, and then analyzing the behavior of the maximum as these shapes are forced into being non-convex. An example of this is a 1 by 2 rectangle, which is then forced into being more of an H shape. This data will be contributed back to the mathematical community, as there is a lack of information in this field currently, with the hope being that further research will be conducted in this field of mathematics.

## **Design and Implementation of an Intelligent Checkers Application**

Andrew Smith, James LeJeune, Heather Aust with Professor Jeffrey Van Baalen

Department of Computer Science

University of Wyoming

Oral Presentation

*Department of Computer Science*

*Laramie, WY*

*Laramie, WY*

*Rock Springs, WY*

CAPP is a Checkers Application developed to implement the rules of standard checkers also known as English draughts. The application provides the ability for the user to play against a human player or a computer player. The computer player uses tree decision techniques that attempt to play intelligently. Although there are similar applications already in existence the goal of our senior design project was to better understand the design of a large integrated software system, learn more about intelligent artificial decision making using trees, and also learn to modularize the software system so it could easily be adapted and upgraded for future versions. One possibility for a future version would divide the system into a complete server client model with many clients connecting to a single game server allowing people to play one another.

## **Effects of Aflatoxin Exposure on Male Reproduction-Project Summary**

Kathy Austin , Amanda Kaiser, and Kristi Cammack

Department of Animal Science

University of Wyoming

Oral Presentation

*EPSCoR*

*Cedar Park, TX*

Aflatoxicosis occurs in livestock consuming aflatoxin (AFB1)-contaminated grain. Research has shown that genetic factors affect susceptibility of reproductive organs to aflatoxicosis. Our objectives were to 1) identify males more fertile (i.e. tolerant) and less fertile (i.e. intolerant) after AFB1 treatment through mating tests and 2) identify differentially expressed genes associated with AFB1 tolerance. AFB1 treatment did not affect sperm counts. Fetuses sired by control or AFB1 treated males were counted and examined for abnormalities. AFB1 tolerant and intolerant males were identified based on mean fetuses and mean TUNEL positive testicular cells. Tolerant males produced similar fetus numbers (12.5) as control males (13.4), but a higher ( $P = 0.01$ ) number than intolerant males (7.6). Intolerant males had numerically greater TUNEL positive cells (136.5) than tolerant (55.0) and control (54.3) males. Microarray analyses were performed on control ( $n = 3$ ), tolerant ( $n = 3$ ) and intolerant ( $n = 3$ ) males. Real-time RT-PCR confirmed numerical upregulation of IBSP and CCK genes and numerical downregulation of PGA, Crisp, and AR genes in AFB1 treated males compared to control males. Similar expression patterns of these genes were observed between tolerant and intolerant males. These results suggest genetic selection for AFB1 tolerance is possible.

### **Design of the 2009 UWYO SAE Baja Car**

Lee Stutzman, Josh Tatro, Dan Foster, Cody Kellogg, Ashli Babbitt, Kevin Clark, Josh Huseth, TJ McKenzie

Mechanical Engineering

University of Wyoming

Oral and Poster Presentation

Cowboy Motorsports consists of eight mechanical engineering students presented with the task of designing a single passenger, off- road vehicle. The vehicle has been designed for the purpose of competing in the 2009 SAE (Society of Automotive Engineers) Mini Baja competition in Auburn, Al from April 16-19, 2009. In order to complete the design, the team was split up into sub-groups, each in charge of designing the suspension, drive train, and frame. The design process consisted of design goals and specifications, design morphology, mathematical models, engineering testing and inquiry, and a detailed design.

The vehicle is powered by a 10 horse power Briggs and Stratton engine. A Comet® CVT (Continuously Variable Transmission) in conjunction with a chain and sprocket speed reduction will be used for the drive train. The suspension consists of four independently articulating wheels with J/A arms in the front and trailing arms in the rear. The frame will be constructed out of 1.25" diameter 4130 steel alloy tubing with a .065" wall thickness. Frame layout has been set to provide sufficient space to protect the driver as well as accommodate the mounting of the drive train and suspension components. Design of the Mini Baja car has been facilitated by frequent submission of progress reports as well as design reviews conducted in the presence of mechanical engineering faculty and advisors. Governing design factors include: the SAE Mini Baja rules and regulations, the vehicles ability to traverse rugged terrain, and the necessity to minimize weight and cost.

### **Biodigestion**

Devan Bagley, Shanda Durham, Coleman Henry, Thien Pham, and Heather Young with Dr. H. Gordon Harris  
Chemical Engineering  
University of Wyoming

An investigation of a process to convert corn stover to biogasoline via gasification and Fischer-Tropsch synthesis was initially undertaken. Extensive process analysis and economic assessment established that this process is very inefficient, and is neither economically viable nor environmentally sound. Consequently, our group explored alternative uses for corn stover feed stock. Five different processes were evaluated, and one was chosen for further analysis: bio-digestion of cow manure to biogas. In this process, waste manure is collected from a feedlot and fed into a two-phase bio-digestion system. The two-phase digestion system is based on a proprietary process: Onsite Power Systems anaerobic digestion. The process uses methanogen bacteria to convert organic solids into methane. The methane produced is then used to create electricity through a generator. The waste from the bio digesters can be sold as fertilizer. The feedlot will house 75,000 cows that produce 70,000 tons per year of harvestable manure. Preliminary calculations show that this manure will convert to 17.64 million cubic meters per year of biogas, which generates 38.8 million KWH per year of electricity, and will result in a gross profit of approximately \$5 million

### **Energy Conversion System for a Solar Concentrating Heliostat**

Will Barnes, Pam Ramaeker, Anna Hartman, Adam Turbiville, and James Baker with Paul Dellenback, Jeff Anderson, Steve Barrett, and Scott Morton  
Department of Mechanical Engineering  
University of Wyoming  
Oral and Poster Presentation

*Department of Mechanical Engineering*

*Laramie, WY*

As oil prices rise and production declines, alternative energy sources are gaining popularity. One such source is solar energy. This project focused on the development of a solar energy conversion system to be used with an 8-foot diameter parabolic dish and a 2-axis solar tracking system. The dish focuses sunlight on an ethanol/water-cooled spiral fin heat sink. The mounting system for the heat sink allows adjustment along the focal length of the dish, so solar concentration can be modified if needed. The coolant is circulated to an adjacent building, where it flows through a radiator and provides heat. The radiator is embedded in a ducting system, which can direct the heat either into the building or outside by use of a damper. Feedback control systems monitor temperatures to maintain safety and effectiveness of the design. The system is designed for use with concentrating photovoltaics. The energy conversion system is an environmentally friendly way to provide heat and save money on the heating bill.

## **Assessing modern sheep microwear to enrich middle school students' lives**

Amber Baltes collaborating with Jonathan Hoffman  
College of Education and Geology and Geophysics  
University of Wyoming  
Oral Presentation

*WySTEP, NSF EPSCoR*

*Riverton, WY*

Hoofed mammal (ungulate) teeth began increasing in crown height in the mid-Miocene. Climate change may have been the driving force behind this ubiquitous morphological adaptation. Hypotheses for this adaptation include: 1) the introduction of high-latitude C<sub>3</sub> grasslands in North America; and 2) a change to an arid environment where exogenous grit covered food sources and increased the abrasiveness of the diets. These hypotheses were investigated at the University of Wyoming's Red Buttes Environmental Laboratory during the summer and fall of 2008. Modern sheep teeth were molded to analyze tooth microwear. Tooth microwear is a method of determining diet for extinct animals. The molds were compared to ancient ungulate teeth. A unit based on the methods and results of this research was created in the fall of 2008 and taught in the spring of 2009 to enrich middle school students' lives in a week long unit about fossils and animal adaptations.

## **Hydrologic Geochemical Correlations with Bacterial Communities in a 52°C Hot Spring and its Outflow Channel, Thermopolis, Wyoming**

Brittany Barlow, Jared Christopherson, Sabrina Forbis, Marietta Gopher, Selena Hammer  
with Suzanne M. Smaglik, M.Sc. and Steven J. McAllister  
Departments of Earth & Environmental Science and Biology & Microbiology  
Central Wyoming College  
Oral Presentation

*INBRE, CWC Ray Winter Scholars*

*Riverton, WY*

The Big Spring in Hot Springs State Park, Thermopolis, Wyoming, flows at an average rate of about 14 million L/day at a temperature between 52 - 54°C. The spring is geologically controlled by an east-west trending fault. Water and microbial samples have been collected on a semi-regular basis from August 2008 to present. At each of 20 sites, water is tested in the field for temperature and pH. Two water samples are collected at each site. One sample is filtered (0.45 m) and the unfiltered sample is frozen for further analysis. Quantitative and semi-quantitative laboratory tests are performed on the filtered water samples. There is a clear correlation of decreasing temperature and pH with distance from the source. Phosphate, SiO<sub>2</sub>, Ca-Mg hardness, Cl<sup>-</sup> and total dissolved solids (TDS) show little variation and nitrate and dissolved oxygen are undetectable. The water becomes cloudy white about half way down the outflow, which may reflect the precipitation of sulfate and carbonate minerals with cooling temperature. The morphology of the microbial communities changes from purple and green cyanobacteria filaments at the source, to white filaments at the outflow and finally to mat with trapped gas (O<sub>2</sub>?) bubbles toward the cooling pond.

## **A Numerical Study of 2D Free-surface Water Wave Equations**

Michael Basden with Dr. Long Lee  
Chemical Engineering  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Kemmerer, WY*

Boundary element methods are used in numerous engineering and physical applications, including solving the fully nonlinear two dimensional water wave equation. It is often used because it is more efficient than methods that require the discretization of the entire computational domain as the BEM requires only the discretization of the boundary. There are, however, many different methods used. This paper details one method in particular, the cubic mid-interval interpolation method.

A Fortran program based on the cubic mid-interval interpolation method is being worked on, and it is hoped that once completed, it will be able to solve the water wave equation efficiently and accurately. The results will then be compared to various asymptotical models such as the Camassa-Holm equation.

## **Robert W. Hite Wastewater Treatment Facility Upgrade**

Adrienne Beckman, Jonathan A. Brant  
Civil and Architectural Engineering  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Los Alamos, NM*

The Robert W. Hite Wastewater Treatment Facility (RWHTF) services the metropolitan Denver area. It consists of two complexes, a North and a South. Currently, the North and South Complexes do not meet the discharge regulations individually. To meet permit limits, the two streams are blended together. The concentrations that do not meet effluent criteria are the nitrates and ammonia. The North Complex is currently being upgraded so that it reaches discharge requirements on its own. This project is to determine a reasonable secondary treatment method for the South Complex that includes nitrification and denitrification.

To determine the best treatment method for the RWHTF, my senior design group (Adrienne Beckman, Andrew Herrera, Forrest Maclean, Guy Grant, Ji Liu, Nicholas Koch, Owen Mullinax, and Timothy Palik) has chosen three different nitrification/denitrification scenarios. We will design the activated sludge basins that can best meet the discharge permit regulations and look into upgrading the secondary clarifiers. We will look at cost, ease of operations and maintenance, ability to retrofit the new system into the old, and preliminary methods for construction implementation.

## **Biologically Inspired Sensor: Expansion of the Automatic Gain Control Circuitry**

Jennifer Beman with Dr. Steven Barrett  
Electrical and Computer Engineering  
University of Wyoming  
Oral Presentation

*EPSCOR*

*Cheyenne, WY*

A sensor inspired by the vision system of the common housefly has been developed at the University of Wyoming that exhibits hyperacuity by using overlapping sensor sensitivity fields. This sensor has been tested and characterized under tightly controlled laboratory settings with very positive results. Every time the sensor is used things such as temperature can affect the sensitivity fields and the sensor must be re-characterized. Currently, this characterization is done by adjusting each of the potentiometers of the sensor by hand. For this sensor to be applicable in real world situations, it must be able to characterize itself and adjust the potentiometers. My research project involves developing a system using digital potentiometers controlled by a microprocessor that would provide automatic characterization of the sensor. This sensor is equipped with automatic gain control circuitry that allows it to be adapted to various lighting conditions. The system I am developing is a part of a larger project with the goal of making the sensor capable of adjusting to ambient light conditions for functionality beyond tightly controlled laboratory settings.

### **Indirect Coal Liquefaction**

Gina Bertoglio, Bryce Dutcher, David Herr, and Fuad Tuhaye with Dr. H. Gordon Harris  
Chemical Engineering  
University of Wyoming  
Oral Presentation

This project involves a coal-to-liquids via indirect coal liquefaction. The primary product of this facility is Fischer-Tropsch diesel. To achieve a production of 15,000 bbl/day of sulfur-free Fischer-Tropsch diesel, the coal feed will be 17,400 tons/day. The processes used in this plant are gasification, air-separation, water gas shift, acid gas removal, Fischer-Tropsch synthesis, product upgrade, and electricity generation. The project is economically viable if the price of crude is above about \$70/bbl. One of the major issues with this plant is utilization or disposal of produced carbon dioxide, given the fact that coal has the highest carbon intensity among fossil fuels. Future legislation regarding carbon dioxide capture and sequestration will dictate profitability for this facility.

## **Identifying Inmates Who Choose Incarceration over Parole**

Brianna Best with Dr. Eric Wodahl

UW Honors Program

University of Wyoming

Oral Presentation

*UW Honors Program*

*Cheyenne, WY*

The United States incarcerates criminals at a rate higher than any other industrialized country in the world. Increasing the number of inmates being released to parole is a known way to decrease the prison population. It is widely recognized that parole provides a number of benefits not only to the offender but to the community, thus increasing parole participation is in the community's best interest. Many researchers have focused on the role of the parole board in releasing inmates to parole, but few have recognized the role of the inmate in the parole process. Recent parole trends in Wyoming have shown that approximately 40 percent of inmates who are eligible for parole are choosing to remain in prison for the remainder of their sentence rather than going on parole. The purpose of this study, which looks at approximately 1,000 parole eligible inmates in Wyoming, is to identify characteristics of these particular inmates. The rational choice model will be utilized as a theoretical framework to understand how inmate's backgrounds, sentence structure, and various characteristics effect their decision to see the parole board.

## **Bacteriophage-mediated Biocontrol of Escherichia coli O157:H7 in Milk and Juice**

K. Edward Bolenbaugh with John D. Willford, Ph.D.

Microbiology

University of Wyoming

Oral Presentation

*Advanced Problems Course*

*Laramie, WY*

*ANVS 4550 Summer 2008 Internship*

*Escherichia coli* O157:H7 continues to be a major foodborne pathogen. Along with commonly associated foods like beef and spinach, milk and fruit juices have been implicated in numerous outbreaks of *E. coli* O157:H7 in the United States, Canada and the United Kingdom. Bacteriophages provide a safe, natural option of biocontrol against these bacterial pathogens. A cocktail of six bacteriophages specific for *E. coli* O157:H7 was developed and tested as a practical means for reducing this bacterium in milk, apple juice, and orange juice. Broth controls using a multiplicity of infection (MOI) of 100 showed the complete elimination of a  $10^5$  CFU/mL *E. coli* O157:H7 culture in less than one hour with no evidence of bacterial resistance. No significant reduction was identified in the apple juice or orange juice trials. However, in a notable milk trial, a 3-log reduction of *E. coli* O157:H7 was seen. The reductions seen in milk trials indicate that our phage cocktail is viable as a biocronrol agent. This cocktail could be a safe, economical and effective means to mitigate temperature abuse of milk in commercial industry as well as a potential method of pasteurization in raw liquid consumables.

## **Rock Robot**

Robert Bowers, Mitch Hawk, and David Webber  
with Dr. John O'Brien and Dr. Dennis Coon  
Mechanical Engineering  
University of Wyoming  
Oral and Poster Presentation

*ME Senior Design*

*Rock River, WY, Sitka, AK, Lander, WY*

Every year the American Society of Mechanical Engineering (ASME) hosts a design challenge to showcase the talents of engineering students from across the nation and allow students to present solutions to design problems. For the 2009 ASME Design Challenge, students were required design and build a remote control vehicle capable of retrieving small rocks, depositing them in a receiving area, and returning to its starting location ready for another run. This competition arose from NASA's interest in including a small radio controlled vehicle on its next mission to Mars.

Parameters of the competition included a design that was within a specified size, lightweight, energy efficient, had the ability to cross barriers, and had accurate rock depositing ability. A robot within these design parameters was designed, built, and tested. The robot will be entered in the 2009 ASME Design Competition in Arlington, Texas.

## **University of Wyoming and Laramie Environmental Scan**

Erin Britt, Stacey Lane, Natalie Villalobos, and Tiffany Oliez  
With Kathleen McKinney  
Health Sciences  
University of Wyoming  
Oral Presentation

*Social Work Research Project*

*Laramie, WY*

The University of Wyoming's "A-Team" in collaboration with the Albany County Coalition to Prevent Substance Abuse is completing an Environmental Scan during 2009. The purpose of this scan is to develop a picture of the UW campus and the surrounding community's environment regarding alcohol use and problems. This scan will provide information to decision makers on how best to prevent underage drinking and their associated consequences.

Volunteers will complete the scan in pairs traveling around Laramie and through the UW campus while answering each question about the campus culture provided on the five page environmental scan tool. Major areas on this data collection tool include campus life, alcohol issues, alcohol availability and promotion, media environment, student living environments, neighboring environments, and drinking environments. Neighborhoods around campus, parties and events, and campus bookstores are also included. Gathering this information may require driving and walking across campus, through campus neighborhoods, and through downtown Laramie. It may also require pairs to go into UW buildings or local businesses. The scan will be completed by a large number of volunteer pairs between March 2009 and October 2009. It will be piloted in March and April.

Pairs will also write down their impressions of specific environments in the notebook provided. Each pair will be given a disposable camera in order to take pictures of things in the environment that stand out as particularly relevant to alcohol use. The results of this study will present on two pairs' data collection. The specific research question is: "How does campus culture and the surrounding environment affect promotion and drinking among college students?"

## **Aerodynamic Resistances of Instruments Used in the Horn Blowing Hierarchy**

Catherine Brown with Drs. Mary Hardin-Jones and David Jones

Division of Communication Disorders

University of Wyoming

Oral Presentation

*UW Honors Program; EPSCoR*

*Richardson, TX*

Oral-motor exercises implemented by speech-language pathologists as a treatment method to improve speech production have caused heated debate in the communication disorders field. These treatment programs claim to increase muscle tone/strength and oral postures necessary for speech production through nonspeech motor exercises. One specific oral-motor treatment program implemented by Rosenfeld-Johnson in 1995 is the "Horn Blowing Hierarchy." This program involves the use of 12 horns that are structured in ascending order according to increasing aerodynamic resistance. Although widely adopted by practicing speech-language pathologists, there is little empirical evidence behind the effectiveness and efficacy of the treatment. The purpose of the study was to examine the aerodynamic resistance required to generate sound from each horn. The data revealed differences in resistance between the horns, but no systematic increase in aerodynamic resistance along the horn hierarchy. The significance of this study lies in the impact of the results on evidence-based treatment: the resistances of the horns do not incrementally increase, suggesting that the treatment program may not be a valid approach to exercising the oral musculature.

## **Controller for a Computer Numeric Controlled Machine**

Brian Bryce and Amos Purdy, Dr. Stanislaw Legowski

Department of Electrical and Computer Engineering

University of Wyoming

Oral and Poster Presentation

*Department of Electrical and Computer Engineering*

*Englewood, CO*

*Valentine, NE*

Computer Numeric Controlled (CNC) machines are used throughout industry to create and replicate parts and to automate processes. Most of these machines use a computer to control motors which adjust the position of a tool such as a drill or router. Using this technique, production of identical parts is possible. These reproducible parts are designed using computer aided drawing (CAD) software. CAD software is used in many different fields because it is possible to model physical components and structures. A CAD drawing is converted into G-code using Computer Aided Manufacturing (CAM) software. This G-code is then interoperated by CNC control software which sends the proper signals to the parallel port. Our senior design project is the interface between the computer and the mechanical system. Our controller reads data from the computer's parallel port and translates this data into the desired motion. This controller is also capable of switching the tool's power on and off. Our design also incorporates limit switches to prevent damage to the machine due to operator error.

### **Dots**

Nicole Budzinak with Dr. Stanislaw Legowski  
Department of Electrical and Computer Engineering  
University of Wyoming  
Oral Presentation

*Department of Electrical and Computer Engineering*

*Cheyenne, WY*

Dots is a simple two player game consisting of a matrix of dots that act as vertices of boxes. Two players take turns drawing lines between dots creating edges of boxes. The object of the game is to complete the most boxes. This design project implements the dots game on a monitor and allows the players to touch the screen at the vertices they wish to draw their lines at. An infrared sensing grid detects the vertices the players select while a processor continuously reads in the information, checks for correct input, and updates the game board. Players are distinguished by the pen-like device that is specific to each player. This touch screen interface allows easy playability without the pen and paper.

### **Electronic Music Stand**

Ryan Buffington and Ali DeMino with Dr. Stanislaw Legowski  
Department of Electrical and Computer Engineering  
University of Wyoming  
Oral and Poster Presentation

*Department of Electrical and Computer Engineering*

*Casper, WY  
Parker, CO*

The Electronic Music Stand is a product designed to cope with the limitations of paper sheet music. A foot pedal with multiple buttons integrated into the base of the stand allows a musician to turn pages easily during a concert or practice without having to put the instrument down. This technology will also benefit the many organizations that hold events outside and have to deal with the inconveniences of wind or darkness which prevent paper sheet music from being readable. The system stores music on a removable SD memory card, which allows the user to add or remove songs using their personal computer. A microcontroller and an FPGA are used to display music images on a 15 inch LCD display. Our presentation will cover the specifics of our design process along with the pitfalls we discovered throughout the year and any advancements that could be made to our design.

## **NASA's 2009 Great Moonbuggy Race**

Elemental Engineering: Kathryn Burton, Peter Spehar, Eli Krahenbuhl, and Matthew Straka  
with Scott Morton, Dr. Nancy Peck  
Mechanical Engineering Department  
University of Wyoming  
Oral Presentation

*Mechanical Engineering Senior Design Project*  
*Funded by Wyoming NASA Space Grant Consortium and NASA*

*Rawlins, WY*  
*Vancouver, WA*  
*Cheyenne, WY*  
*Casper, WY*

The following presentation encompasses the complete design of a two passenger, human powered, moon-rover type vehicle to compete in the 2009 NASA Great Moonbuggy Race. NASA provided design specifications for the competition, which, in conjunction with Elemental Engineering's own specifications, led to design morphologies of key moonbuggy systems. These designs were further refined with mathematical models to ensure the vehicle meets all design specifications and is capable of traversing rough, inclined terrain. From the final designs, detailed plans and specifications were produced to describe each piece needed to manufacture the moonbuggy. A competition-ready vehicle was produced from these plans and specifications. On April 3 and 4<sup>th</sup>, EE competed in NASA's 16<sup>th</sup> annual Great Moonbuggy Race in Huntsville, Alabama. Elemental Engineering has decided to use an articulated-frame design constructed of chromoly, while utilizing common bicycle components to manufacture the vehicle. Riders are positioned back to back with the rear rider facing backward. The project is funded by The Wyoming NASA Space Grant Consortium who has provided a \$5000 grant to help cover design and fabrication costs as well as travel expenses to the competition in Huntsville, Alabama. A \$400 lodging allowance is to be provided by NASA for the competition.

## **Wooing Women: Raising Awareness of Wyoming's Unjust Gender Wage Gap Among Women of the New Silent Generation**

Hanna Bush

With Cary Berry-Smith

Department of Women's Studies; Department of Communication and Journalism  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Gillette, WY*

Wyoming's gender wage gap is a travesty; the highest in the nation, Wyoming weighs in a full 15 percentage points behind the national curve. Women in Wyoming who work full-time, year-round are paid 63 percent of what their male counterparts earn, almost a full 40 cents behind a man's dollar (a wage gap of 37 percent). The disproportionately high wage gap in Wyoming threatens the entire state; research shows that areas with larger wage gaps tend to defer new workers from entering the workforce. Wyoming's "brain drain," or the phenomenon of college-educated people leaving the state despite having acquired their degree(s) here, is one of the highest in the country.

A straw poll taken of resident Wyoming women 21 years and younger found that less than 5 percent of women polled knew how large Wyoming's gender wage gap was. The purpose of this research is to create a web-based video to be posted on the Wyoming Women's Foundation Web site. The video, along with an accompanying audio essay, will include basic information about Wyoming's wage gap and will be targeted at women 25 years and younger. The impact of this research is its potential to increase advocacy for closing Wyoming's gender wage gap.

## **Aldehyde Dehydrogenase 2 Knockout Increases Ethanol-Induced Cardiac Depression: Role of Protein Phosphatases**

Emily Byra with Dr. Jun Ren and Dr. Heng Ma  
School of Pharmacy  
University of Wyoming  
Poster Presentation

*NSF EPSCoR and NASA Space Grant Consortium*

*Laramie, WY*

Alcohol intake contributes to alcoholic cardiomyopathy characterized by cardiac hypertrophy and contractile dysfunction. Acetaldehyde, the first metabolic product of ethanol, has been marked as a major cause of alcoholic cardiomyopathy initiation and aldehyde dehydrogenase 2 (ALDH2) has been thought to play a key role in oxidizing this acetaldehyde, thus providing a cardioprotective effect. The aim of this study was to examine the effects of cardiac acetaldehyde exposure through the transgenic knockout of ALDH2 enzyme after alcohol ingestion and to observe the Akt signaling pathway.

Mechanical properties of cardiomyocytes from ALDH2 KO mice were compared to C57 mice after ingestion of alcohol. Western Blot was used to observe expression of the Akt signaling pathway.

The ethanol-induced effect was significantly increased in the ALDH2 KO group. Alcohol exposure prolonged TR90 without affecting TPS in wild type group. The ethanol-induced prolonged duration of relengthening was significantly enhanced in the ALDH2 KO group. Compared with wild type mice, the phosphorylation of Akt response to alcohol stress was markedly decreased in the ALDH2 KO group. Alcohol exposure significantly increased the levels of protein phosphatase 2A in wild type and in the ALDH2 KO group.

These results suggest that ALDH2 is a trigger for the Akt pathway in response to alcohol-induced injury and the ALDH2 transgene has a cardioprotective effect against alcohol-induced cardiac depression through inhibition of protein phosphatases.

## **Evidence for manganese photochemistry en route to manganese-oxo clusters**

Jordan Calmes with Dr. Mark Mehn  
Department of Chemistry  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Evanston, WY*

Several manganese(I) carbonyl species have been prepared as precursors to an oxo-bridged manganese tetramer. In addition to being fragments of the oxo-bridged manganese cluster, these compounds have interesting photochemical and redox properties of their own. Here we present our experiments on the photochemistry, electrochemical, and IR activities of these compounds. We also describe the stability of these compounds in various solvents. In Nature, water-splitting and oxygen evolution take place during photosynthesis, but the structure and mechanism of the oxygen evolving complex of photosystem II are not yet well understood. We have synthesized a novel oxo-bridged manganese tetramer that might undergo oxidation and reduction reactions similar to those that take place in the oxygen evolving cluster of photosystem II.

## **Creating a Small Business: SimpliciTea**

Erin Capron with Dr. Karen Page  
Economics & Finance  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Powell, WY*

Starting a business in today's economy may seem impossible, but with the right strategy it can be done. The purpose of my project is to outline a successful business plan for a small business. The plan is for SimpliciTea, a gourmet beverage and dessert shop located in Buffalo, Wyoming. SimpliciTea sells fresh brewed tea and coffee beverages along with a variety of specialty desserts. The mission of this shop is to provide a calming escape and enrich everyday life one person at a time. The plan will cover a market analysis, an operational plan, overall business strategies, and financial information and analysis. In order to do this, I have researched the industry, the market, and various ways of operating the business through a variety of research tools. This research shows that there are entrepreneurial opportunities available even during an economic downturn.

## **Nitrogen Cycle: Integration into the Classroom**

Jennifer Carpenter with mentor Lisa Kunza  
Department of Secondary Education: Biology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR: WySTEP*

*Soldotna, AK*

Nitrogen fixation is the assimilation of atmospheric nitrogen into biologically usable forms. The nitrogen fixation rates occurring in Ditch Creek, Grand Teton National Park, Wyoming are among the highest rates ever recorded. Our research set out to quantify the rate of nitrogen fixation in Ditch Creek and examine the fate of nitrogen fixed in this stream. Results of this research are still being examined. Integrating the nitrogen cycle into the classroom setting is not challenging. However, the specifics of the research prove to be somewhat beyond the comprehension level of a tenth grade biology student. The high school lab experiment designed, as a result of the research, involved topics including the nitrogen cycle, water quality, and human impacts. Students set out to measure nitrate and nitrite amounts in water samples from various fake locations. Upon completion of sampling, students analyzed their results and determined possible causes for the nitrate and nitrite levels. This lab led into the discussion of effects of high nitrate levels and various human impactions such as fertilizers and fossil fuels.

## **An Investigation of the Criterion Validity of a Progress Measure for Language Intervention**

Helen Chanthongthip with Theresa Ukrainetz, Ph.D.

Communication Disorders

Poster Presentation

*McNair Scholars Program*

*Rawlins, WY*

This pilot study will examine the word fluency and narrative retell subtests of the Dynamic Indicators of Basic literacy skills (DIBELS) test. The objective of the study is to determine if these subtests are valid and sensitive measures for assessing progress in language intervention in children between grades one through three. The study will be a single-subject design examining behaviors across participants, and comparing the pattern of scores of the control participant to those receiving language treatments. The control participant will be receiving treatment for articulation disorder. Measurements will be taken twice a week after each participant's treatment session. If it is found that the language subtests of DIBELS are an adequate measure of progress, it may be a good means of measuring language progress in children receiving treatment.

## **Synthesis and Purification of Recombinant Spider Silk Proteins.**

Yi Ern Cheah with Dr Patrick Johnson

Department of Chemical and Petroleum Engineering

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Kuala Lumpur, Malaysia*

Spider silk fibers have been well known for their remarkable mechanical properties. It has been proven to be stronger than steel while possessing the tensile strength comparable to Kevlar. Many attempts has been made to exploit the spider silk's use commercially, making research that much more extensive and in need. As of today, the production of these fibers on a large scale has not been successful. On a laboratory scale, a few methods have been developed to produce recombinant spider silk proteins. The main objective of my research is to study one of these methods - the fermentation of genetically modified *Escherichia Coli* (E.coli) and the purification process to produce recombinant spider silk proteins. My research yielded a more optimized method to produce the materials needed for Dr Patrick Johnson's tissue engineering project.

**UW Digital Applications -- Expanding Opportunities for International Scholarly Publishing:  
The Schism of the Old Believers from the Russian Orthodox Church**

Stephanie Elizabeth Cohn, Jeren Hakiyeva, Saroj Poudel and  
Alexandra Nicole Casper  
Stephen C. Boss, Faculty Mentor  
University of Wyoming Libraries  
University of Wyoming  
*Oral Presentation*

*University of Wyoming Libraries*

*Golden, CO  
Ashgabat, Turkmenistan  
Kathmandu, Nepal  
Casper, WY*

This project relates the progress on an international, scholarly, digital project sponsored by the University of Wyoming (UW) and Saratov State University (SSU) in Saratov, Russia. The University Libraries of UW and Saratov State University have participated in faculty exchanges and have shared information from each library's respective collections with one another. One of the more interesting information exchanges has a joint project involving a self-paced CD-ROM featuring the history and music from the Old Believer Schism that rocked the Russian Orthodox Church in the middle part of the 17th century. The Library at Saratov State University had produced the educational exhibit based on materials and content from their Special Collections. They shared the collection on a CD-ROM disk with UW. The UW Libraries worked to expand the reach of the collection by taking the content from the disk, reformatting the presentation and mounting the presentation on OMEKA, an open-source piece of software that features a robust search and display interface. Content screens are being translated from Russian into English. The goal of the project is to present a bi-lingual digital presentation on an important event that took place in Russian History, discuss the challenges of translating content and meaning, focus and expose the unique liturgical Old Belief collections from SSU to a wider worldwide audience and to share an open-source digital application with Saratov State University so more bi-lingual, trans-Atlantic projects featuring digital work can be shared and exposed to wider international audiences.

## **Morphology of microbes and microbial communities at the 52°C Big Spring and outflow channel at Thermopolis, Wyoming**

Nicolas Colgin, Selena Hammer, Andrea Lyon, Cheryl Veggian  
with Suzanne M. Smaglik and Steven J. McAllister  
Departments of Earth & Environmental Science and Biology  
Central Wyoming College  
Poster Presentation

*NSF EPSCoR, INBRE*

*Riverton, WY*

The Big Spring at Thermopolis is roughly 5 m in diameter, with a 4 m outflow channel 150 m in length to the first cooling pond. The mineral-rich 52-54°C water flowing from the spring is the result of groundwater flow from the Owl Creek Mountains to the south, intersecting an east-west fault-line beneath the Thermopolis valley. Water and microbial samples have been collected on a semi-regular basis from August 2008 to present. We describe microbial communities, the microbe types within them, and how they change “downstream” at 11 sites from the inflow to the outflow, and 5 sites beyond the cooling ponds. The main spring supports a multitude of pigmented bacteria: a thin green layer covering a thicker reddish-brown layer, a growth pattern typical of cyanobacteria; purple and green filamentous bacteria; and yellow spongiform mats around the edges. There is a clear distinction of morphologies of the microbial communities with distance from the outflow. In the outflow channel the morphology changes from green to white filamentous and biofilms near the outflow, to algal mats with abundant trapped gas bubbles, to spongiform mats and vertical columns pushed upward by trapped gas bubbles within the mat, at the edge of the cooling pond.

### **Anti-Herbivore Properties of Bromelain**

Levi Collins with Dr. Greg Brown  
Botany  
University of Wyoming  
Oral Presentation

*Lovell, WY*

Bromelain refers to a group of proteolytic enzymes produced by the pineapple (*Ananas comosus*) that have the ability to break down, or digest proteins. The concentration of bromelain found in pineapple leaves, stems and fruits is much higher than is needed for primary metabolic functions, thus bromelain can be placed into a distinctive category of plant secondary metabolites. When the function of secondary plant chemistry is unknown, as it is with bromelain, they are generally thought to mediate some interaction between the plant and one or more factors within the environment. We hypothesized that bromelain has anti-herbivore activity, specifically for insects. To test this hypothesis we performed controlled, replicated *in vitro* experiments where fruit flies, *Drosophila melanogaster*, were cultured on a food media containing bromelain in known concentrations, including the concentration reported for ripe pineapple fruits. Following standard culture duration, all control and treatment populations were censused for numbers of adults, pupae, larvae, and eggs. Analysis of these data suggests that bromelain has no negative influence on fruit fly reproduction and development, thus not supporting our hypothesis.

***Eimeria* Identification and Evolutionary Relationships in the Wyoming Ground Squirrel  
(*Spermophilus elegans*)**

Erica Costello, Dagmara Motriuk-Smith, and R. Scott Seville  
Department of Zoology and Physiology  
University of Wyoming/Casper College Center  
Oral Presentation

INBRE-UW/CC

Casper, WY

The objective of this study was to identify species of *Eimeria* occurring in Wyoming ground squirrels (*Spermophilus elegans*) in central Wyoming. Fecal samples were collected from ground squirrels during the summer of 2008. The animals were live-trapped, their fecal samples were collected and the animals were released. The samples were mixed with 2% potassium dichromate and held at ambient temperature for 7+ days to allow sporulation of *Eimeria* oocysts. Following sporulation oocysts were isolated from feces by sugar flotation and examined at 100-1000X light microscopy for the presence/absence of *Eimeria*. Thirty samples were screened and 23 were positive for *Eimeria* (prevalence = 77%) and 5 species recovered: *Eimeria lateralis*, *Eimeria callospermophili*, *Eimeria vilasi*, and *Eimeria cynomysis*. *Eimeria lateralis* positive samples possessing a minimum of 1,000 oocysts were concentrated by repeated sugar flotation and centrifugation. In the future, genomic DNA will be isolated and polymerase chain reaction (PCR) and agarose gel electrophoresis will be performed. 18S rDNA will be sequenced and compared to the other Eimerians in the database.

**Arginase and Brisket Disease in Cattle**

Kimberly Cranford with Dr. Mark Stayton  
Department of Molecular Biology  
University of Wyoming  
Oral Presentation

NSF EPSCoR and UW Honors Program

Alpine, WY

Brisket disease, otherwise known as high altitude sickness and known to cause pulmonary hypertension in humans, also plays a detrimental role in the cattle industry. Though it is understood that many cattle are dying from brisket disease, a cause and treatment for the disease has not yet been fully understood or implemented. Arginase, an enzyme that plays a major role in pulmonary hypertension in humans, may also be a factor in the metabolic pathway leading to brisket disease in cattle. My experiment shows how the bovine *Arginase1* gene has been isolated and cloned from cattle lung tissue. To test the association between elevated ARG1 levels and brisket disease in cattle, I have cloned the full-length coding region for bovine ARG1 into a bacterial expression vector. By this means, I have produced the bovine ARG1 in *E. coli*. Eventually, ARG1 will be purified and an antibody synthesized to detect the bovine ARG1 in cattle as a means to successfully identify cattle with brisket disease.

## **Democracy and Islam: is Cooperation Possible?**

Kelsey Day with Seth Ward

International Studies and Religious Studies

University of Wyoming

Oral Presentation

*UW Honors Program*

*Cheyenne, WY*

The rapport between democracy and Islam has come to the attention of the world as an incredibly pertinent issue of our time. Can these two very powerful entities, the Muslim nations, and the West peacefully coexist? The connection between democracy and Islam is complex partially because the Muslim world is not at all ideologically monolithic and democracy is certainly not easily defined or implemented. Two extremes lead some to deny the possibility of a positive connection between Islam and democracy and others to purport that Islam requires democracy. In-between the two extremes a more compromising attitude suggests that even though the political systems are not explicitly defined as Islamic in the Muslim world, Islam is still a support for democracy. Democratization and religious resurgence are two of the most important themes in world affairs.

The characteristics of democracy, Islamic Law and their relationships were defined and researched. Case Studies from specific countries around the world were used to illustrate the reality of the subject. Specific findings led to the imperative idea that the future relationship between Democracy and Islam depends on the understanding and education of both the West and the Islamic nations.

## **COTS—A Tool to Make Advising Easier**

Gary Derbish and Brant Waldron with Dr. Jeffrey Van Baalen

Department of Computer Science

University of Wyoming

Oral Presentation

*Department of Computer Science*

*Riverton, WY*

*Yuma, CO*

COTS (Computer Online Tentative Scheduler) is an online computer application to make scheduling classes with an advisor easier for students by allowing the student to create a tentative schedule of classes for next semester. The current system has students and advisors meet to select courses, but in many cases both parties are unprepared for the encounter. This is inefficient and delays the class enrollment which could cause the student to miss a class that's offered in that semester. The advisor and the student can use this tentative schedule as a guideline to better communicate which classes will be taken in the coming semester. COTS works by surveying a student to gather information such as their major and classes they've completed. In this way it can predict and form a tentative schedule of courses for next semester that are relevant to the student's major. Our program increases the efficiency of student-advisor communication and improves the student's ability to graduate on time.

## **Exploring the differences between men and women and their views regarding parenting while imprisoned.**

Ashley Dimit, Shannon Cunningham with Dr. Kathleen McKinney  
University of Wyoming  
Oral Presentation

*Department of Social Work*

*Big Piney, WY  
Goshen, IN*

The focus of our study is exploring the differences between men and women's views regarding parenting while imprisoned; more specifically this study will explore anxiety issues for men and women. To measure anxiety we interviewed inmates of both sexes, using surveys that focused on, living situation prior to incarceration, placement of the children during parent's incarceration, visitation and parenting programs. The researchers traveled to the women's facility in Lusk and distributed 75 surveys to the incarcerated women and mailed 75 surveys to the men's facility in Rawlins. The researchers want to show that incarcerated parenting affects the genders differently. The results of our study could be a great tool for implementing treatment programs on parenting for the incarcerated parents in the state of Wyoming. Many states, like Wyoming, have adopted the same therapeutic, counseling and class models for both fathers and mothers in the prison system. Seeing how the experience may affect one gender differently than the other we hope this study will influence prison systems to implement new programs to meet specific gender and parenting needs of those incarcerated.

## **Developing Genetic Tools for the Planctomycetes and Verrucomicrobia: Novel approaches to transformation**

D. Domman with N.L. Ward, B. Steven, M. Sait  
Molecular Biology  
University of Wyoming  
Oral Presentation

*Molecular Biology Department*

*Casper, WY*

The phyla *Planctomycetes* and *Verrucomicrobia* present a unique set of characteristics that differentiate them from other prokaryotes. These include an altered cell wall structure lacking peptidoglycan, the presence of an intracytoplasmic membrane, nuclear body envelope, and sterol synthesis. Superficially, some of these characteristics resemble those in eukaryotes, raising questions of their origin and function. However, these phyla are relatively poorly characterized and lack the molecular tools needed for further characterization. The initial experiment tested the effect of different electroporation conditions and buffer solutions on uptake of foreign DNA by *Verrucomicrobium spinosum* and *Gemmata obscuriglobus*. Presented here is a novel approach to the transformation of *G. obscuriglobus* via electroporation using a 10% sucrose buffering solution. Preliminary evidence indicates that an antibiotic resistance encoding Tn5 transposon carried on plasmid pAG408 was integrated into the host genome. This integration permitted growth on a kanamycin-supplemented medium but did not support growth on a gentomycin-supplemented medium. To date, 37 putative mutants have been identified and are currently being screened by PCR to identify insertion sites. Future work includes the utilization of this electroporation protocol to generate targeted mutations and a stable expression system. These methodologies will hopefully increase the molecular tools available to study these unique organisms.

**From the Field to the Classroom: Adapting Scientific Research Experience into the Secondary Science Classroom.**

Kathryn Downham with Clark Cotton

Department of Zoology and Physiology & Department of Secondary Education

University of Wyoming

Oral Presentation

*NSF EPSCoR WySTEP*

*Lander, WY*

As part of the Wyoming Science Teacher Education Program (WySTEP) I spent my summer assisting Clark Cotton with data collection and analysis with the focus of the research being kidney function in Black-tailed Prairie Dogs during arousal from hibernation. We looked a suit of chemicals needed for the proper functioning in kidney's across various levels of arousal both in the kidney's themselves as well as the blood plasma and urine.

The second half of my presentation will be focused on how I integrated my summer research experiences into the classroom. I have found through my residency in teaching that in order to be able to teach science in a meaningful way, one must have had experience in practicing science. By having personal experiences with research and research methods I can help my students better make the connections between the scientific knowledge they learn in the classroom and the research that made that knowledge possible.

**Educational Reforms of the Progressive Era**

Casey Dschaak, Dr. Teena Gabrielson

Department of Political Science

University of Wyoming

Oral Presentation

*UW Honors Program*

*Belle Fourche, SD*

Education is constantly slowly evolving. In The United States we tend to forget the past. The educational system in the United States can be divided into two rough categories one being classical education and one being progressive education. Progressive education is a product of the Progressive era 1870-1920. This portion of the United States saw the end of the Civil War and the complexities of reconstruction. Important factors that influenced educational change were social classes, social evolution, and the second industrial revolution. This paper uses textual research to include Karl Marx, John Dewey, Theodore Roosevelt, Woodrow Wilson, and many contemporary authors who have formulated their opinions on the roots of progressive education. I suggest the emergence of noticeable social classes and success of communist philosophy allowed educational reform. Education then became a means of upward mobility. I also suggest that Charles Darwin and On the Origin of Species, enlightened politicians to social control. Education then could become a means of producing productive citizens for an evolving society. Lastly the specialization of occupations during the industrial revolution was necessary for profitability and so education specialization and the industrial revolution worked cooperatively for reform.

**Biotechnology and other areas of science rely on the use and understanding of the metric system: Development of reusable learning objects as a biotechnology teaching tool.**

Clay Stoner<sup>1</sup>, Rachele Dube<sup>1</sup>, Jami George<sup>2</sup>, Cameron Treeby<sup>2</sup> with Ami Erickson  
Division of Natural Science  
Northern Wyoming Community College District, Sheridan College  
Poster Presentation

*Wyoming NASA Space Grant Consortium*

*Sheridan, WY<sup>1</sup> and Buffalo, WY<sup>2</sup>*

The metric system is an invaluable tool to researchers and scientists as a universal measurement guide. A slide show teaching the metric system was created as a reusable learning object (RLO) to aid with understanding the terms used for measurements in biotechnology. Various scenarios, staging metric comparisons, were videotaped to accompany a slide show to teach the steps needed in using the RLO. Tools used to create this RLO include a metric system converter, power point slide show, and hand out. After viewing the slide show, it would be expected that the viewer would gain knowledge about the use and application of various units of measurement involved in the metric system.

**Residues and Pseudoprimes: A Discussion of Fermat Pseudoprime**

Carla Elder, Maurisa Jensen, Kelley O'Toole; Dr Siguna Müller, Dr. Ruben Gamboa  
Mathematics  
University of Wyoming  
Oral Presentation

*Wyoming Cryptography School*

*Rock Spring, WY  
Cheyenne, WY  
Cheyenne, WY*

Starting with a discussion of Fermat's Little Theorem and Carmichael numbers, *Residues and Pseudoprimes* will discuss possible structures for Fermat pseudoprimes and those pseudoprime's relations to quadratic and higher residues. The presenters will begin by touching on the research done by Daniel Shanks on numbers of the form  $n = (6m+1)(12m+1)$ , where both factors are primes. Then they will introduce the modified form  $n = (2m+1)(2km+1)$ , again where both factors are prime. After introducing their new form, the presenters will briefly discuss the Scheme and Excel algorithms used to generate and test these numbers. Finally we will talk about the relation we found between the form of the factors and bases for which  $n$  is Fermat pseudoprime.

## **Determining Influencing Factors of Pro-social Behavior**

Jennifer Fair, Bethany Kopsa, Amy Rieser and Lilly Tahir with Dr Gary Hampe

Sociology  
University of Wyoming  
Oral Presentation

*UW Sociology Department*

*Cheyenne, WY  
Rockton, IL  
Jackson, WY  
Washington D.C.*

This research seeks to discover how altruistic values influence individuals to participate in volunteer activities. We define altruistic behavior as people's feelings toward and willingness to help others. Volunteering is defined as any charitable donation in various forms (for example monetary, labor, and any support) that contributes to the well-being of any individual. Non-profit organizations have a reoccurring challenge finding and retaining volunteers willing to take part in their programs. The objective for this study is to identify shared altruistic tendencies, allowing organizations to be directed more specifically toward individuals who are apt to participate in volunteer activities, helping overcome a personnel shortage. In turn, this study will help organization raise their rate of volunteerism. To determine the correlation between social activism and altruistic behavior we will use statistical techniques to analyze the archival data from the General Social Survey 2004 Interuniversity Consortium for Political and Social Research on altruistic behavior. We predict individuals with higher levels of altruistic characteristics will be more likely to participate in volunteering activities.

## **Isolation and Characterization of Antibiotics from *Streptomyces* Isolated from Soil Samples**

Katie Fall with Ami Erickson  
Division of Natural Science  
Northern Wyoming Community College, Sheridan College  
Poster Presentation

*Wyoming INBRE*

*Sheridan, WY*

The objective of this study is to identify, isolate and characterize antibiotics produced by three samples of *Streptomyces* by using antibiotic assays and chromatography. Three samples of *Streptomyces* were identified as able to produce antibiotics against (*Bacillus subtilus*, *Escherichia coli* (*E. coli*), and *Sarcina aurantiaca*). By cutting zones of inhibition from agar plates and filtering broth cultures, chromatography will be used to analyze the sample complexity, substance identification, relative composition, and kinetic characteristics of the sample. *Streptomyces* Sample 1 had excreted light pink pigments into the agar. The zones of inhibition averages for Sample 1 were *S.aurantiaca*: 2.13 cm, *E. coli*: 1.30 cm, and *B.subtillus*: 1.23 cm. *Streptomyces* Sample 2 was a light yellowish color with no excretion of pigments into the agar. Sample 2 averages were *S. aurantiaca*: 0.20 cm, *E. coli*: 0.10 cm, and *B. subtilus*: 0.40 cm. *Streptomyces* Sample 3 was a light yellow color with crusty properties. Sample 3 averages were *S.aurantiaca*: 1.35 cm, *E.coli*: 0.10 cm, and *B.subtillus*: 0.67 cm.

## **Cytoarchitectonic and Immunohistological Profile of FMR1-KO Mice in the Posterior Piriform Cortex**

Tyler Felton, Andrew Young, Chunzhao Zhang and Qian-Quan Sun  
Department of Zoology and Physiology  
University of Wyoming

*NSF EPSCoR*

In this study we examined cytoarchitectonic and immunohistological profile of GABAergic neurons in the posterior piriform cortex. Taking advantage of transgenic mice in which GABAergic neurons express green fluorescent proteins (GFP), we studied subtype specific expression of cellular markers in GABAergic circuits and their developmental profile. In the part of the study, several neuronal markers, including calcium binding proteins, voltage-gated potassium channels, glutamate receptors, were examined in GAD67-GFP and GAD65-GFP mice. The results of these experiments support the idea that GABAergic cells of the piriform cortex are composed of multiple subtypes with combinatory expression of different neuronal markers. In the second part of the study, we observed the longevity of GAD67-GFP and GAD65-GFP cells. Mice of six different age groups were used including: 1 month 12 days, 1 month 22 days, 3 month, 6 month, 1 year 22 days, and 2 year. The results showed that the density of GAD65-GFP neurons in the posterior piriform cortex and cell body area maintain a fairly constant level throughout life, with the cell body area peaking at 4-6 months of age. Also, the majority of cells found in layer II and the ratio of layer II cells/total GAD65-GFP cells remains constant throughout life. These results 1) provide detailed information regarding cell-type specific expression of cellular markers; 2) provide evidence that GABAergic neurons in the posterior piriform cortex maintain stable morphological and cytoarchitectonic properties from 1 month to 2 years of age in mice.

### **Multi-Sensor Rocket Payload**

Kyle Fox and Erich Lichtfuss with Dr. Legowski, and Dr. Johnson  
Electrical Engineering and Physics Department  
University of Wyoming  
Oral and Poster Presentation

*Department of Electrical and Computer Engineering*  
*Department of Physics*  
*Colorado Space Grant: RockSat*

*Laramie, WY*  
*Loveland, CO*

Spaceborne experiments have traditionally been logistically impossible for many educational institutions. With the advent of NASA's new RockSat program, the expense of space based experimentation has been reduced dramatically placing it within the reach of many universities and high schools. To assist these new student projects, we have devised a standard platform for future experimentation. The design of the platform is focused on flexibility, ruggedness, and ease of development for future users. The platform consists of a standard set of highly accurate sensors to record both internal canister parameters and the rocket's flight characteristics throughout the duration of the flight. The platform incorporates a high speed Controller Area Network (CAN) data bus allowing up to 127 experiment modules to be added to the project with minimal effort. Experimental and environmental data is stored on a high speed microSD card offering Gigabyte storage capacities while being removable for prompt data analysis. The designed comprehensive electrostatic discharge (ESD) combats harsh environmental conditions. The platform's operating system is designed with extensive error handling capabilities while maintaining easy modification for future users. The platform reduces development time by providing a very reliable and versatile data processing, transfer, and storage system.

## **Impact of Physical Lifestyle on Mental Health**

Jacqui Frost, Cassie Kennedy, and Kelly Leichtnam with Dr. Gary D. Hampe  
Department of Sociology  
University of Wyoming  
Poster presentation

*Department of Sociology*

*Bandera, TX  
Kemmerer, WY  
Sheridan, WY*

This study is focused on how mental health affects physical lifestyle. It has been shown that psychological well being can influence how well one's body is able to function as a whole as well as fighting off certain diseases. There has not been research done on how to "prescribe happiness" in order to have those health benefits. The question we will ask is "does leading a healthy lifestyle make you happier?" We will use data from the General Social Survey, 2006, #20681, Inter-University Consortium for Social and Political Research. The independent variable, physical lifestyle, is measured by a person's physical activity, diet, amount of sleep, and whether a person smokes or drinks regularly. Mental health is measured by self-assessment questions regarding optimistic versus pessimistic outlooks, confidence, self appraisal, and an objective measure depression.

## **The Relationship between Perceived Discrimination and the Presence of PTSD Among a Refugee Sample**

Andrew Galbreath and Melissa Salvato  
Social Work  
University of Wyoming  
Oral and Poster Presentation

*University of Wyoming IRB Supported*

*Sheridan/Casper, WY*

(Background) Refugees of tumultuous international countries come to the United States for asylum. These refugees are not often assimilated immediately into the society of refuge; therefore they must overcome social barriers in order to become successful in the current society of residence. Many also face psychological maladies such as depression, anxiety, and PTSD. In this study, the researchers aim to find a relationship between the presence of PTSD and those who do not feel as though they are healthy participants in their current society.

(Methods) Using a Basic Demographic Scale and an Everyday Demographic Scale - both are standardized and evidence-based - the researchers will group each participant of the study into a variety of categories. The Basic Demographic Scale will help the researchers control for particular variables such as age, sex, and education level. Researchers will also have access to PTSD diagnosis among participants.

(Results/Conclusion) The relationship between those who score low on a Perceived Discrimination Scale and those who are diagnosed with PTSD will support the need for evidence-based and competent "person-in-environment" treatment of refugees. Dissemination of the findings will help those who practice within mental health agencies allocate appropriate resources/counseling techniques to refugees.

**Comparison of methods and techniques of DNA extraction and amplification: Development of reusable learning objects as a biotechnology teaching tool.**

Jami George<sup>1</sup>, Cameron Treeby<sup>1</sup>, Clay Stoner<sup>2</sup>, Rachele Dube<sup>2</sup> with Ami Erickson  
Division of Natural Science  
Northern Wyoming Community College District, Sheridan College  
Poster Presentation

*Wyoming NASA Space Grant Consortium*

*Buffalo, WY<sup>1</sup> and Sheridan, WY<sup>2</sup>*

The manipulation of molecular DNA and genetic engineering are important tools in biotechnology that can positively affect all areas of production in agriculture, food science, and medicine. Multiple protocols for extracting, isolating, and amplifying genetic DNA were explored. Spectrophotometry, gel electrophoresis, and polymerase chain reaction (PCR) were utilized in two DNA extraction and amplification methods in the attempt to yield testable DNA from human hair follicles and plant *Spinacia oleracea* leaves. Flow charts comparing and contrasting DNA extraction and amplification methods were developed from the procedures as a reusable learning object. The human DNA extraction that was amplified using a primer for the PV92 allele yielded successful results. The methods used for *Spinacia oleracea* yielded extraction of DNA, but amplification was unsuccessful using the OPAB 07 and 09 primer. Further investigation is needed to determine the specific causes for *S. oleracea* results. Lab techniques were developed, including proper use of lab equipment such as micropipettes and gel electrophoresis, as well as solution preparation for lab protocols.

**Prying Open My Third Eye:  
Drug Subculture in American Literature from the 1950s**

Lillian J. Gilmer with Dr. Beth Loffreda  
Department of English  
University of Wyoming  
Oral Presentation

*English Honors, UW Honors Program*

*Lander, WY*

Literature represents culture, that of the mainstream and that of the underground, and the literature written by members of a subculture defined by drug use evolves into a complex consideration of difference in a conformist American society. Through the works of William S. Burroughs, Jack Kerouac and Allen Ginsberg in the 1950s, Ken Kesey and Tom Wolfe in the 1960s, Hunter S. Thompson in the 1970s, and finally the contemporary novelists T. C. Boyle and Susan Choi, I traced the role of drug-related difference and its struggle within the mainstream cultural construct. Within these works I discovered a progressive theme of conflict between the two cultural entities. From a beginning entrenched in a willful separation from the 'norm' which resulted in anxiety, to an explosion of alternative thought bent on utilizing difference, to a resulting disillusionment when that difference proved largely ineffectual, and finally to a criticism of the past through distance, literature of the drug subculture examines the fissure in thought and action between an 'other' and the 'norm.' My findings were reinforced by secondary research including the critical responses to the authors themselves as well as books about the role of drugs in American society.

## **Bioinspired Analogs for Water Gas Shift Catalysts**

David Granum with Dr. Mark Mehn  
Department of Chemistry  
University of Wyoming  
Oral Presentation

*School of Energy Resources REU*

*Casper, WY*

Carbon monoxide dehydrogenase (CODH) is an enzyme which catalyzes the reversible oxidation of CO to CO<sub>2</sub>. Specifically, the C-Cluster is the site responsible for catalyzing the reaction, and its structure has recently been solved. CODH oxidizes 10<sup>8</sup> tons of carbon monoxide each year, and the H<sup>+</sup> byproduct could be converted into hydrogen gas, a potential fuel source. Inspired by CODH's ability to oxidize large amounts of CO at ambient temperature and pressure, it is our overall goal to synthesize a bimetallic complex capable of oxidizing CO following a similar mechanism as CODH. This research was devoted to obtaining information which would aid in the synthesis of this bimetallic complex. The first part of our research reports the formation, structural characterization, and coordination chemistry for several β-ketoaminate complexes. This data will help in preparing the β-ketoaminate section of the desired bimetallic complex. Secondly, we have begun the initial steps in obtaining the FeCp portion of the bimetallic complex, the results of which are discussed.

## **Determination of Cell Type and Subcellular Location of Spermidine Synthase**

Kevin Grauberger with Dr. Mark Stayton  
Molecular Biology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Mitchell, NE*

Heart disease is the leading cause of death in the United States. In an effort to understand the early responses in the heart to an acute myocardial infarction (AMI), a microarray study was performed and the arginine-nitric oxide-polyamine pathway was highly up regulated. Immunohistochemistry was used to determine the cell type and subcellular location of spermidine synthase (SPDS), spermine/spermidine acetyl transferase (SSAT), and polyamine oxidase (PAO). Initial immunohistochemistry results for SPDS suggest the enzyme is located in the intercalated discs of cardiomyocytes. Immunohistochemistry for PAO suggests the enzyme is located in fibroblasts. Immunohistochemistry for SSAT did not give conclusive results. Additionally, the researchers attempted to clone a bovine Arginase 1 (ARG1) gene into *E. coli* for the purpose of overproduction and the gene was successfully introduced into *E. coli*. Also, increased L-arginine levels in the blood may help increase the chances of surviving an AMI and citruline is a precursor for L-arginine. Blood plasma samples were prepared for amino acid analysis in an attempt to determine if mice with increased dietary citruline levels helped to elevate blood arginine levels.

## **Characterization of Coal and Water Samples from Coal-bed Methane wells by Gas Chromatography Mass Spectrometry: Enhancement of Secondary Biogenic Methane Production**

Leslie Graul with Dr. Franco Basile  
Department of Chemistry  
University of Wyoming  
Oral and Poster Presentation

*Department of Chemistry*

*Omaha, NE*

Secondary biogenic coal-bed methane production is the production of methane by anaerobic microbial systems *in situ* after the initial process of coal formation. Secondary biogenic methane production does occur and methanogenic organisms have been detected in coal beds, providing additional confirmation that the process is biogenic. These observations, however, do not provide the conditions required optimizing biogenic methane production nor do they provide an indication of the fraction of methane potential that could be recovered. Instead these preliminary results provide a starting point for evaluating the suitability of secondary biogenic methane production as a sustained source of methane.

In order to optimize conditions for secondary biogenic methane production, a complete characterization of the microbial population present in these deposits must be conducted along with a detailed chemical characterization of their coal and water matrix. This paper starts to look at the soluble fraction in the coal. The goal is to develop an accurate picture of the metabolites available to methanogenic bacteria and use this information to optimize the generation of biogenic methane.

### **Building the Expectation of Sustainability into the**

Patti Gunderson with Dr. Tony Denzer  
Civil and Architectural Engineering Department  
University of Wyoming  
Oral Presentation

*Department of Civil and Architectural Engineering*

*Casper, WY*

The University of Wyoming's Architectural Engineering program offers junior and senior level Architectural Design courses to help students meld engineering methodologies with architectural philosophies. As all stakeholders (owners, architects, engineers and builders) collaborate at earlier stages in the construction industry, major improvements are supported. The 2030 Challenge aims for all new construction and major renovations to be "carbon-neutral in 2030 (using no fossil fuel GHG emitting energy to operate)." ([http://www.architecture2030.org/2030\\_challenge/index.html](http://www.architecture2030.org/2030_challenge/index.html)) This goal has been adopted by the American Institute of Architects and the American Society of Heating, Refrigeration and Air Conditioning Engineers, among many others. At the University of Wyoming, the Architectural Design courses are the ideal tools to support integration. The goal of this semester's study is to develop and test sustainability and energy efficiency topics and materials that will help engineering students understand and contribute to this effort, not as an after-thought but in a deep and global fashion. Daylighting, natural ventilation, passive solar heat gain, and thermal and photovoltaic solar devices should all be considered mainstream and accessible. The goal is to incorporate design and energy analysis tools in conjunction with common-sense principles to verify the cost-effectiveness of all materials choices and design decisions.

## **Assessment of Water Quality Extension Products in the Northern Plains and Mountains Region**

April Hadley with Ginger Paige, PhD  
Department of Renewable Resources  
University of Wyoming  
Poster Presentation

*McNair Scholars Program*

*Douglas, WY*

A goal of Extension in the Land Grant University System is to develop education programs and materials that effectively disseminate information from research out to end users in the state or region. A difficult task in extension is to quantify the impacts of extension program outputs on changes in knowledge or behavior. This study will examine the effectiveness of extension educational materials used by landowners in the Northern Plains and Mountains Region. The overall goal in developing and disseminating the materials was to improve understanding of soil and water issues among the target audience, landowners in the region. It is hypothesized that the materials were effective in increasing the knowledge base of landowners. The methods used to test the hypothesis will include targeted written and phone surveys. Data will be analyzed using standard statistical methods, such as Chi-square. The results will be used to assess 1) the quality of the program materials and 2) the effectiveness of the extension program on changing knowledge of the targeted audience. This study will increase our understanding of the effectiveness of the approaches used to disseminate information and products in extension programs.

### **Aristotle's Persisting Contributions to Identity**

Sara Halliday, mentor Robert Colter  
Philosophy Department  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Newcastle, WY*

*Background:* Through the study of Aristotle, I found brief mentions of the modern philosophical discussion of identity and sought to hash out what Aristotle might bring to the table for the modern discussion.

*Methods:* In-depth reading of Aristotle's Metaphysics leads to many conclusions about identity, the soul, essence, and personal persistence over time. The paper seeks to coalesce this into a cohesive view about personal identity. Through philosophy articles, the conclusions are backed up and compared to the modern viewpoint.

*Conclusion:* Aristotle's discussion of metaphysics gives us his possible answer to personal persistence over time due to his views regarding *potentiality*. We may call this personal potentiality. An account cannot be given for personal identity once a person passes out of our immediate perception. There is no essential identity, only accidental properties and a shared essence between all humans. Finally, we can apply the final cause to realize that our essence may be more about action rather than metaphysical properties.

## ***Eimeria* Parasites in Wyoming Ground Squirrels and the Secondary Science Classroom**

Nick Hamar, Dagmara Motriuk-Smith, R. Scott Seville  
Department of Zoology and Physiology  
University of Wyoming/Casper College Center  
Oral Presentation

NSF EPSCoR-WySTEP

Casper, WY

The purpose of the study conducted during the summer of 2008 was to identify the eimerian parasites found in Wyoming ground squirrels (*Spermophilus elegans*) live-trapped in Natrona County and to learn basic field and laboratory techniques. *Eimeria* are intestinal parasites that are found in a wide variety of animals that can cause coccidiosis. Fecal samples were collected from live captured squirrels and mixed with 2% potassium dichromate to allow sporulation of *Eimeria* oocysts. After one week samples were screened for presence/absence of eimerians and the number of oocysts counted using 100X magnification microscope. Twenty-two of 30 samples (prevalence =73%) tested positive for *Eimeria*. Samples possessing a minimum of 1,000 oocysts were set aside for later molecular tests. A microbiology teaching unit was designed and implemented during spring residency at Natrona County High School in Casper, 10<sup>th</sup> grade students. This unit included all three Wyoming state science standards. Students swabbed common objects throughout the school and grew the bacteria on LB/agar plates, some of which included antibiotic ampicillin. The focus of the discussion was aimed at microbial diversity, spread of diseases, significance of antibiotics in treatment of infections, and antibiotic resistance.

### **Phosphorus assimilation efficiency in fresh water gastropods:**

#### **An indicator of invasion success?**

Brenda K. Hansen with Dr. Amy Krist  
Department of Zoology and Physiology  
University of Wyoming  
Oral Presentation

NSF EPSCoR

Casper, WY

Invasive species are being documented on a global scale. As a result, numerous studies have been conducted to assess the damage caused by them, and to help determine possible changes. The purpose of this research is to continue work determining the difference in nutrient needs between a native and two invasive aquatic snails by measuring ingestion, egestion (fecal matter) and assimilation efficiency of the common nutrient requirements, Carbon (C) and Phosphorus (P). Most of my project has focused on developing the methods that will be applied to the upcoming feeding trials, including establishing digestive turn-over and metabolic rate. Pending the return of samples from the University of Wyoming Stable Isotope Facility, the base line for the ratios of C, N (Nitrogen) and P of adult individuals will also be discussed. This will be the first study to measure assimilation efficiency in the context of C:N:P stoichiometry of an invasive invertebrate species, and the values that I gather will contribute to a growing database of information about invasive species and aquatic ecosystems. Increasing this knowledge base will provide a better understanding of how aquatic ecosystems function and how invasive species affect them.

**Migratory and biological implications of isotopic composition in nail halux and feather samples for *Cinclodes nigrofumousus* and *C. oustaleti***

Ellen Hart with Dr. Carlos Martinez del Rio  
Zoology and Physiology  
University of Wyoming  
Oral Presentation

*UW Honors Program and NSF EPSCoR*

*Davenport, IA*

Stable isotopes are biologically and physiologically significant in our study of organisms and their interactions with their habitats. Additionally, they are easily quantified and compared by used of mass spectroscopy. Many studies have utilized this relatively new technology, especially relative to migratory patterns, however, none have yet compared the isotopically different assimilation of diet in species that migrate between the isotopically lighter terrestrial and heavier marine habitats. *Cinclodes* is an ideal species for this comparison since *C. oustaleti* purportedly migrates between a terrestrial and marine environment while *C. nigrofumousus* is obligatory marine. I compared the  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  of claw and feather samples from both species collected in Chile during winter 2006, finding strong evidence for significant differences in seasonal change between *C. oustaleti* and *nigrofumousus*. Such findings have implications for the physiology of the species, especially regarding renal function and for further usefulness of stable isotopes the ecological and physiological understanding of organisms.

**A Comparison Study on the Effectiveness of Different Types of Therapies in Treating Attachment Disorder in Children**

Amanda Hathaway and Megan Varga with Dr. Kathleen McKinney  
Department of Social Work  
University of Wyoming  
Oral Presentation

*Department of Social Work*

*Star Valley, WY  
Cheyenne, WY*

Reactive attachment disorder (RAD) is a condition which presents itself in children who have experienced abuse or neglect at a young age. Currently there is no effective evidence based practice for treating RAD. In this study we will compare the effectiveness of traditional therapy and art therapy in treating RAD. The therapeutic relationship relies on trust and open communication. This relationship is extremely difficult to develop with children diagnosed with RAD as its symptoms include the inability to trust, difficulty forming interpersonal relationships, delays in auditory processing skills, and a short attention span. Due to these unique symptoms, it is our hypothesis that art therapy will be a more effective treatment for reactive attachment disorder. We propose that art therapy can provide children with an alternate language through which to express themselves. This language is hands on and has the capability of keeping children's interest while providing a less intrusive way of developing a trusting relationship. Surveys addressing past work with children diagnosed with RAD will be completed by both art therapists and traditional therapists. The responses to these surveys will help us determine the difference in effectiveness between traditional therapy and art therapy in treating reactive attachment disorder.

## **Applications of Lucas Sequences in Primality Testing**

Andrew Hauser, Karl Heimbeck and Heather Robinson

with Dr. Siguna Mueller

Department of Mathematics

University of Wyoming

Oral Presentation

### *Wyoming Cryptography Cohort*

Given integers  $P$  and  $Q$ , a Lucas sequence is defined as the list of all  $U_n$  and  $V_n$  such that  $U_{n+1} = PU_n - QU_{n-1}$  and  $V_{n+1} = PV_n - QV_{n-1}$ . By testing specific conditions of  $U_n$  and  $V_n$  in combination with the Fermat test, the primality of  $n$  can be tested. The goal of this research was to determine which combinations of the conditions on  $U$ ,  $V$  and the Fermat test work best to yield the least amount of pseudoprimes when used as a primality test.

### **“Working the Kinks Out: Understanding Contemporary Sexual Identity through Sex Blogs”**

Jane Noelle Hawley with Dr. Beth Loffreda

Department of English

University of Wyoming

Oral Presentation

*UW Honors Program*

*Bakersfield, CA*

The Beautiful Kind’s blog tagline reads:

Be open and honest.

Don’t be ashamed of your inner pervert.

Work the kinks OUT.

Perceptions of contemporary sexuality and sexual normality have been revamped since the popularization of the weblog. These perceptions continue to change as an increasing number of Internet users begin to write, read, and comment on sex blogs. Exploring a variety of contemporary sex blogs, the project examines construction of sexual identity through blogging. The presentation will investigate questions concerning sex blogging and the formation of individual sexual identity through the writing and reading of sex blogs. Topics addressed include male virginity, geek love, the self-described slut, BDSM, exhibitionism, bisexuality, vanilla women, Half Naked Thursday, chastity, and fetishism.

This study attempts to “work the kinks out” by investigating these issues without polarizing sexual identity formation as being determined largely by gender or sexual orientation. It considers areas such as economics, parenthood, and education as elements informing the fluidity and complexity of sexual identity. Rather than settling on conclusions, the project proposes that the probing questions we ask about our sexual identities and practices tell us more about how we think about sex than the so-called answers to these questions.

## **Cotyledonary Vascular Morphology of the Ovine Placentome and the Effects of Maternal Obesity**

Sarah Hein with Dr. Stephen P. Ford  
Department of Animal Sciences  
University of Wyoming  
Oral Presentation

*UW Honors Program and NSF EPSCoR*

*Casper, WY*

In the gravid uterus of the ewe, 70-120 placentomes composed of a fetal component (cotyledon) and a maternal component (caruncle) function as individual placental units where maternal to fetal nutrient transfer occurs. Further, the morphological conversion of ovine placentomes from type A (found early in gestation) to more advanced forms (B, C, or D types) increases with the advancement of gestation. To our knowledge, nobody has evaluated the changes in the three dimensional structure of the cotyledonary vasculature as the placentome advances from A to D forms. Further, nobody has evaluated the changes that may occur in this vascular bed in response to maternal obesity. Using latex vascular casts, we visualized the cotyledonary vascular beds of type A, B, C, and D placentomes in a normal pregnancy and found that the cotyledonary vascular beds become larger and more organized as the placentome develops. In the obese ewes the cotyledonary beds of the A type placentomes were markedly less branched and organized than type A placentomes from control pregnancies, resulting in a less dense vascular bed, and suggesting decreased blood flow through this bed in obese ewes.

## **Testing the hypothesis of an extraterrestrial impact around 12,900 years ago as a cause of megafaunal extinctions and the decline of the Clovis culture**

Ilene Hilman with Dr. Todd Surovell  
Department of Anthropology  
University of Wyoming  
Poster Presentation

*NSF EPSCoR*

*Laramie, WY*

Near the end of the last ice age, a number of large mammalian genera disappeared from North America during a drastically colder period known as the Younger Dryas. In 2007, Richard Firestone, Jim Kennett, Allen West, and others proposed that the Younger Dryas was triggered by an extraterrestrial (ET) impact. They purport that a comet exploded/impacted the North American glacial ice sheets approximately 12,900 years ago. Dust, soot, and smoke lowered temperatures, leading to megafaunal extinctions and the decline of the Clovis archaeological culture.

Evidence for the ET event comes from carbon-rich layers across North America containing magnetic grains rich in iridium, titanomagnetite microspherules, charcoal, soot, carbon spherules, glass-like carbon containing nanodiamonds, and fullerenes with helium. Firestone et al found that soil samples from the Younger Dryas boundary contained one or more of these markers in concentrations well above background.

Dr. Todd Surovell, Department of Anthropology, University of Wyoming, Dr. Vance Holliday, Department of Anthropology, University of Arizona, and this author tested samples from Lubbock Lake, Texas and San Jon, New Mexico. The samples did not exhibit significant differences between the Younger Dryas stratum and surrounding strata. This study does not support the existence of an extraterrestrial event.

## **Linking Obesity and Socioeconomic Status: Are the Poor Fatter?**

Alyson Hinman , Christopher Woods, Rebecca Sellars, and Erin Therriault

With Dr. Gary Hampe  
Department of Sociology  
University of Wyoming  
Oral and Poster Presentation

*Department of Sociology*

*Laramie, WY  
Guernsey, WY  
Wheatland, WY  
Sheridan, WY*

Our research examines the relationship between socioeconomic status and obesity. The United States is plagued with a rising obesity rate. The exponential rate of obesity within the past few decades is largely due to an increasingly sedentary lifestyle. However, the definition for who is considered obese is rather vague due to three existing and sometimes conflicting viewpoints. These viewpoints include medical, cultural, and governmental. In examining these three viewpoints, one finds a specific trend in American society. , suggesting that lower class individuals are more likely to be overweight than individuals of an upper class.

This study utilizes data from the National Health Survey in 2006 Study #20861, accessed from the Inter-University Consortium for Political and Social Research 20861 in order to analyze obesity as measured by the Body Mass Index. Important environmental factors, specifically including one's lifestyle, social class, class culture, age, and gender directly influence obesity in all socioeconomic statuses, especially the rate of obesity among the lower class.

**17beta-Estradiol supplementation attenuates cardiomyocyte contractile dysfunction via activation of AMP-activated protein kinase (AMPK) in ovariectomized mice**

Anna Huff with Dr. Jun Ren

Molecular Biology

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Pueblo, CO*

Cardiovascular disease is significantly lower in premenopausal women than males or postmenopausal women, attributed to the protective role of estrogen, in addition to reduced insulin sensitivity and increased risk of type 2 diabetes associated with diabetic cardiomyopathy. AMP-activated protein kinase (AMPK) increases energy supply by increasing glucose transport and free fatty acid utilization. AMPK activation by estrogen was recently observed in C2C12 myotubes and rat skeletal muscle in vitro. However, little is known about how estrogen affects AMPK signaling in the heart. The major aim of this study is to observe the effects of 17beta-Estradiol supplementation on ventricular myocyte contractile function and AMPK activation. Female C57 mice were subjected to bilateral ovariectomy (Ovx) or sham operation (sham). A subgroup of Ovx mice were given 17beta-Estradiol supplement (IP, 40µg/kg/day) for 6 weeks. Mechanical and intracellular Ca<sup>2+</sup> properties were evaluated, including peak shortening (PS), time to PS (TPS), time to 90% relengthening (TR(90)), maximal velocity of shortening/relengthening (+/-dL/dt). Levels of AMPK, pAMPK, Akt, pAkt, pACC and pAS160 were assessed by Western blot. Ovx decreased PS and ±dL/dt, TR(90) with the exception of TPS. Interestingly, 17beta-Estradiol supplementation restored the depression in PS and ±dL/dt but failed to reverse in TR90, which was associated with prolongation in the intracellular calcium decay rate. Western blot results showed that Ovx did not alter the levels of total Akt and AMPK, but ablated the activation of both. These alterations in protein expression were restored by 17beta-Estradiol. The expression levels of pACC and pAS160 were found slightly depressed in Ovx mice but not significant. These data suggest that 17beta-Estradiol supplementation attenuates the abnormalities of mechanical and protein functions in ventricular myocytes caused by estrogen deficiency and the crosstalk between the estrogen receptor and AMPK signaling pathways may play an important role.

**Irreconcilable Differences:  
Missionary Persecution and Eviction in  
16<sup>th</sup> Century Japan**

Jessie Hughes with Dr. Kristine Utterback  
Department of History  
University of Wyoming  
Oral Presentation

*Department of History*

*Bullhead City, AZ*

The European Reformation was a very dividing period of Europe's history. Political divisions and wars were just some of the results to appear in the west. However, the Reformation period was not localized only to Europe. During the 16<sup>th</sup> Century Japan was going through its own crisis of which was nothing less than the constantly evolving change of leadership. It was into this situation that the first Catholic missionaries arrived.

The research first attempts to understand the interaction the Shogunate and local leaders had with the missionaries, and then to determine the extent to which differences evolved prior to the arrival and stay of Protestants like the Dutch. Under the era of Nobunaga Catholic missionaries arrived in Japan and were welcomed for various reasons. However, a rift occurred during the shift of leadership to Regent Hideyoshi and later Ieyasu Tokugawa. The local and regional power struggles, ideological conflict, and threat of Europe's fleets created a tense and often violent conflict in Japan between its rulers and the foreign missionaries, all before the Protestant nations established a solid presence.

**Shift Scheduling using Database-Driven Technology**  
Matt Huston and Brent Rathburn with Dr. Jeffrey Van-Baalen  
Department of Computer Science  
University of Wyoming  
Oral Presentation

*Department of Computer Science*

*Hemingford, NE  
Dayton, WY*

Scheduling shifts in retail business is often time consuming and difficult; using database-driven technologies, this program aims to reduce the time and difficulty associated with scheduling. By implementing a program to compare business-given constraints, employee availabilities, and employee needs, scheduling shifts will become easier and faster. This program is written in C#.NET using Visual Studio 2008 and includes technology from SQL Server 2005. The program is desktop-based and allows for new users to immediately begin using it without complications. By using this program, retail businesses can devote more time to more appropriate tasks and focus less on scheduling employee shifts.

## **Unruly Women: Women in the 1916 Easter Rising**

Emily Jelly with Dr. David Messenger  
Department of History  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Sheridan, WY*

Women played a large role in the 1916 Easter Rising in Ireland. The participation of women in this revolt is often overlooked. Not only did women play an important part in the rising itself they also played a pivotal role in creating the myth of the Rising while many of the leaders of the Rising were in prison. I chose to undertake this research in order to show how women were part of the Rising. Often in a rising minority groups such as women are understudied. To complete my research I examined newspapers, letters, and many secondary sources.

## **Cisplatin compromises the ultrastructure of mitochondria and mechanical function of cardiomyocytes**

Kyla Jones with Heng Ma and Jun Ren  
Department of Pharmaceutical Sciences, Center for Cardiovascular Research and Alternative  
Medicine, School of Pharmacy  
University of Wyoming  
Oral Presentation

*NASA Space and Science and NSF EPSCoR*

*Longmont, CO*

Today, cisplatin is a chemotherapeutic agent used to treat various types of tumors. Treatment with this drug has been effective against numerous malignancies, including those of the lung, head and neck, and especially genito-urinary system. Despite the effectiveness of cisplatin, it has been shown to have toxic side effects. The focus of this research was to determine the mechanism of cardiotoxicity correlated with the medication.

Throughout this experiment, research was done on C57 male mice. They were treated with Cisplatin (10 mg/kg/day i.v.) or control (0.9% NaCl) for one week. Cardiac tissue was collected one week later for analysis. Various experiments were performed, including: mouse heart perfusion, cardiomyocyte isolation, measurement of cell shortening and relengthening, and western blot analysis.

The results collectively illustrated that cisplatin is harmful to cardiomyocytes. The heart to body weight ratio was slightly decreased, while the peak shortening amplitude and maximal velocity of shortening/relengthening were significantly depressed. Results also demonstrated that cisplatin compromises the mitochondrial membrane and activates the ER stress response. This damage leads to induced apoptosis.

From this information, we can conclude that treatment with cisplatin has various mechanisms in which it damages cardiomyocytes and results in cardiotoxicity.

## **Yo! Poetry Raps: Rejuvenating a Lost Art in a Top 40 World**

Jason Joyce with Danielle Pafunda  
Dept. of Business, Creative Writing  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Cheyenne, WY*

The purpose of this project is to rejuvenate poetry in the classroom. Poetry serves as an important creative process because there are no content requirements, barriers of entry, expressive restrictions, or pre-requisites for people to create poems. I have been in the process of crafting a collection of poetry from the eyes of a twenty-two year old that is immersed in a modern, popular culture infused world. The need for my creating of the collection and project stems from the general population of youth, namely teenagers, defining themselves through popular culture- especially Top 40 music lyrics and mainstream recording artists. There is an equally important medium being left out which has similar elements, that being poetry. As poetry is in a different context, has a less broad reach, and is generally less accessible and mainstream, teens and youth have been underexposed to an important creative process. The project aims to get youth excited about poetry, whether it be reading or creating, and discover elements of modern poetry which can be just as defining for them as popular radio hits. This portion of the project comes in the form of outreach workshops tailored to high school and junior high students.

## **Silk Genes and Proteins from Orb-weaving Spiders (family Araneidae)**

Traci J. Keating with Dagmara Motriuk-Smith,  
and R. Scott Seville  
Department of Zoology and Physiology and  
University of Wyoming/Casper College Center  
Poster Presentation

*NSF EPSCoR-UW/CC*

*Casper, WY*

Scientists have been studying spider silk and attempting to produce artificial fibers which could find use in a variety of commercial and medical applications. Although much knowledge about silk has been already acquired, most attempts to recreate a quality silk fiber have not yielded satisfactory results. The purpose of this research project was to identify silk glands and prepare a quality genomic DNA. Fresh tissue samples were obtained from live *Argiope trifasciata* orb-weaving spiders. The spiders were anesthetized and dissected. Major ampullate, minor ampullate, and tubular silk glands were identified based on size, morphology, pigmentation along with the ducts and spigots used in silk secretion. After examination of the glands using a dissecting microscope (100X), the glands were stored for further protein and RNA studies. Genomic DNA was extracted from *Latrodectus*, *Nephila*, *Tetragnatha*, *Araneus* and *Argiope*. Fresh and frozen tissue samples were utilized. DNA results from the fresh and frozen tissue samples were compared. Fresh tissue samples yielded the best DNA results as determined by gel electrophoresis and UV spectroscopy. Future experiments will include amplification and sequencing of silk genes.

**“The Story of a Book: The creative process behind writing and illustrating a Children’s Book”**

Katherine Kerber with Ricki Klages

Art

University of Wyoming

Oral Presentation

*UW Honors Program*

*Greenwood Village, CO*

It began with an idea. Books have enchanted children for generations. Stories like the Peter Rabbit and Goodnight Moon have not only regaled and soothed small children for generations, but given them the tools they needed to achieve the kind of literacy that allows for the length and breadth of discovery all across this campus and many like it. Behind each and every book, however, there is an author who brings it across the finish line.

The process of making a book can be divided into three parts; the research, the execution and the marketing. In researching, the author needs to discover not only what the book he/she wants to write would be about and what the illustrations should look like, but also the demographics of the audience and the length of the book. After mapping out the book, I went on towards execution which involves creating a look for each of the characters and, in this case, mastering the medium of watercolor. Last, the marketing stage, involves a cycle of sending out publishers packets tailored to the desires of each of the seven publishers that have been identified as being possibly interested in this novel. It began with an idea and it ended with a book. This is that story.

**Fail safe device for a Load-bearing Portable ‘dead hang’ designed for locations where no Existing Rigging Positions Exist**

Margaret Kimble with Professor Charles Dolan

Department of Civil Engineering in association with the Department of Theatre and Dance

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Lakewood, CO*

Designed by the University of Wyoming Theatre Department the ‘Grid Dog’ provides a portable rigging system to create secure hanging locations above the stage where no standard rigging positions exist. The Grid Dog was originally designed to provide greater flexibility in stage design while ensuring stability. Research has furthered these features by increasing the flexibility to different grids, assisting in the lifting of larger loads with the addition of a mechanical aid, and increasing security through the addition of a fail-safe device.

Test methods included the testing of all parts to ensure that they meet / exceed their capacity requirements through load testing. Swing tests were conducted to ensure lateral stability and slip control. The adaptability to other grids was tested on comparison to other grids on campus and with description and measurements of other grids of theatres across the country.

The result of the research project is the development of a working prototype of the advanced Grid Dog and a modified version of the original that are both adaptable to various theatres and provide a range of hanging possibilities.

**Systematic leaf anatomy of Bromeliaceae subfamily Bromelioideae (Pineapple Family) – a preliminary comparative survey of the epidermis**

Emi Kimura with Dr. Gregory K. Brown

Botany

University of Wyoming

Oral Presentation

*Hokkaido, Japan*

There have been few comparative studies of leaf anatomy within subfamily Bromelioideae (Pineapple Family), despite the fact that such data have general utility in helping to clarify taxonomic relationships. This study focused on the leaf epidermis, and adjacent cells (e.g., trichomes, hypodermis) from 20 randomly selected Bromeliaceae species cultivated in the Williams Conservatory, University of Wyoming. This comparative survey concentrated on the size and shape of epidermis cells, the size and density of stomata and trichomes, and the cross sectional appearance of the epidermal and hypodermal layers. Both quantitative and qualitative data were collected, and these will be valuable new additions to the technical, systematic descriptions for these species.

**West Nile Virus: Structure, Transmission, and Detection**

Jan-Pablo Kollmar with Dr. Robert Corcoran

Department of Chemistry

University of Wyoming

Oral Presentation

*UW Honors Program*

*Iowa City, IA*

West Nile Virus, a member of the family *Flaviviridae*, infects birds, humans, horses, and other mammals. Spread through infected mosquitoes West Nile Virus has rapidly become an issue across the United States, and its prevalence has only increased over the last ten years. Current detection methods for West Nile Virus have a number of shortcomings and a new method for rapid, specific detection is needed.

The research I have been performing with Dr. Corcoran has been focused on designing a novel detection method for West Nile Virus. This assay will rely on a spectroscopic phenomenon known as Surface Enhanced Raman Scattering (SERS) and will allow for a fast, accurate, self-contained detection method. This assay will allow for better control of the spread of the virus, and will reduce the risk of infection.

### **Changes in Fetal Adipose Tissue Mass in Obese Ewes**

Carlie Koonce with Dr. Stephen Ford

Department of Animal Science and Center for the Study of Fetal Programming  
University of Wyoming  
Poster Presentation

*NSF EPSCoR*

*Chicago, IL*

The recent literature suggests a correlation between the maternal nutritional environment and patterns of adipose deposition in the fetus, such that pre-gravid and gestational obesity increases the likelihood of above-average fat deposition in offspring. Studies have shown that birth weight is a factor in later insulin resistance, cardiovascular disease, and obesity such that both higher- and lower-than-average birth weights are most susceptible to the onset of metabolic disease in adult life. The purpose of this study was to investigate the patterns of fetal adipose-deposition in response to maternal nutrition in sheep as a model for human development and disease predisposition. Based on the relationship between maternal and fetal weight described in the literature, it was hypothesized that fetuses of obese ewes would be fatter than fetuses of control ewes, and as a result, would have significantly more visceral fat. This increased adiposity was expected to be demonstrated as larger adipocytes per unit area in pericardial and perirenal fat depots in fetuses of obese ewes compared to fetuses of control ewes. Fetal fat tissues were sectioned, stained, photographed, and analyzed using image software. Statistical analysis of average adipocyte size and adipocytes per unit area showed no significant difference between treatment levels.

### **Canine Influenza in the Rocky Mountain Region**

Carlie Koonce and Stephanie Pruitt with Dr. Brenda Alexander

Department of Animal Science  
University of Wyoming  
Poster Presentation

*College of Agriculture: Paul Stock*

*Chicago, IL and Cheyenne, WY*

Canine influenza virus is a highly contagious, infectious disease agent commonly found in dogs in animal sheltering facilities. Because this is a newly emerging pathogen, all dogs are susceptible to infection and have no naturally-acquired or vaccine-induced immunity. Following outbreaks in 2005 and 2006, Northern Colorado and southern Wyoming have been identified as regions endemic for disease; however there has been only very limited surveillance of infection in these states. The purpose of this study is to survey animal shelters and breed rescues in the Rocky Mountain region in order to identify sero-prevalence of viral antibody in at-risk populations. Serum was collected and tested for antibody using an Influenza NP Antibody Inhibitor ELISA.

## **Grid Tied Photovoltaic System with Battery Backup**

Jeffrey Rickerl and Mark Korir with Dr. Stan Legowski

Electrical and Computer Engineering

University of Wyoming Oral and Poster Presentation

This presentation and poster covers the design and installation of a 1.2 kW grid intertie with battery backup photovoltaic system at the Bilbrough/Crammer residence near the Vedauwoo exit 329 off Interstate 80. A total of 3600 W of essential loads including the refrigerator, freezer, heater fan and lighting were determined and isolated in a subpanel. A charge controller, inverter, 120V to 240 volt single phase transformer, and battery bank were sized to handle these essential loads and provide at least three days of power in the case of a blackout. During normal operation the photovoltaic system will produce approximately 4.5 kW hours of electricity per day charging the batteries if necessary or feeding power back into the grid providing approximately one half of the electricity needs of the household when grid power is available. All necessary permitting and calculations were made concerning wire and conduit size, grounding, appropriate disconnecting means, and other requirements for a safe and compliant installation as directed by the National Electric Code and the electric distribution provider. The total out of pocket cost of the installation is approximately \$16,000 with expected tax write-offs and grants returning about \$5000 for a total installation cost of \$11,000.

### **A social worker in the emergency room: A closer look at reason for visit and the cost per services.**

Jessica Kramer, Holly Sibert, Nakia Singleton with Dr. Kathleen McKinney

University of Wyoming

Oral Presentation

*Department of Social Work*

*Fairbanks, AK*

*Fort Bridger, WY*

*Cheyenne, WY*

The purpose of this study is to examine the cause of injury and expected source of payment as it relates to social/psychological issues among patients in emergency departments (EDs) nationwide. Specific variables related to social issues will be examined in light of research that indicates having social workers in the emergency departments reduces overall costs. Through secondary data analysis, we will show how the lack of providing social service care in the EDs will increase costs of services. This data will provide important information as a way to address reducing costs within hospitals.

## **Cheyenne Regional Medical Center IT Department On-Call Program**

Bryon Kury with Jerry Hamann  
College of Engineering and Applied Science  
University of Wyoming  
Oral Presentation

*College of Engineering and Applied Science*

*Cheyenne, WY*

The Cheyenne Regional Medical Center (CRMC) Information Technology Department (ITD) needed an on-call system that would allow managers to efficiently organize on-call personnel. The system had to be easy to implement, maintain, learn, and that could be expanded to other parts of the hospital. It needed to be implemented with Lotus Notes which some applications were already implemented.

I will design the system to update the on-call schedule dynamically based on the number of weeks the managers schedule employees. The managers will be able to add, delete, edit employee information, and quickly make changes to existing schedules. On-call personal will be able to search for their weeks of on-call as well as make changes with fellow employees with email notification to the manager. The system will display on a web page on the CRMC homepage so all employees with a valid user name and password can access the on-call schedule.

Since Lotus Notes is already used for other applications within the hospital implementation, maintenance, and expandability will have a short learning curve. Training for the new system will be made available at the earliest possible date.

## **ANTIBIOTIC RESISTANCE OF SOIL BACTERIA FROM SITES WITH AND WITHOUT CATTLE**

Cory Lawson and Lynnet Mains with Dr. Elise Kimble & Dr. Allan Childs  
Northwest College, Powell, WY  
Poster Presentation

*INBRE*

*Powell, WY*

*Powell, WY*

Use of antibiotics in cattle may act as a selective pressure to increase the relative number of soil bacteria isolates resistant to the antibiotic drugs. On the other hand, soil bacteria are exposed to antibiotics synthesized by other soil bacteria. It may be that the effect of antibiotics entering the soil through cattle is inconsequential because of natural exposure to antibiotics. To determine the relative importance of the presence of cattle, soil from two adjacent areas occupied by cattle given antibiotics during calving and intermittently at other times was collected aseptically. Bacteria were isolated and tested against a panel of antibiotics using antibiotic discs on appropriate agar media. Diameter of the zone of inhibition was recorded. Soil from a site which had been free of cattle for more than ten years was similarly processed. Patterns of resistance from these sites are compared with data from samples from the Bighorn Mountains obtained last summer.

## **Speaking Out: Experiences of Native American/Indigenous Students on a Predominately White Campus**

Amanda LeClair with Dr. Angela Jaime  
English Department  
University of Wyoming  
Both oral and poster

*UW Honors Program and McNair Scholars Program*

*Ft. Washakie, WY*

The objectives for this study comes twofold; affirming my own experiences as a Native student in American Indian Studies courses, and documenting the experiences of other Native American students in these courses taught on a predominately white campus. This study will be qualitative in nature; my narrative and the interviews of the participants. I will be looking to see what the interviewees had to endure in these classes, both socially and academically. I will be looking for whether or not their experiences are similar or different to mine. Also, my research will include what a Native professor must endure while teaching Native classes at this same institution. My coding will be based on whether the students benefitted from their interactions from other individuals in the class. The importance of this study is to raise the consciousness of non-Native students and professors about the experiences of Native students and the issues they face in American Indian Studies courses on a predominately non-Native campus.

### **Spectrum Visualization Software**

Avery Lee with Dr. Jeff Van Baalen  
Department of Computer Science  
University of Wyoming  
Oral Presentation

*Department of Computer Science*

*Green River, WY*

The data in a spectrum map is collected with the Examiner and corresponding software produced by DeltaNu. The map data is then loaded into a piece of software called Map Maker to be manipulated into a visual representation of the spectra gathered from some material. Currently the Map Maker software is slow and sometimes unreliable. The software becomes unresponsive if too much data is loaded at one time or if it is trying to perform an especially process intensive function. My senior Design project is to redesign the software to eliminate or reduce these limitations. My design removes the process intensive portions of code from the UI thread so that the Interface is not affected by the data processing portion of the code. This keeps the program responsive and allows for larger data sets to be loaded at a single time. The final aspect of my redesign is to implement more efficient routines in the data processing portion of the code to increase the speed and usability of the software.

## **Marion Zimmer Bradley's Darkover: Accepting a Thought-Experiment**

Amanda Lehman with Dr. Susan Aronstein

Department of English

University of Wyoming

Oral Presentation

*UW Honors Program*

*Arvada, CO*

Marion Zimmer Bradley performed what she called, a “thought-experiment” in her Darkover novels, developing her writing into an example of the genre of Science-Fantasy which has been embraced by many authors since her time. This paper explores the formation of Bradley’s world now known as Darkover through her reactions to the cultural issues of the 60s, 70s and 80s, when she was writing most. From the website devoted to this series, to the book written about Darkover by Bradley’s second husband, the information on Bradley and her world spans a wide range of sources and points of view. This wealth of material, added to the more than 20 novels in the series, help analysis while also showing the impact of Bradley’s work on her audience.

In working to break into the male-dominated world of Science-Fiction, Bradley joined a powerful movement to strengthen equality between diverse peoples, whether different in gender, race, sexual orientation, or general philosophy. Her writing aims towards an ideal of understanding and cooperation between all people. While this suggested mode of operations was relevant to those living in fear of Vietnam and the Cold War, the wish for mutual acceptance through comprehension remains prominent in today’s world.

## **Anthropology in Uniform**

Jamie Levi with Dr. Sarah Strauss

Anthropology

University of Wyoming

Oral Presentation

*UW Honors Program*

*Sheridan, WY*

In December of 2008 the American Anthropological Association took a vote and changed the code of ethics to which all anthropologists adhere. This change was sparked by the use of anthropologists and other social scientists in a project designed by the United States military, Human Terrain Teams. Each Human Terrain Team (HTT) consists of five members two of whom are social scientists while the other three are specially trained members of the U.S. military. Their goal is to gain the cultural and social knowledge of the people of Iraq and Afghanistan that military operations of the past, have ignored. As an anthropology student who has conducted ethnographic research with the Air Force ROTC on campus, I have the unique position of understanding more of the military world than my peers. This knowledge coupled with the experience of doing my own ethnographies, has allowed me to look at the HTT program and find it has been poorly executed. While the military should understand more about the area and the people with which they are fighting, there was not enough research done within the anthropological community to ensure that the military program ideas would connect with what anthropological ethic would allow.

## **Biological Functions of Superoxide Dismutase, Peroxide Catalase, and Thiol Peroxidase in Cyanobacteria**

Matthew Link with Dr. Stephen Herbert  
Plant Sciences  
University of Wyoming  
Oral Presentation

*USDA NRI Plant Biochemistry*

*Cheyenne, WY*

Cells maintain a homeostasis of reactive oxygen with dynamic systems of enzymes and other molecules collectively known as antioxidants. Three types of antioxidants, superoxide dismutases, catalases, and peroxidases are thought to work together in microbial cells to limit  $\cdot\text{OH}$ , which results from reaction between  $\text{O}_2^-$  and  $\text{H}_2\text{O}_2$ .  $\cdot\text{OH}$  is a very strong oxidant capable of oxidizing most biological molecules.

Cyanobacteria are an appropriate model system for studying the role played by antioxidants in oxygen-evolving photosynthetic systems. They are easy to grow and modify genetically. *Synechococcus sp.* PCC 7942 was used in this study because it is believed to have a single superoxide dismutase, single catalase, and single peroxidase. It is the only photosynthetic organism in which a mutant lacking superoxide dismutase has been created.

SodB is an iron superoxide dismutase that may exist in association with Photosystem I in chloroplasts and cyanobacteria. SodB catalyzes the conversion of  $\text{O}_2^-$  (a byproduct of photosynthesis) to  $\text{H}_2\text{O}_2$ . KatG is a peroxide catalase which converts  $\text{H}_2\text{O}_2$  to  $\text{H}_2\text{O}$  and  $\text{O}_2$ , whereas TplA, a thiol peroxidase, converts  $\text{H}_2\text{O}_2$  directly to  $\text{H}_2\text{O}$ . The physiology of these three antioxidants was investigated with various assays and stresses on mutants, including light intensity, hydrogen peroxide, paraquat, and a superoxide dismutase assay.

## **Honeypots and Network Security**

Christopher MacLellan with Dr. Jim Ward  
Computer Science Department  
University of Wyoming  
Oral Presentation

*NSF EPSCoR and UW Honors Program*

*Gilbert, AZ*

Background information will be provided on Honeypots and how they can be used to provide more security on a network. I will discuss various types of Honeypots and the pros and cons of each platform. I will then explain Live Linux CD's and how they function. Once these underlying technologies are explained I will describe how I combined the two technologies to make Live Linux CD's that allow one to deploy Honeypots quickly and easily on any computer with a CD drive. I will also highlight the cost and security benefits of deploying Honeypots using this technology.

## **Effects of a Diet High in Saturated Fat and Total Fat Content on Inflammatory Markers and Amyloid Plaque Accumulation in a Transgenic Mouse Model of Alzheimer's Disease**

William Malik and Kyle Ryff with Bruce Culver, Ph.D.

School of Pharmacy  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Afton, WY*

Alzheimer's disease (AD) is a progressive brain disorder that causes degeneration of thinking and memory. Two extensively studied subjects associated with AD are neuroinflammation and amyloid-beta ( $A\beta$ ) plaques. Diets high in fat have also been linked to increased risk of developing dementia. Transgenic AD model mice were fed a high-fat diet or a control diet for five months, and their brains were assayed for  $A\beta$  plaques and inflammatory markers using Western blots and ELISA. Western blots of the inflammatory enzyme cyclooxygenase-2 (COX-2) showed significantly higher expression in the hippocampus and cortex of high-fat specimens, compared to controls. Controls had significantly more neuronal nitric oxide synthase (nNOS) in the cortical tissues than did high-fat animals. The inflammatory cytokine tumor necrosis factor alpha (TNF- $\alpha$ ) was significantly higher in the hippocampus of high-fat animals than in controls. For two isoforms of  $A\beta$ , cortical and hippocampal tissues of high-fat animals had higher concentrations than did those of controls, though this was not statistically significant. Overall, these results suggest that a high-fat diet may influence the inflammation and  $A\beta$  plaque formation associated with AD. However, the small sample sizes limited our ability to show statistical significance, and further study with larger sample sizes is needed.

### **Legos Connecting Students to the Energy Problem**

Craig Markum with Bruce Parkinson, Jennifer Schuttlefield, and William Medina

Chemistry and Science Education  
University of Wyoming  
Oral Presentation

*The S.H.Ar.K. Project*

*Laramie, WY*

The world continues to find itself in the midst of a growing energy problem. Experts all agree that the fossil fuel resources that we continually use will run out. Progress has been made in the field of renewable energy and now a project is being developed to take research into high school science classes. Dr. Bruce Parkinson's research has concluded that hydrogen power is the energy source of the future and by using solar power and a metal oxide to split water, the world's energy problem could be solved.

The goal of the S.H.Ar.K. (Solar Hydrogen Activity Research Kit) project is to take inexpensive readily available commercial products, place them in the classroom, and have high school students perform real scientific research to find the unknown metal oxide. Major strides have already been made with Legos and Ink Jet printers to find this metal oxide that will split water into hydrogen and oxygen. My research goal is to eliminate the need of the Ink Jet printer in the classroom and develop a pipetting technique that can be used in laboratory experiments in secondary classrooms.

## **Understanding the Application of Fractal Dynamics in Health and Applying the Concepts from Chaos Theory to Biomedical Problems**

Aylin S Márquez

Dr. Eric Moorhouse

Department of Mathematics

Dr. Jun Ren

Department of Health Science

University of Wyoming

Poster Presentation

*McNair Scholars Program*

This study will examine whether fractal dynamics in physiology may explain hidden information in physiologic time series and provide new approaches to monitor cardiac disease, following Goldberger et al. (2002). It is hypothesized that the self-similarity that is displayed in fractal geometry will be observed in the cardiac interbeat series. We intend to apply similar data and look for similar patterns that are occurred in Goldberger's research. Our method will use physiologic data and readings from a dynamical self-test to illustrate the output of healthy systems. These illustrations of healthy systems will be compared with fractal geometry. With open-source data and algorithms, the applications of fractals will be analyzed. The importance of the study is to understand and predict possible applications of fractal dynamics to biomedical problems with fractal dynamics.

### Reference

Goldberger, A. L., Amaral, L. A. N., Hausdorff, J. M., Ivanov, P. Ch., Peng, C.-K., and Stanley, H. E., *Fractal dynamics in physiology: Alterations with disease and aging* (2002) *Proc. Nat. Acad. Sci.* 99, 2466–2472.

### **The Dilemmas of a Global Standard**

Amber May with Dr. Linda Kidwell

Department of Accounting

University of Wyoming

Oral Presentation

*Department of Accounting and UW Honors Program*

*Aurora, CO*

The United States has evolved its own set of Generally Accepted Accounting Principles (GAAP) over the last four decades. While other countries have created and developed their own set of GAAP, they are not necessarily compatible with the U.S. standards. As technology and other changes continue to foster a global economy, an increasing number of companies are going overseas to operate and obtain capital. The argument is made that one set of accounting standards is needed to allow investors, creditors, and other stakeholders to make educated decisions about the financial condition of companies. In theory, this argument has merit; yet, there are several issues about a conversion to a single set of standards that may cause serious problems for the people, organizations, and countries involved. There are potential legal, social, economic, and political questions that must be resolved for a successful conversion to take place. Currently, the fervor of converting to a global standardized GAAP has somewhat diminished due to the state of the world economy. Hopefully, this time will be utilized discussing answers to those legal, social, economic, and political questions so that an optimal decision is reached.

## **Spectroscopic Investigation of Stars with 8 $\mu\text{m}$ Excesses in GLIMPSE**

Emily May with Dr. Henry Kobulnicky  
Physics and Astronomy  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Casper, WY*

The spectra of 27 suspect stars chosen from the Galactic Legacy Infrared Mid-Plane Survey Extraordinaire (GLIMPSE) are studied to determine reasons for excess infrared radiation. Through classification and identification of key emission/absorption lines, new debris disks may be discovered around these suspect stars. Of the 27 stars included in this study, 22 of them display H $\alpha$  absorption. The other 5 display H $\alpha$  emission lines. In these cases, the excess emission is thought to be caused by bremsstrahlung emission from ionized gases. Therefore, we are left with 27 stellar spectra displaying excess infrared radiation that could be caused by excess dust around the star in a circumstellar disk. Here we present the spectra of a few of these 27 stars and their classifications. The need for further analysis is evident in determining the causes of the excess infrared radiation. Also, some of the other five spectra are presented and it is explained why they are not candidates for a debris disk system.

## **Changing Perceptions of Minorities in America**

Jonathan McBride with Dr. Gracie Lawson-Borders  
African American Studies  
University of Wyoming  
Oral Presentation

*African American Studies Program*

*Cheyenne, WY*

The times are changing in the United States, especially with the recent election of our country's first African American president. Perceptions of African Americans and other minorities throughout the nation are shifting and changing viewpoints. The purpose of this study is to reveal the relationships between perception and reality in regards to minorities, in terms of race and economic status and that effect on the primary divisional factor that causes a gap between minorities and whites and rich and poor, which is education. Areas that have been specifically examined are the effect of President Obama in the media as a minority figure, increasing diversity in the workforce, national economic and educational priorities, educational programs and cultural influences, all culminating to highlight the progress made in this country on tightening the educational gap, the current state of it and where it is headed in the near future.

## **Visualization of the *Verrucomicrobium spinosum* type III secretion system needle protein using Transmission electron microscopy**

Sage McCann with Dr. Michelle Sait and Dr. Naomi Ward  
Department of Molecular Biology  
University of Wyoming  
Oral Presentation

*INBRE*

*Laramie, WY*

Genome sequencing of *Verrucomicrobium spinosum*, the type strain of the phylum *Verrucomicrobia*, has revealed the presence of a Type III secretion system (T3SS). The presence of a T3SS is typically indicative of a pathogenic interaction with a eukaryotic cell; however, no pathogenic or symbiotic interactions have been reported in *V. spinosum*.

A key component to the T3SS injectisome is the presence of a needle protein that mediates an interaction between the bacterial and eukaryotic cell. We have identified two putative needle proteins in the *V. spinosum* genome. Our aims are: 1) to determine if the structural components of the T3SS injectisome are being expressed, 2) to visualize the T3SS using transmission electron microscopy (TEM) and 3) to use immunoelectronmicroscopy to identify and localize the putative needle protein.

We have successfully extracted RNA from *V. spinosum* grown under standard conditions. We then PCR amplified the VspC and VspQ T3SS structural proteins, verifying that they are expressed. We have also developed methods to embed, generate thin-sections and visualize *V. spinosum* using TEM.

## **SERS Detection of Viral DNA using Morpholino Oligos Tethered to Colloidal Gold Nanoparticles**

Joshua T. McConnell with Patrick Johnson, Ph.D  
Department of Chemical & Petroleum Engineering  
University of Wyoming  
Poster Presentation

*McNair Scholars Program*

*Laramie, WY*

This study will examine Au nanoparticle based DNA biosensors utilizing morpholino oligos as tethering and signaling probes. Thiol-functionalized and non-functionalized morpholinos are to be obtained from Gene Tools, LLC. The non-functionalized morpholinos (signaling probes) will be modified with a Raman dye. The thiol-functionalized morpholinos (tethering probes) will be attached to the nanoparticle surface. Conjugated Au nanoparticles and signaling probes are to be exposed to a sequence of DNA; one being the target West Nile Virus DNA and the other being a control. Both will be analyzed using SERS spectroscopy. Analysis will be performed with buffers of differing strengths. The results of this experiment will be compared to results obtained from using DNA as the signaling and tethering probes. I hypothesize that an enhanced signal will be observed as a result of using morpholinos in this method of DNA sensing and that the elimination of noise will be observed when using buffers of lower ionic concentration. If the hypothesis is supported, an enhanced method of DNA detection will be available.

## **Monoclonal Antibody Production Against Synthetic (PrP<sup>c</sup>)**

Kaitlin McDaniel with Everett Lee Belden, Ph.D.

Microbiology

University of Wyoming

Poster Presentation

*McNair Scholars Program*

*Powell, WY*

This study investigates the production of monoclonal antibodies against the two different mule deer prion protein allotypes. We hypothesized that antibodies can be made against synthetic prion peptide (PrP<sup>c</sup>) sequence differences specific for amino acid dimorphisms at position 225. Monoclonal antibodies were produced against synthetic peptide sequences representing (PrP<sup>c</sup>) 225 F (phenylalanine at position 225) and 225S (serine at position 225) prion peptides and screened by ELISA for reactivity to synthetic (PrP<sup>c</sup>). Western blots and immunohistochemical analysis will be run to confirm antibody specificity and reactivity. This furthers research on prion biology by allowing genotype determination of tissues and the examination of cellular expression differences that may occur between the two mule deer genotypes.

## **A Digital World for the Graphic Designer: The new era of digital technology and design**

Caitlin McKernan with Jennifer Venn

Department of Art, University Honors Program

University of Wyoming

Oral Presentation

*UW Honors Program*

*Colorado Springs, CO*

Digital and Web communication has become essential to the graphic designer. The expansion of the digital world has in many ways changed their overall role. Digital media and the Internet are so important in terms of communication that the designer must now learn to design for it in order to stay current with their own industry. The designer is now, however, able to experiment with multiple platforms. There is a world of options available.

In talking with current professional designers and examining existing designer websites, I have discovered that good usability, navigation, and interaction are critical in terms of Web design, as is an overall theme or concept to tie everything together. I have applied these principles to my own website and marketing documents. I have compared the design process to that of travel, based off the quote by Rosalia de Castro, "I see my path, but I don't know where it leads. Not knowing where I'm going is what inspires me to travel it." A designer's final concept never ends up where it was going originally; there is a process and a journey that changes and morphs an idea. This concept is carried throughout my other personal marketing documents.

## **Polymorphism in the Human Genome caused by the insertion of an Alu transposon**

Heather McOmer, Rasha Riad, Josh Sharpe with Dr. Ami Wangeline

Department of Biology

Laramie County Community College

Poster Presentation

*WY IDeA Networks of Biomedical Research Excellence, NIH*

*Cheyenne, WY*

The focus of this research was on an Alu insert at the pv92 locus located on Chromosome 16 in humans. Alu sequences are the most abundant short interspersed mobile elements (SINE) in the human genome, approximately 300 nucleotides in length. An examination of a polymorphism caused by the insertion of an Alu transposon at the pv92 locus for ten diverse populations was conducted using PCR and gel electrophoresis. It was found that there are significant differences in insertion frequency between some groups, suggesting patterns in migration and overall relatedness. Human chromosomes contain more than one million Alu copies, some of which are known to cause disease. Alu research offers a relatively simple method for the study of human populations in regards to relatedness and their risks for Alu implicated inherited diseases.

## **Feasibility Study of a Delivery Chain System in Vietnam's Textile Industry**

Thao McVay with Guidance from Thorsten M. Janus, Ph.D

Department of Finance

University of Wyoming

Poster Presentation

*McNair Scholars Program*

*Casper, WY*

Currently, migrant workers from rural areas come to the large cities of Vietnam to work in textile "sweat shops". This study will examine if a delivery chain system can be applied to the textile industry in that country. A delivery chain system would mean the company would deliver loads of fabric, patterns, or clothing design information to workers in communities and on the due date, the company's truck would pick the goods up and shift them to the next process. It is hypothesized that operating costs for textile manufacturers can be decreased by providing rural communities with the necessary equipment to produce products. This study will use email surveys and possibly phone surveys to Vietnamese managers and migrant workers in the textile industry in Hochiminh City as well as foreign clothing managers in America. The survey will collect the opinions of migrant workers regarding their working environment preferences. In addition, the surveys would gather managers' viewpoints as to whether the delivery chain system would cut down operating costs for the company. If this study indicates that a delivery chain system is feasible in Vietnam, migrant workers' may be able to remain in their home villages.

## **The Romance of Scotland in Diana Gabaldon's *Outlander***

Kelly Meeboer, Dr. Susan Aronstein  
Department of English  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Torrington, WY*

Scotland has long been a location of mystery and superstition—the land and people intrigue foreigners, drawing them in, in spite of perceived dangers. Diana Gabaldon, author of *Outlander* and its sequels, sets her first novel in Scotland precisely for this reason. Part of the reason that the novel succeeds as a romance (and, thus, with romance readers) is its Scottish setting—people, objects, and superstitions—which perpetuates the myth of Scotland as a mysterious place. *Outlander's* readers escape into the story via the main character's escape into a magical Scotland. This escape uses traditional elements of the romance novel to acquire an audience of that genre, including a plot that centers on the love of two unlikely partners and which results in a happy ending; however, *Outlander* both critiques and transcends generic romance by confusing gender roles at times which enables the heroine to become the focus of the novel. Ultimately, *Outlander* demonstrates the ability of a novel to appeal to the romance audience while also attracting a broader audience.

## **The Impact of Conflict in Family Run Business**

Tracy Montanez with Dr. Roland Kidwell  
Department of Management and Marketing  
University of Wyoming  
Poster Presentation

*McNair Scholars Program*

*Alliance, NE*

This study will examine conflict in family businesses and how different types of conflict can have positive and negative impacts in the family run business. The objectives are 1) to examine the ability of a family member to serve as a help or hindrance in the family run business and 2) to determine how families deal with the conflict that has arisen or establish methods to avoid dysfunctional conflict. This will be accomplished through a series of surveys followed by personal interviews with key members of several family businesses. The importance of this study is to determine the impact of conflict in the family business and strategies that are successfully used to deal with it. Depending on the conflict, this can have a positive or negative impact on the family run business.

## **Variation in Tooth and Temporalis Muscle Size in Various Subsistence Groups**

Candis Moore with Dr. James C. Ahern  
Department of Anthropology  
University of Wyoming  
Poster Presentation

*McNair Scholars Program*

*Thermopolis, WY*

This study will compare temporalis muscle attachment area and tooth size and their connection to various subsistence patterns in human populations. It is hypothesized that different subsistence groups will present different relationships between tooth and temporalis muscle size. The method will use archival data for subsistence patterns along with measurements of tooth size and temporalis attachment area. Correlation analysis will be used to determine the relationship between tooth size, temporalis attachment area, and subsistence practices. Results may help researchers determine unknown subsistence patterns from fossil record data.

## **Irene and the Underworld: An Exploration of Modern Fantasy**

Rebecca Mueller with Dr. Susan Aronstein  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Fort Collins, CO*

Fantasy, defined as fiction that incorporates fanciful or supernatural events, has become an important genre in popular culture during the last twenty years. New authors such as J.K. Rowling (the *Harry Potter* series) and Stephenie Meyer (*Twilight*) capture the imagination of America's youth, while their elders are entertained by both old favorites like Tolkien and newer authors such as Robert Jordan (*The Wheel of Time*) and Terry Pratchett (the *Discworld* series). Even Hollywood has caught on, producing the fantasy-laden *Pirates of the Caribbean* trilogy as well as adapting most of the books named above. Despite its powerful influence, however, fantasy still suffers from a juvenile reputation. In an effort to disprove that notion, I began writing a fantasy novel myself, documenting my influences, both scholarly and popular, as I did so. The result, *Irene and the Underworld*, offers a uniquely personal glimpse into the intellectual potential of fantasy fiction. During the presentation, I will discuss the prevalence of fantasy in the modern world, how the conventions of the genre may be manipulated to present a social critique, and how fantasy can draw on older, established works to go in a new direction.

## **The Art of Memoir through Graphic Novels and Prose**

Rose Jacqueline Elena Muller  
with Dr. Clifford Marks  
International Studies and English  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Laramie, WY*

Graphic novels in America are rising as a viable and respected art form and recently are becoming the newest and most creative medium to write memoirs. Although writing one's own story seems like a simplistic task, it can for be an excruciating and exhausting mental and physical endeavor that creates self awareness and meaning. Notoriously some of the most famous and pervasive graphic novel memoirs can take up to a decade to produce, including Art Spiegelman's two volume epic, Maus which he clocked 11 years and Alison Bechdel's Fun Home took her 7 years to produce. The textual and narrative elements combined with artistic skills create unique and special forms of memoir, offering new forms of cultural significance in the new millennium, and is becoming a new form of self expression. After spending several months looking at some of the best examples, I have attempted to viably tell my own story through this medium in an artful and meaningful manner, critically examining myself in a limited space, time, and energy vacuum.

### **Lockheed Martin/SAE Aero Design Competition**

Justin Mullings, Angelo Herrera, and Christopher Mertes with Dr. Doug Smith  
Department of Mechanical Engineering  
University of Wyoming  
Oral and Poster Presentation

*Mechanical Engineering Senior Design*

*Cheyenne, WY; Minnetonka, MN*

A heavy-lift, remote-controlled aircraft was designed and fabricated for the 2009 Aero Design competition, which was established by the Society of Automotive Engineers (SAE) and is sponsored by Lockheed Martin. The goal of the aircraft is to lift as much payload as possible within dimensional constraints. The most critical aspect of this project is the design of the wing, which is the most significant contributor of weight to the aircraft, but also must generate enough lift to carry the aircraft along with its payload. Due to the objective of having as low of weight as possible without cargo, the primary aircraft materials consist of polycarbonate, balsa wood, and light-weight aluminum.

Mathematical models were developed to describe the behavior of the aircraft during flight in order to predict lifting capabilities, engine thrust, aerodynamic drag, and in-flight stability. Using a highly iterative process, these models were used to develop an appropriate design with payload capabilities of over 25 pounds. The physical components of the aircraft were then configured to conform to competition restrictions and to provide advantageous flight characteristics mirroring those developed with the mathematical models. The fabricated aircraft will be participating in the international Aero Design competition in Marietta, Georgia.

### **Automation of a Hydraulic Car Crusher**

Morgan Neelands, Sam Kruger, and Cameron Wunder with Dr. Ann Peck  
Department of Mechanical Engineering  
University of Wyoming  
Oral and Poster Presentation

*Mr. Chris Colter ACE Salvage*

*Laramie, WY*

Mr. Chris Colter of ACE Salvage in Laramie, WY owns a homemade hydraulic car crusher that he would like to automate. The crusher is currently operated by a driver who must load and run it. This is done with a throttle pedal and two valves that direct fluid to two hydraulic cylinders which lower a platen to crush material. This is frequently performed in harsh weather. Our senior design project intends to automate the process using a wireless handheld transmitter/receiver system, Programmable Logic Controller (PLC), and solenoid operators mounted to the current valve bank. PLC programming uses ladder logic programming which continually scans for operator input. Using solenoid operator attachments negates purchasing new valves by machining the current valves. The system is designed to require little if any maintenance once installed and will allow the loader operator to retrieve and crush material simultaneously. Time required by ACE Salvage to process scrap material will be reduced and exposure to harsh weather by the operator nearly eliminated.

### **Spanglish: A Feature of a Diverse Multicultural Populace or a Linguistic Perversion?**

Deidre Neumann with Sarah Carle  
International Studies, Modern and Classical Languages  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Worland, WY*

The concept of Spanglish as both a language and a developing culture within the Latino ethnicity has become part of various academic and political discussions in recent years. The roots of Spanglish vary greatly as do the reasons to explain not only its development but also its growth. The attitudes towards the developing creole differ significantly as well: some view it as the worst and most disrespectful aspect of the transnational background that its speakers possess. The opposing side would say it is not just a language but a developing culture based on the multicultural upbringing of many of America's Latinos. However the trend has spread beyond the borders of the United States throughout the Caribbean, Central and South America and even Spain. An examination of much of popular culture throughout all of these regions will reveal this actuality. As we examine the true scope of the spread of Spanglish, an uncertainty arises of where to draw the line. For those who approve of Spanglish, that do indeed see it as a developing form of expression for transnational Latinos, how do we decide when it has been taken too far? Or is it even possible to take it too far?

## **Piriform PCR: Searching for Spider Silk Sequences**

Thomas Neuwerth with Dr. Randy Lewis  
Molecular Biology  
University of Wyoming  
Oral Presentation

*Rawlins, WY*

Our research goal was the isolation of the gene encoding piriform silk from *Araneus gemmoides*. This protein, expressed by the piriform silk gland, acts as the “cement” between joints in a spider’s web. Of the six different types of silks produced by orb-weaving spiders, piriform silk proteins were the single silk type for which there was no sequence data. Piriform cDNA sequences have been recently isolated in our laboratory for three other spider species, but not for *A. gemmoides*. Polymerase Chain Reaction (PCR) primers were designed from the conserved 3’-regions of the known piriform sequences and were used to amplify genomic DNA from *A. gemmoides*. The hypothesis was that consensus and degenerate primers from the three known piriform sequences would have sufficient sequence homology to the *A. gemmoides* gene to provide a basis for PCR amplification. Genomic DNA was isolated from spiders captured in the Laramie area. PCR products were analyzed by agarose gel electrophoresis; presence of a band indicated a successful amplification. After a successful amplification PCR fragments were excised from gels, eluted, and submitted for sequencing. At this point one sequence has been produced; research is continuing and should produce additional sequences in the future.

## **The Effects of Fish Presences on Mayfly Allometry**

Trista E. Niekum and Dr. Robert O. Hall  
Department of Zoology and Physiology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Sidney, NE*

The presence of predatory fish in a stream can change body size, behavioral patterns, and life history in some species of mayflies that seek to minimize the threat of predation. While there is some evidence for altered morphology in certain mayfly taxa, it is not known whether the presence of fish impacts the allometry of their prey. We examined *Baetis* sp. (summer), an un-described species to examine how reduced size at emergence may affect *Baetis* body shape. We measured head-capsule width, body length, and ash-free dry mass of male and female mayfly larvae collected from fish and fishless reaches of a Rocky Mountain stream. Body length more accurately predicted body mass than did head-capsule width. Maximum likelihood analysis revealed little difference in the parameter estimates between body length and body mass for mayflies from fish versus fishless reaches. Our results suggest that while mayflies mature at smaller size in streams that contain fish, their allometries are similar to those from fishless streams.

## **Antibiotic Resistance of Bacteria in Water Above and Below a Water Treatment Plant**

Charlotte A. Nutt and Tran H. Nguyen with Dr. Allan Childs and Dr. Elise Kimble  
Northwest College, Powell, WY  
Oral Presentation

*INBRE*

Cody, WY  
Ho Chi Minh City, Vietnam

Recent concern about introduction of medicines used by humans into natural waterways prompted an investigation into antibiotic resistance of bacteria in water from two sites. In the past people were advised to discard unused drugs by flushing them and most likely still do this. If antibiotic drugs enter natural waters through a sewer system, they may exert selective pressure for antibiotic resistance. If that is so, the frequency of resistance would be greater in isolates below a sewage treatment plant than in isolates above the sewage treatment plant.

Water and streambed pebbles were collected from Bitter Creek above and below the Powell Municipal Sewer Plant. Water was filtered and bacteria from the filter were isolated and tested for resistance to a panel of drugs using antibiotic discs on appropriate agar media. Diameter of the zone of inhibition was recorded. Pebbles were placed on agar and bacteria similarly isolated and tested. Patterns of resistance and frequency of resistance of the two sites are compared.

### **A survey of *Didymosphenia geminata* in Grand Teton National Park and surrounding areas.**

Angela M. Ostrander<sup>1</sup> with Lisa A. Kunza<sup>2</sup> and Robert O. Hall<sup>1</sup>, (1) Zoology and Physiology, University of Wyoming, Laramie, WY, (2) Program in Ecology, Zoology and Physiology, University of Wyoming  
Oral Presentation

*UW Honors Program and NSF EPSCoR*

Lingle, WY

Once only identified in nutrient poor waters, *Didymosphenia geminata*, a microscopic single-celled freshwater diatom, has been expanding its native range and is occurring more frequently in nutrient-rich streams and rivers. The invasive tendencies of *D. geminata* are greatly altering physical and biological conditions in streams and rivers; the stalk material that *D. geminata* produces has the potential to cover up to 100% of stream substrate with a thickness of up to 20 cm. We conducted a survey of *D. geminata* in Grand Teton National Park, Wyoming in summer 2008. We found and confirmed *D. geminata* in 7 streams including; Phelps Lake Outlet ( $1.5 \times 10^8$  cells/m<sup>2</sup>), Taggart Lake Outlet ( $2.4 \times 10^7$  cells/m<sup>2</sup>), Phelps Lake Inlet ( $2.1 \times 10^6$  cell/m<sup>2</sup>), Jenny Lake Outlet ( $8.4 \times 10^5$  cells/m<sup>2</sup>), Flat Creek ( $2.9 \times 10^7$  cells/m<sup>2</sup>), Leigh Lake Outlet ( $1.3 \times 10^4$  cells/m<sup>2</sup>), and Fish Creek ( $9.2 \times 10^5$  cells/m<sup>2</sup>). We found a trend of *D. geminata* presence in lake outlet streams and high traffic areas; areas where people had direct access to the stream or highly traveled areas (bridges, roads, trails, etc.). In fact, four of the seven streams where *D. geminata* was found are lake outlet streams, and all streams were noted as high traffic areas (no less than 10 people present at the stream).

## **Advantages of College Services Pertaining to First Generation College Students**

Amanda Parks with JD Rottweiler, Ph.D. Academic Services

Psychology

Central Wyoming College, UW Outreach Program

Poster Presentation

*McNair Scholars Program*

*Lander, WY*

This study will compare first generation Central Wyoming College (CWC) graduates to all CWC college graduates, class of 2009. The objective is to investigate whether services offered by the college, specifically; Academic Advising, Student Success Center (TRiO), Counseling Services, Computer Labs, Financial Aid Advising, Student Organizations, and Outreach Services, were utilized by the graduates, how important the resources were to their experience and how satisfied they were with them. It is hypothesized that (1) first generation, graduating CWC students used the resources more often and (2) those graduates indicate that the services were important to them more often than the other graduates. We will utilize an exit interview conducted by CWC staff. The information will then be compiled and will compare first generation responses against non-first generation responses within CWC. With the knowledge gained from this study it may be possible to better serve the needs of first generation college students, thereby increasing retention and successful completion of their degrees.

## **Sieving and Searching for Pseudoprimes**

Daniel Peterson with Dr. Siguna Müller

Mathematics

University of Wyoming

Oral Presentation

*Honors Program, EPSCoR, and Wyoming Cryptography School*

*Cheyenne, WY*

This presentation details the attempted construction of a highly unlikely composite number, which would be very strong against both the Miller-Rabin and Frobenius statistical primality tests. The construction begins with sieving through numbers in an adaptive way in order to find potentially compatible prime factors of the target composite, and then using local search heuristics (namely hill-climbing) to combine them together in a variety of ways. As this method did not produce the desired results, an exhaustive search on all possible compatible combinations was run, with a disappointing but definitive result.

**Geometric Attack on the GPS Problem**  
Daniel Peterson with Dr. G. Eric Moorhouse  
Mathematics  
University of Wyoming  
Oral Presentation

*Wyoming NASA Space Grant Consortium*

*Cheyenne, WY*

The GPS problem as presented here is the arrangement of satellites in orbit so that from any given point on the planet, at any time, there are as many satellites within range as possible. This ensures that accurate triangulation can be achieved by the GPS receiver. To attack this problem, planes of orbit are spread out to be mutually spaced out as far apart as possible, and then satellites are dispersed through these planes. The resulting satellite network is tested for integrity, so that the best possible solution can be found.

**Tracking Transience: How to Read Graffiti on Laramie's Architecture**

Eileen Pfefferle with Dr. Susan Frye  
English  
University of Wyoming  
Oral Presentation

*UW Honors Program, English Honors*

*Cheyenne, WY*

Graffiti provide an opportunity for the writer and reader to adapt the dominant order – architecture, writing, and reading – and engage in the city's landscape.

This presentation explores how the graffiti is experienced. De Certeau's *The Practice of Everyday Life* and Juliet Fleming's *Graffiti and the Writing Arts of Early Modern England* provide a platform from which to approach writing that takes place on a city's walls instead of within the confines of a page. I use the work of de Certeau and Fleming to examine the processes of writing and reading graffiti by considering how and where graffiti are written and read, graffiti's relation to the landscape, and their relation to the social order of a community.

Through a consideration of the process of writing and reading graffiti, the form of the graffiti – including the written surface, and the content of the graffiti, it is possible to ponder how graffiti reveal what is, and is not present in Laramie, WY. Graffiti in the downtown alleys and on the Garfield pedestrian bridge urge the casual passerby to pay attention to the unique character of Laramie and to the surrounding landscape.

## **PostSecrets: The Evolution of Secret Telling Through Postcards and Web 2.0 Technologies**

Jacklynn Pham with Dr. Michael Knievel

Department of English

University of Wyoming

Poster presentation

*McNair Scholars Program*

*Omaha, NE*

Synthesizing research in genre studies, media, and visual rhetoric, this study will investigate the impact that postcard composing and Web 2.0 technologies have on the nature of secret telling as a cultural and rhetorical practice. Using PostSecret, an online community art project where people reveal a secret about themselves via a homemade postcard sent to a blog audience, I will examine 1) the visual/textual composition of the PostSecret postcards and 2) sample the online discussion surrounding the postcards. To study composition, a convenience sample of University of Wyoming students will be shown the text of a PostSecret and asked to provide their interpretations of the secret. Next, they will be shown the postcard as a visual/textual whole and be asked how the inclusion of an image does or does not change their impression of the secret. I will also study the nature of online discussion spawned from PostSecret by observing the interactions within forums and by surveying online participants about how the act of secret telling has shaped their involvement in the PostSecret community. As a result of this study, I intend to highlight the ways PostSecret and current Web 2.0 technologies have expanded the rhetorical context for secret telling.

### **Human Rights Considerations of EU Crisis Management**

Kash A. Pontarolo with Dr. Stephanie Anderson, Political Science

Psychology

University of Wyoming

Oral and Poster Presentation

*UW Honors Program*

*Lingle, WY*

The European Union prides itself in having one of the most developed frameworks for protecting human rights abroad, despite a track record that suggests otherwise. It is hypothesized that EU crisis management missions have failed to adequately address human rights in third countries. To best test this hypothesis, European Union primary sources, government documents, and other scholarly articles were analyzed. According to third country reports and human rights watchdog organizations, the EU has failed to uphold their own human rights standards internally and in external policy. Internal inconsistencies raise question about the genuineness of Union human rights concerns abroad, and selective, ineffective crisis management missions/ operations negatively affect the perceived legitimacy of the EU as an adequate human rights protector. The significance of these findings are great: In lieu of a global arena characterized by internal and external insecurities, where the EU has defined the promotion of peace and democracy as their top goals, the Union must be held accountable for inconsistencies and misconduct related to human rights.

## **The Role of Endogenous MIF on Ischemic AMPK Activation**

Garrett Poulos with Dr. Ji Li

The Center for Cardiovascular Research and Alternative Medicine (C-CRAM)

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Laramie, WY*

Macrophage migration inhibitory factor (MIF) is a pro-inflammatory cytokine that is increased in the plasma of patients with myocardial infarction and in animal hearts following ischemic injury. A known important regulator of metabolism in striated muscle is AMP-activated protein kinase (AMPK). Recent information suggests that cardiac MIF may play a role in the activation of AMPK and that human cells with a low expression of the MIF gene promoter have impaired activation of AMPK during hypoxia that is corrected by exogenous MIF. An understanding of this as it pertains to the regulation of AMPK could have implications for potential pharmacological treatments for ischemic myocardium. This study examined the role of endogenous MIF on ischemic AMPK activation. This was done by utilizing mice unable to create endogenous MIF. Isolated hearts from these mice were subjected to various durations of control perfusion or global ischemia with or without reperfusion and immunoblot analysis was performed to assess AMPK expression. These experiments are still in progress and full results are not available, but it seems likely from available results that AMPK activation is influenced by MIF.

## **Long-Term Perspectives on the Effects of Climate Change On Wyoming's Water Resources**

Paul Pribyl with Dr Bryan Shuman

Department of Geology and Geophysics

University of Wyoming

Oral and Poster Presentation

*Department of Geology and Geophysics*

*Laramie, WY*

An increasing global concern is the availability and allocation of water. In western states, such as Wyoming, the policy deciding the current and future allocation of water has been based on weather data primarily from the past 30 to 100 yrs. This time span does not cover the full range of weather events that can occur. By reconstructing past changes, I intend to improve understanding of the sensitivity of water resources to climate change. Project goals include gaining a greater understanding of past climate changes, their patterns, and their impacts on hydrology. I aim to establish a record of drought that extends back 15,000 years and encompasses a broad range of possible climate variation. Through collection and analysis of lake sediment my research shows fluctuation climate and water events including periods of significant drought lasting over 5000 years as recent as only 3500 years ago.

**LED Touchpad Toy**  
Cory Pritchard with Dr. Legowski  
Electrical Engineering  
University of Wyoming  
Oral and Poster Presentation

*Department of Electrical and Computer Engineering*

*Casper, WY*

A large majority of toys manufactured today incorporate LEDs into their designs. These designs range from stuffed bears to more developmental toys such as musical instruments and textured toys. The LED Touchpad Toy was designed as a developmental toy for toddlers and infants ages 6 months and older. It was required that the toy display a pattern of lights when it is turned on and off. It was also required that the toy incorporated the use of different colored shapes and lights to promote eye-hand coordination, cause and effect learning, and sensory stimulation. Two modes of operation were programmed. One mode would light up whichever shapes a child pressed on the toy, while another mode would display a patterned lightshow on the toy depending on the region touched. Child safety was taken into consideration when choosing the materials to build this toy. This project studied possible plastic and rubber materials to use and weighed their pros and cons. The shapes were fabricated using sculpting clay and cast and molding techniques using silicone.

**Effect of Progesterone and RU486 on the Expression of Ram Sexual Behavior**

Stephanie Pruitt with Dr. Brenda Alexander  
Department of Animal Science  
University of Wyoming  
Poster Presentation

*College of Agriculture*

*Cheyenne, WY*

Progesterone is necessary in males for spermiogenesis and testosterone biosynthesis. The current study tested the hypothesis that progesterone is also a crucial modulator of sexual behavior in rams. Intact domestic white-faced rams ( $n = 8$ ) and rams gonadectomized (GNX;  $n = 6$ ) at 6 – 7 mo of age were exposed to ewes in estrus at 18 mo of age. Only intact rams exhibiting behavior toward estrous ewes and GNX rams showing an absence of reproductive behaviors were used to evaluate effects of progesterone. Expressed reproductive behaviors were categorized as investigatory (investigatory sniffs, flehmen, foreleg kicks, nudge, vocalization) or consummatory (mount attempts, mounts, ejaculations). Effect of progesterone was determined using a complete block randomized design with treatments separated by 14 d. GNX rams implanted with 4 doses of Synovex-h (testosterone + estradiol) were behavior tested following progesterone or vehicle treatment. Intact rams were behavior tested following treatment with the specific progesterone receptor antagonist, mifepristone (RU486) or vehicle. Behavior was monitored for 30 min twice during the vehicle and treatment period.

**Determination of Phylogenetic Relationships of Three *Eimeria* (Apicomplexa: Eimeriidae) Species Using 18S-ITS1-5.8S-ITS2-23S rDNA Sequence.**

Leah Quealy with Dagmara Motriuk-Smith and R. Scott Seville

Department of Zoology and Physiology & University of Wyoming/Casper College Center  
University of Wyoming  
Oral Presentation

INBRE

Casper, WY

The taxonomy and classification of parasites in the genus *Eimeria* (Apicomplexa: Eimeriidae) has been based on oocyst morphology, host specificity and host geographic distribution. However, identification of species sharing similar morphologies or displaying broad host ranges is difficult based on these characteristics alone. In this study, we compare sequence data from the ITS1 and ITS2 rDNA regions of three *Eimeria* species collected from six species of wild rodent hosts to determine if they provide additional characteristics useful in resolving taxonomic difficulties. ITS1 and ITS2 rDNA sequences were obtained from *Eimeria callospermophili* isolated from Wyoming ground squirrels (*Spermophilus elegans*), yellow bellied marmots (*Marmota flaviventris*), white tailed prairie dogs (*Cynomys leucurus*), and black tailed prairie dogs (*Cynomys ludovicianus*), *Eimeria lancasterensis* from Wyoming fox squirrels (*Sciurus niger*) and Virginia Delmarva fox squirrels (*Sciurus niger cinereus*), and *Eimeria ontarioensis* from Wyoming fox squirrels. Phylogenetic hypotheses generated using maximum parsimony and neighbor joining analysis of the ITS1 and ITS2 regions supported the conspecificity of the four *E. callospermophili* isolates. Additionally, *E. lancasterensis* and *E. ontarioensis* formed two distinct monophyletic lineages though the WY and VA strains of *E. lancasterensis* were unable to be resolved.

**Social Exclusion and the Brain: Neural and Motivational Responses to Social Ostracism**

Maurissa Radakovich with Nicholas Schwab

Department of Psychology  
University of Wyoming  
Oral Presentation

NSF EPSCoR

Rock Springs, WY

Belonging appears to be a fundamental human need and motivation (Baumeister & Leary, 1995). Because the need to belong is so strongly associated with our psychological and physical health, it has been theorized that threats to our social belonging result in specific negative psychological and neural responses and an increased motivation to reassert our belonging within the group (MacDonald & Leary, 2005; Williams, 2008). However, the degree to which our relationship information is activated may affect the degree to which our belonging needs are threatened. Davidson's (1995) model of prefrontal cortex (PFC) functioning may provide a useful model for neural and behavioral responses to social exclusion. Davidson's model suggests that the PFC is responsible for initiating fundamental motivational processes, with the left PFC initiating approach-type motivations and the right PFC initiating withdrawal-type motivations. The current study investigated the neural activity in the PFC using electroencephalography (EEG) after social exclusion when relationship cognitions were activated or not. We found that participants showed less neural approach response (left PFC activation) following social ostracism when their relationship cognitions were activated suggesting that having chronically or state activated relationship cognitions may help protect individuals from the negativity of social ostracism.

## **Estimating the body mass of large animals**

Jonathan Rader with Brent Breithaupt

Geological Museum

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Laramie, WY*

Body mass is an intrinsic property of all animals that is intimately related with their anatomical and physiological form and function. The body mass of extinct animals cannot be measured directly. Therefore, modeling is a valuable tool in the study of large animal mass, biomechanics, and physiology. A previous study employed a physical modeling technique and two mathematical techniques from the literature to estimate the *en-vivo* mass of a sauropod dinosaur, *Apatosaurus excelsus*, based upon the University of Wyoming specimen (UW 15556). The physical model produced an estimate of ~13,500 kg, in contrast to the estimate produced by both mathematical models of ~16,900 kg. Resolving the observed disparity among the results produced by these methods is vital to future studies requiring valid mass estimates. This can be accomplished by estimating the mass of individual large extant animals, and comparing to their known mass values. Estimates of the body mass of zoo-housed individuals from two extant taxa, the African elephant (*Loxodonta africana*) and the giraffe (*Giraffa camelopardalis*), along with their recorded mass, provide the basis for such a comparison. This ongoing study may provide valuable information to improve future mass estimates as well as other work based upon them.

## **The evolution of SINEs in primate genomes**

Josh Sharpe and Rasha Riad with Dr. Ami Wangeline

Department of Biology

Laramie County Community College

Oral Presentation

*WY IDeA Networks of Biomedical Research Excellence, NIH*

*Cheyenne, WY*

Alu sequences are a type of short interspersed elements (SINEs) and have become an abundant feature in primate genomes, with numbers reaching over one million copies. Given that some families of Alu's, including the ALU-Y group, are still polymorphic within the human genome, light can be shed on the migration patterns of humans as they have populated different regions. A specific Alu insert at the pv92 locus was amplified for ten distinct human groups totaling ninety five individuals. Statistically significant variation between some groups was found in Alu insertion frequencies for this locus. The Alu SINE's provide a simple way for diverse fields of biology to gain deeper understanding of both primate and human descent and association to particular reproductively isolated groups.

**An Investigation of the Landscape Development and Climatic History of Table Mountain,  
Fremont Co., Wyoming**

Timothy K. Reed with Suzanne Smaglik and Dr. Carol Frost  
Geology and Geophysics  
University of Wyoming  
Poster Presentation

WSGC

Lander, WY

Studies of the Wind River Mountains have contributed a significant amount of information relative to the geologic and climatic history of the planet. However, there is a prominent feature in this region that remains an enigma in the scientific community. Table Mountain, located on the western foothills of the Wind River Range, is one of the most prominent geographic features that define the landscape in this region.

The research conducted for this project focused on the veneer of sediments that make up the extraordinarily flat top surface of the mountain. A grid system for sampling was developed for a series of 22 hand dug pit samples to be taken. Initial observations were made at the time of collection relative to the sampling site, vegetation, and other identifiable characteristics. Collected sediment samples were then sieved to determine the defining characteristics for the sediment horizons at intervals of 0-10cm and 10-30cm. This research presentation will present the initial observations at sample locations and the results of laboratory analyses to determine the sediment characteristics. The presentation will also assess the findings of these analyses relative to previous research, as well as exploring the relationships with climatic events that shaped the region.

**A Matter of Life and Death: The search for a c-di-GMP binding partner that allows wild type  
*Escherichia coli* to survive while strain BL21 cannot.**

Joseph M Reed with Dr. Mark Gomelsky  
Department of Molecular Biology  
University of Wyoming  
Oral Presentation

Wyoming NASA Space Consortium

Omaha, NE

Cyclic dimeric guanosine monophosphate (c-di-GMP) has been found to be ubiquitous in bacteria. There are two proteins that control the levels of c-di-GMP within the cell; GGDEF domain proteins synthesize c-di-GMP while EAL domain proteins degrade c-di-GMP. The Gomelsky lab has recently shown that overexpression of the GGDEF domain is toxic to *Escherichia. coli* BL21. When the same GGDEF domain is overexpressed in wild type *E. coli* the cells grow and express the normal phenotype. Currently there are only two known c-di-GMP binding partners in *E. coli*, PilZ and YcgR domains. We hypothesize that *E. coli* BL21, which contains both PilZ and YcgR protein domains, is missing another unknown c-di-GMP binding partner that would allow for its survival in the presence of elevated amounts of c-di-GMP. To find this new c-di-GMP binding partner we successfully created a wild type *E. coli* genome library and introduced it into the BL21 strain overexpressing the GGDEF protein domain. We have collected 18 colonies that survived; among them three colonies have an unidentified gene that we are currently analyzing.

## **Oscillators in Space**

James C. Richey and Justin R. Thornton with Dr. Stanislaw Legowski  
Department of Electrical and Computer Engineering  
University of Wyoming  
Oral and Poster Presentation

*Department of Electrical and Computer Engineering*  
*Department of Physics*  
*Colorado Space Grant:RockSat*

*Loveland, CO*  
*Littleton, CO*

Oscillators are used in many applications including space flight. The United States as well as many other countries use microprocessors which have on board oscillators to run advanced applications in controls and other information processing. Our senior design project will look at the effects a rocket has on precise oscillators in the x, y, and z directions. It will also allow us to look for changes in frequency when it comes to the environmental effects such as vibrations, rocket spin, and rocket acceleration. There is analog circuitry and a microprocessor that looks for changes in the oscillators during the space flight. The data is then saved to a flash card. The data is analyzed after the rocket returns to earth using signal analysis software. At this time we do not have any results. There however, is preliminary testing to make sure that all of our circuitry is working together and correctly. The experiment was designed to fit in a very small allotted space and designed to comply with all NASA requirements. This project comes with high importance because of the uses oscillators have in our world today.

## **Determining Training Techniques of Effective Composting Procedures at three Laramie, Wyoming kitchens**

Amy Rieser with Dr. Patricia Taylor  
University of Wyoming  
Poster Presentation

*McNair Scholars Program*

*Jackson, WY*

This study will compare training techniques used in the implementation of composting kitchen prep waste in two University of Wyoming kitchens and one locally owned restaurant in Laramie, Wyoming. In June of 2008, Agricultural Community Resources for Everyday Sustainability (ACRES) the University of Wyoming Student Farm organized a small scale composting program with the University campus and various local downtown restaurants. In its first year of operation ACRES removed a prime supplier of compost, the University Washakie Dining Center due to massive amounts of trash found within the compost material. I hypothesize the Washakie Center does not effectively train its kitchen staff on the importance of and correct procedure of composting. I will compare training methods at Washakie to two other composting sites, University of Wyoming Catering and one off-campus restaurant. Through the use of surveys, participant observation, and examining training documents, compost training techniques used at these locations will be identified. If this study shows that improved training techniques are useful, it could lead to improvement and reinstatement of composting at the Washakie Center location. With the potential re-implementation of the Washakie Center composting program ACRES could double the volume of the total compost received.

**Intimate Partner Violence and the Factors that Affect the Act of Leaving; Economics, Self-Efficacy and Sense of Responsibility to Family**

Shannon Wagner and Kim Ripley with Dr. Kathleen McKinney  
Department of Social Work  
University of Wyoming  
Oral Presentation

*Department of Social Work*

*Laramie, WY  
Sheridan, WY*

Domestic violence also known as Intimate Partner Violence (IPV) is a complex issue facing care givers and society today. This issue is making the headlines as people are less willing to accept it and grow more courageous about speaking out about it. The purpose of this study is to compare three main factors and the impact they have on a woman's decision to leave an abusive relationship. Economics, self-efficacy and sense of responsibility to family are factors examined in this report in relationship to Maslow's Hierarchy of Needs theory (1943).

This qualitative study was conducted using personal interviews with persons having experienced IPV and professionals working with them. Methods used are regression analysis and a search for themes within the subject's experiences. Results include having access to financial support and believing in the ability to take care of oneself as deciding factors in breaking from the abuse cycle. The results of these interviews point to the need for greater financial support when conducting interventions with intimate partner violence as well as a greater understanding that leaving an abusive relationship is a process and not an event.

**A Catalog of [OIII] 5007 Photometric standards in the Virgo Cluster**

Frances Rivera with Daniel Dale, & Rajib Ganguly  
Department of Physics & Astronomy  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Aguas Buenas, Puerto Rico*

The number of sources that can be used for the calibration of narrow band photometry is small compared to that of broadband photometry. Narrowband photometry of point sources is important for a variety of reasons, from the search for intracluster planetary nebulae to understanding the star-formation history of the universe (e.g., through Lyman alpha-emitting galaxies). There will be a need in the next several years for more photometric narrow-band standard stars with the next generation of surveys (e.g., with the Large Synoptic Survey Telescope, or the One-Degree Imager). Thus, more standard stars (both primary and secondary) for narrow band need to be identified and cataloged. Over the last three years, we have been collecting narrow-band [OIII] 5007 images of portions of the Virgo Cluster, along with broad-band V and R. The data were collected at the 2.3m Wyoming Infrared Observatory and the Kitt Peak 0.9m. We present our [OIII]5007 photometry calibration of point sources in the Virgo Cluster region, most of which are intracluster planetary nebula. For greater utility of this catalog, we also cross-calibrate our photometry with the Sloan Digital Sky Survey ugriz system. In addition, we take advantage of the long baseline of our observations to find time-variable sources (rejected from the standard star catalog) such as background quasars, supernovae, novae, and micro-lensing events

## **Molecular Modeling of Protein-Substrate Interactions**

Noll Roberts with Dr. Rob Milne

Division Natural Science

Sheridan College

Poster Presentation

*INBRE*

*Sheridan, WY*

In an effort to make molecular modeling software resources available to lower division students, a student pilot project to model the enzymatic conversion of Angiotensin I to II has been attempted. Protein sequence and functional information will be obtained through the use of the UniProt database. 3D X-ray crystallography structures will be obtained from the Protein Data Bank. Visual viewing and analysis will be done with Deepview and Visual Molecular Dynamics (VMD). Autodock will be used to determine enzyme-substrate docking configurations. Finally, through the use of the above tools and use of ClustalW, variations in sequence, structure, and function will be evaluated to gain a better understanding of snake venom serine proteases.

## **Spider Silk Expression in Alfalfa: A Recombinant Report**

Monica Rowan with Dr. Randy Lewis & Dr. Holly Steinkraus

Molecular Biology and Plant Sciences

University of Wyoming

Oral Presentation

*Department of Molecular Biology*

*Edinburg, TX*

Spider silk is one of nature's oldest biomaterials and has long been revered for its strength and flexibility. We have been working on a system that incorporates spider silk genes into alfalfa plants. The research goal is to produce an alfalfa plant capable of expressing spider silk proteins. To date we have successfully expressed a recombinant dragline silk protein (MaSp1) in alfalfa however the yield has been at a less than optimal yield. Current work is being done to optimize protein expression and generate plants capable of producing the spider silk in larger amounts. Fibers spun from the acquired synthetic silk may be used to construct designer textiles. Some proposed applications of silk encompass biomedical uses including sutures, artificial tendon and ligaments and, industrial uses include protective clothing, composite materials for building, and aerospace applications. While large scale production may be years away, the outcome of these experiments show a promising future.

**The effects of a high saturated fat diet on the accumulation of  $\beta$ -amyloid in an Alzheimer's disease transgenic mouse model**

William Malik and Kyle Ryff with Bruce Culver, Ph.D.  
School of Pharmacy  
University of Wyoming  
Poster Presentation

*NSF EPSCoR*

*Casper, WY*

Alzheimer's disease (AD) is a progressive brain disorder that leads to degeneration of thinking and memory. Two subjects that have been studied extensively in AD are neuroinflammation and amyloid-beta ( $A\beta$ ) plaques. Diets high in fat have been linked to increased risk of developing dementia. Transgenic AD model mice were fed a high-fat diet or a control diet for five months, and their brains were assayed for  $A\beta$  plaques and inflammatory markers using Western blots and ELISA. Western blots of the inflammatory enzyme cyclooxygenase-2 (COX-2) showed significantly higher expression in the hippocampus and cortex of high-fat specimens, compared to controls. Neuronal nitric oxide synthase (nNOS) was significantly higher in the cortical tissues of control animals than in high-fat animals. The inflammatory cytokine tumor necrosis factor alpha (TNF- $\alpha$ ) was significantly higher in the hippocampus of high-fat animals than in controls. For two different isoforms of  $A\beta$ , cortical and hippocampal tissues of high-fat animals had higher concentrations than did those of controls, though not significantly. Overall, these results suggest that a high-fat diet may influence the inflammation and  $A\beta$  plaque formation that have been associated with AD. However, the small sample sizes used limited our ability to show statistical significant differences, and further study with larger sample sizes are needed.

**A Continued Study of Microjet Shear Stress**

Bridget Schabron with Dr. Jon Naughton  
Mechanical Engineering Department  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Laramie, WY*

This presentation is about the continued experimental study of wall shear stress caused by the impingement of a supersonic impinging microjet on a plate. The method of oil film interferometry was used to measure the shear stress. Measurements were made for various height to diameter nozzle ratios and nozzle pressure ratios as well as several different oil viscosities.

The plate temperature for this study was monitored vigilantly. In order to obtain accurate wall shear stress results, a camera calibration was run for each different set of tests and grids were used for camera image calibration to account for camera perspective. Monitoring the temperature was especially important, as the variance of temperature affects the actual oil viscosity. Unlike the previous semesters of this study, final tests were run this time, and the temperature data was actually used in the analysis.

The results of the study indicate that wall shear stress rapidly decreases as the distance from the impingement point increases. The study of wall shear stress created by microjets is important due to its present use in clean rooms and for spot cooling, more specifically the cooling of parts on small parts and electronics.

## **The Causes and Consequences of Poor Math Performance in the United States**

Angela Schanke with Linda Hutchison  
Math Secondary Education  
University of Wyoming  
Oral presentation

*NSF EPSCoR and UW Honors Program*

*Pueblo West, CO*

Recent assessments such as the Third International Math and Science Survey (TIMSS) have brought to attention the poor math skills of students in the United States. Compared to other industrialized countries, we are one of the lowest scoring. Studies show that students with the upbringing common to middle class white males best adopt our approach, which relies heavily on abstract concepts. The focus of my research was to explore the differences in performance possibly caused by gender and race. I read nearly two-dozen articles and studies that focused on these discrepancies. I also conducted interviews of students in the Honors department concerning their experience in math classes and how that affected career choice. What I found was that gender stereotype threat has a significant effect on whether women pursue math or not. Once students are in the pipeline for STEM courses, blacks and whites are equally likely to have a career in these subjects, with Hispanics more likely than either of them. Women, on the other hand, are significantly less likely to remain in the program. New programs that support women and allow more minorities into the pipeline are necessary for the ranking of the United States to improve.

### **“Woman as a Savior who Deceives, as Presented in Selected Poetry by Blas De Otero (1916-1979)”**

Alysa Schroff  
With Carlos Mellizo  
Spanish  
University of Wyoming  
Oral Presentation

*Department of Modern and Classical Languages*

*Cheyenne, WY*

Blas de Otero was a Spanish poet from the city of Bilbao whose poetic publications date from the early 1940's until shortly before his death in 1979. A principal theme throughout his work is the relentless quest for social solidarity and existential sustenance. In a collection of poetry titled *Ángel fieramente humano* (*Angel fiercely human*) published in 1950, Otero presents a series of poems in which the poetic voice is portrayed as deeply perplexed by the precarious human condition. In my paper, I take a feminist viewpoint in regards to the poet's attempt to reach existential enlightenment by means of other beings not himself: God and Woman. I take into special consideration the position of Woman as a potential vessel through which such answers of existentialism may be attained— and the misogyny that results when the poet fails to find satisfactory consolation in her embrace. I will analyze three specific poems: “Cuerpo de mujer”, “Sumida sed” and “En un charco”, and will comment on “Canto primero”, whose decisive tone not only rejects Woman as a provider of solace, but also (due to the sexist nature of the Spanish language) as a member of humanity as a whole.

## The presence of Planctomycetes in Southeastern Wyoming

Kayley Schulmeyer with Naomi Ward

Molecular Biology

University of Wyoming

Oral Presentation

NSF EPSCoR

Laramie, WY

**Background.** Rosette-forming planctomycete bacteria are believed to be associated with eutrophication events in fresh water, and the blooming of alge/cyanobacteria. Species such as *Planctomyces bekefii*, *Planctomyces guttaeformis*, and *Planctomyces stranskae* have been observed in freshwater bodies during the time of their blooming, but have not yet been isolated in pure cultures for characterization.

**Methods.** To identify these *Planctomyces* species, examination and sample collection from four diversely impacted freshwater systems in Southeastern Wyoming was conducted. Once samples were collected DNA analysis, microscopy, and attempts at culturing them will be performed to characterize them.

**Results.** We have not yet shown the presence of rosette-forming *Planctomyces*, but conditions in Labonte are ideal for their growth. The moderate summer temperature, with a pH ranging from 6.8 to 9.4 suggests the appropriate conditions for its growth. From sediment enrichment cultures some bacteria that have morphology to planctomycete have been found.

**Conclusion.** Labonte Lake exhibits conditions suitable for development of rosette-forming Planctomycetes. Enrichment cultures resulted in development of planctomycete morphologies.

## Mechanistic Studies of Pyrolysis Induced Site-Specific Cleavage at Aspartic Acid by Tandem Mass Spectrometry

Alissa Schunter with Dr. Franco Basile

Department of Chemistry

University of Wyoming

Oral Presentation

NSF EPSCoR

Fort Collins, CO

Our group's previous ESI MS-MS studies of peptides indicate that pyrolysis at 220°C for 10 seconds causes a site-specific cleavage at the C-terminus of aspartic acid (D) residues that is accompanied by a loss of water on the C-terminal fragment. Elucidating the mechanism for this cleavage will allow us to use pyrolysis to determine the sequence of unknown peptides. The literature indicates that peptides cyclize during analysis and subsequently re-open at multiple sites around the ring, causing the amino acid sequence to be scrambled, so the first step in elucidating the mechanism for the cleavage at D is to acetylate the N-terminus of the sample peptides to prevent this cyclization. As of the writing of this abstract, experimentation with various methods of acetylation is being carried out. Once satisfactory acetylation is achieved, one peptide sample will be pyrolyzed and acetylated, and its loss of water product ion analyzed by MS-MS. Another sample will also be acetylated and its loss of water fragments analyzed by MS<sup>3</sup> without pyrolysis. Since the mechanism for the loss of water under these conditions is well-documented, I expect to deduce the mechanism resulting from pyrolysis by comparing the MS<sup>2</sup> spectrum to the MS<sup>3</sup> spectrum.

## **Photovoltaic properties of silicon frustules under various treatment conditions**

Jason Schwarzwalter with Dr. Rob Milne  
Natural Science Division  
Sheridan College  
Poster Presentation

*NSF EPSCoR*

*Sheridan, WY*

In 2007 Nature magazine published a paper by researchers at the University of Georgia detailing a procedure to produce silicon from the exoskeletons of diatoms (frustules). The importance of this procedure is that the silicon is produced at very low temperatures and the resulting structure has a shape and surface area that exhibits potentially useful properties. We proposed to replicate the work described in the Nature paper and investigate the photovoltaic properties of the resulting silicon frustules under various treatment conditions. The majority of the project was spent developing a sealed reaction chamber that could provide an inert environment at the required temperature. Product composition was evaluated using x-ray diffraction and scanning electron microscopy. Results of subsequent treatments will be presented.

## **Mapping Pain Pathways in the Spinal Cord of Mice**

Elise Scicluna with Dr. Woodbury  
Physiology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Wheatland, WY*

The project examined the sensory system that conveys information to the cerebral cortex and ultimately our conscious awareness of external stimuli. Mapping the spinal network and how it relays information to the thalamus was studied using mice.

The substantia gelatinosa, the sensory integration center, is located in the spinal cord. It controls nociceptive and tactile transmission to the brain. Nociceptors and tactile receptors receive sensory information from the external environment and relay it to second order neurons located in the spinal cord. The substantia gelatinosa then projects the input to higher regions of the brain.

Using mice, these spinal cord neurons can be mapped. In the experiments, mice were anesthetized and marker injections were made to find where the spino-thalamic neurons terminate. Surgical procedures were performed to make the injections, and the mice were allowed to rest for 6-7 days. Then, mice were sacrificed and their nervous tissue was preserved. The brain and spinal cord of the mice were detached and partitioned to tag the neurons. The neurons that conveyed the marker to their cell bodies were mapped according to location in the spinal cord. Understanding this pathway will be beneficial because mice are becoming the preferred model for pain research.

## **The Reality of Prescription Drug Abuse**

Natalie D. Scissons with Dr. Heck  
Criminal Justice Department  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Casper, WY*

Countless studies and published reports have shown that prescription drug abuse has become increasingly problematic amongst teenagers and young adults. These particular individuals have turned to pain relievers, tranquilizers, stimulants and sedatives in their attempt to attain a “high.” While the overall usage of narcotics throughout the teen population has appeared to decline, the youth population has now begun to rely on prescription drugs in order to get high simply because they believe it to be a safer alternative than that of illegal drugs. The primary reason why individuals have elected to utilize prescription drugs as a means to get high is because they have mistakenly identified such drugs as being safe merely because they have been proscribed; thus, these individuals feel as though such narcotics produce a medically safe high. Those abusing prescription drugs have managed to obtain them in a rather troublesome fashion for they have typically been able to acquire them for free from either friends or relatives. Due to the ready availability of prescription drugs and the countless individuals who elect to consume such narcotics, prescription drug abuse should be considered to be one of the nation’s most prevalent drug epidemics.

## **Perceived Locus of Control and Learned Helplessness: A Comparison of Elementary Aged Students with and without Disabilities**

Caroline Sell with Elizabeth Simpson, Ph.D  
College of Education  
University of Wyoming  
Poster Presentation

*McNair Scholars Program*

*Scottsbluff, NE*

This study will explore whether students who are labeled as disabled and served in special education tend to have an external locus of control in regard to their academic success as compared to their non-disabled peers. It is hypothesized that students labeled with disabilities have an external locus of control which is often demonstrated by learned helplessness when compared to their non disabled peers who, we hypothesize tend to have an internal locus of control. Our method is to survey 120 elementary students in the third and fifth grade from a minimum of two elementary schools in a small Rocky Mountain community. The sample will consist of approximately 60 students in third grade and 60 students in the fifth grade. We will choose classes in which students with disabilities are included in the general classroom. We will code the surveys so we can compare responses for students with and without disabilities. We will utilize the Academic Self-Regulation Questionnaire based from the Self-Determination Theory. The original format of the Self-Regulation Theory was constructed by R.M. Ryan and J.P. Connell. The instrument is designed to differentiate the students’ tendency to view motivation to complete academic tasks as internally or externally controlled. This study may provide insight that allows teachers and administrators to see the effects of labeling students as disabled and how it can be detrimental to the students’ motivation to be engaged in academic tasks.

## **Fire history of the Snowy Range, WY over the past 16,000 years**

Robert Shriver with Dr. Tom Minckley

Department of Botany

University of Wyoming

Oral Presentation

*NSF EPSCoR and ENR*

*Olathe, KS*

Fire plays an important role as a disturbance mechanism in forest ecosystems of the Rocky Mountains. While tree ring analysis provides useful insight into historic fire frequency, these analyses are limited by the age of trees. In contrast, macroscopic charcoal deposited in lake sediments, can serve as a proxy for determining the role of fire and fire frequency over large time scales. In addition, this method encompasses a larger range of vegetation and climate variability, dating back to the formation of the lake. This temporal depth can therefore provide insight into changes in fire-climate-vegetation relationships. Our study explored natural range of variability of fire in the Snowy Range, WY over the past 16,000 years, based on a lake sediment core taken from Little Windy Hill Lake. Results show infrequent fire activity from 16,000 to 12,000 cal yr BP, when high elevation steppe conditions existed. From 12,000 to 8,000 cal yr BP, fire frequency increase but was variable (~2-4/1000 yrs) as forest conditions established. During the period between 8,000 and 2,000 cal yr BP, fire frequency stabilizes around ~4/1000 yrs and present day forest vegetation establishes. For the past 2000 years there were no significant fires in the record.

## ***Anopheles*: How a Tiny Mosquito Almost Thwarted the Construction of the Panama Canal**

Alexander Smeaton

With Dr. David Legg

Department of Renewable Resources

University of Wyoming

Oral Presentation

As people looked for a faster, safer way to ship things across the globe they began to envision a trade path through the Isthmus of Panama. However, because of Panama's tropical location, and the presence of many swamps and lakes necessary for *Anopheles* to reproduce, made Panama a haven for the dreaded insect. Since it wasn't known until 1898 that mosquitoes transmitted the disease many attempts to build trade routes across the isthmus failed, including Spanish, Scottish and French attempts. The French attempt was estimated to have lost approximately 20,000 lives alone to malaria.

When it was discovered and confirmed that *Anopheles* mosquitoes were transmitting malaria, the United States immediately took steps to wipe out the problem through process of draining standing water near villages and houses, oiling swamps to kill mosquito larva, application of larvicides, providing workers with quinine, and placing nets over buildings to prevent further transmission. This lowered malaria rates from 11.59 cases/1000 employees in November 1906 to 1.23 in December 1909, enabling the U.S. to finish the canal.

**Bicycle Mounted USB Power Supply**  
Nicholai Smith with Dr. Stanislaw Legowski  
Department of Electrical and Computer Engineering  
University of Wyoming  
Oral and Poster Presentation

*Department of Electrical and Computer Engineering*

*Chugiak, AK*

In recent years, the popularity of bicycles has been on the rise in the United States. With this increase in popularity people are using bicycles as a form of commute and for extended bicycle tours. My senior design project fulfills these cyclists' needs for a reliable portable power source to charge small electrical devices such as cell phones, or nearly any other type of device that can be charged from a USB power supply. I am using a weather proof dynamo located in the front hub of a bicycle to supply the small amount of power required for this project. My project supplies a constant 5V to the USB device while the cyclist is traveling at the rated speed of the power supply. Additionally my device is small and rugged enough for any cyclist and can be placed in a small saddle bag protected by the seat and seat post.

**Cloning and Expression of Recombinant PrP Protein From the Moose (*Alces alces shirasi*)  
Genomic Variant 209 Ile**

Sandra Smylie, Jean Jewell PhD.  
Department of Veterinary Sciences  
University of Wyoming  
Oral Presentation

*UW Honors Program and NSF EPSCoR*

*Douglas, WY*

Chronic Wasting Disease is a transmissible spongiform encephalopathy (TSE) that affects white-tail deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), and Rocky Mountain elk (*Cervus elaphus nelsoni*). The Shira's moose (*Alces alces shirasi*) is another North American cervid that inhabits the CWD endemic area of Northern Colorado and Southeastern Wyoming. Although rarely documented, the moose is susceptible to develop CWD. The Shira's moose has two different genetic alleles of the prion protein, but unlike the situation in deer and elk there is no known correlation between CWD susceptibility and genotype. The aim of this project is to clone and express in bacteria the moose prion protein allele that has an isoleucine at codon 209. The purified recombinant prion protein will then be used to obtain and standardize MALDI (matrix-assisted laser desorption ionization) mass spectroscopy spectra to analyze the allelic composition of disease-associated prions in CWD-infected moose. This analysis will complement similar analyses being done on mule deer, white-tail deer, and elk that also contain genetic differences within the prion protein gene. Furthermore, with the use of standardized mass spectroscopy, continued research will provide insight about the relationship of the genetic variability in moose to the susceptibility and process of CWD.

**Phenotypic and Genotypic Characterization of Antibiotic Resistance Integrons in *Salmonella enterica* serovar Newport**

Raymond Soto with John Willford, Ph.D.  
Department of Microbiology/Molecular Biology  
Poster Presentation

*McNair Scholars Program*

*Powell, WY*

This study will examine three different integrons (1.0, 1.2, and 1.8 kb) demonstrated to be present in multi-drug resistant *Salmonella* Newport isolates. In a preceding study on multi-drug resistant *Salmonella enterica* serovar Newport isolates demonstrated the presence of at least three different integrons. It is hypothesized that these integrons may play a role in antimicrobial resistance. Our methods for analyzing this will initially involve cloning each of these integrons into expression vectors. Phenotypically, resistance profiles for each integron will be established individually and then transformed into non-resistant bacteria separately and in combination to demonstrate similar resistance profiles. Genotypically, each integron will be sequenced and analyzed through GenBank. This research may lead to characterization of potential mechanisms of antimicrobial resistance.

**Serologic Characterization of a Potential Virulence Gene Product from *Brucella abortus***

Jessie Spellman and Gerard Andrews  
Department of Veterinary Sciences  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Cheyenne, WY*

*Brucella abortus* is the causative agent of brucellosis in ungulates. Infection causes spontaneous, premature abortion and can therefore be a serious problem for wildlife populations, as well as the beef and dairy industries. Current diagnostic tests are ELISA-based, which detect the presence of lipopolysaccharide antibodies in serum. These tests must be performed in the laboratory and are therefore labor-intensive and time consuming. Through the application of in vivo-induced antigen technology (IVIAT), ten *B. abortus* genes were previously identified that are up-regulated during infection in elk. Specifically for this project, we PCR-amplified, cloned, and expressed one such gene, *virJ*, encoding a component of a type-IV secretion system required for virulence in *B. abortus*. We subsequently electroblotted and probed the recombinant protein with twenty-one serum samples from elk that previously tested both negative and positive for brucellosis, as well as elk that were immunized with the *B. abortus* S19 live vaccine. Sixteen confirmed positive and negative cattle serum samples were also tested. Based on preliminary results, we conclude that *VirJ* is a predictor of natural infection in elk. Analysis of additional samples should confirm if sero-reactivity to this antigen allows differentiation from vaccination, as well as predicts infection in cattle.

## **Structural Evidence for Juxtaposition Of Two Archean Terranes in the Teton Range, Western Wyoming**

Sarah J. Stacy with Susan M. Swapp, Barbara E. John, B. Ronald Frost, and John Reed  
Geology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR and UW Honors Program*

*Cheyenne, WY*

The presence of Archean gneisses recording high pressure granulite facies metamorphism and associated leucogranites in the northwest Teton Range suggest that a 2685-2671 Ma Himalayan type orogeny occurred here. Contrasting rock types,  $\epsilon\text{Nd}$  values, and thermobarometric evidence indicate that the rocks in the west were formed under higher temperatures and pressures than those in the east. This evidence suggests that the rocks in the eastern Teton Range were accreted to those in the west after the 2685-2671 Ma high pressure event.

A comprehensive set of structural data for the region is used to test if the structural history of the area is consistent with this hypothesis. Foliations define open folds with average hinge orientations  $\sim 20^\circ/026^\circ$  across the entire range which postdate foliation and isoclinal folding, but are crosscut by the Mount Owen Quartz Monzonite (2550 Ma). Lineations to the west of a preliminary boundary defined by a string of ultramafic bodies define folding with average hinge orientations  $\sim 44^\circ/257^\circ$  while the lineations to the east of this boundary are folded about the average hinge orientation  $\sim 35^\circ/126^\circ$ . These two fold orientations indicate that these blocks experienced distinct early structural histories, supporting the hypothesis of juxtaposition of two terranes after the Himalayan event.

## **Mapping Burn Severity within the Grizzly Gulch Fire Using Remote Sensing Techniques**

Adam Stephens & Brice Stanton with Dr. Ramesh Sivanpillai  
Department of Renewable Resources  
University of Wyoming  
Oral Presentation

*WyomingView*

*Rapid City, SD  
Newcastle, WY*

This project assessed the extent and severity of the Grizzly Gulch fire in a forested area near Deadwood, South Dakota. Two images acquired from Landsat (a US remote sensing satellite) were used to extract the Normalized Burn Ratio Index (NBRI) values prior to and after the fire. Fire boundary or perimeter was visually interpreted from the satellite images to create the area of interest. The NBRI was computed by extracting pixel values from the infrared bands of the Landsat images to correspond with burn severity ratios within our study area. Maps were then made by recoding NBRI values which illustrated the following four levels of burn severity: High, Moderate-High, Moderate, Moderate-Low, and Low. The raster image from the NBRI recode model with assigned burn severities was then laid over a Digital Elevation Model (DEM) for our study area to create 3-D terrain to illustrate the extent and severity of the fire relative to topography, slope and aspect.

## **Identification of A and B blood group like environmental antigens**

Chris Stone with Bernardino Madsen

MLT Program

Casper College

Oral and Poster Presentation

*Casper College*

*Casper, WY*

The ABO blood group system is the most important clinically significant human [blood antigen](#) system. It is the only blood antigen system with opposite corresponding antibodies. An individual with type A blood will have circulating anti-B antibodies.

The associated anti-A and anti-B antibodies are usually [IgM](#) antibodies which are produced in the first years of life by sensitization to environmental substances. Anti-A and anti-B antibodies are not present in the newborn and develop in the first years of life. It is postulated that food and environmental antigens (bacterial, viral or plant antigens) have [epitopes](#) similar to A and B red blood cell glycoprotein antigens. The environmental stimuli have never been identified.

Exposure to incompatible blood during transfusion therapy results in a massive hemolytic transfusion reaction. It would be beneficial to transfusion medicine to identify the environmental stimuli. With the identification of the antigenic stimuli it may be possible to create manufactured products for human transfusion that lack antigenicity.

### **Preventative Medicine in the United States: The Acceptance and Impact of the HPV Vaccine**

Layne Strannigan with Sherrie Rubio-Wallace

Fay W. Whitney School of Nursing

University of Wyoming

Oral Presentation

*UW Honors Program*

*Cheyenne, WY*

Preventative medicine is an important aspect of healthcare that is often overlooked. Vaccinations are the simplest and most effective form of prevention for a variety of illnesses. In 2006, a vaccine was approved that protects girls from several strains of the Human Papillomavirus (HPV), a sexually transmitted infection. Despite the vaccine's proven effectiveness and the high prevalence of HPV, many Americans remain skeptical of the need to mandate vaccination of all school-aged girls. In order to increase the acceptance and uptake of the vaccine, it is necessary to understand what factors most directly affect a woman's decision to receive or abstain from receiving the vaccine. This topic was selected due to its recent importance and my interest in the field of healthcare.

Research for the project was conducted using the most recent sources available including magazine articles and journal articles. In addition, the University of Wyoming Student Health is referenced in order to focus on a specific population of interest.

Acceptance of the vaccine is dependent on a variety of factors including cost, physician recommendation, media portrayal, education on the virus and the vaccine and a woman's perceived susceptibility to the disease being prevented. Due to the variance of factors, it is evident that a healthcare provider must give sufficient information on both the virus and vaccine for all patients. In addition, education is critical, not only to increase acceptance of the vaccine, but to increase the patient's awareness and ability to protect herself.

**Common Housefly based Machine Vision Sensor  
including Multiple Lenses**

Rob Streeter with Dr. Steve Barrett  
Electrical and Computer Engineering  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Saratoga, WY*

Much research on the *Musca domestica* machine vision sensor has already been conducted at the University of Wyoming. This on-going project is working to increase the capabilities of the sensor, and characterize the sensor behavior. The sensor illustrates a number of superior qualities when compared to standard vision sensors.

A design I tested, using a custom designed light box, utilizes forty-nine sensing cells. The high number of sensing cells vastly improves the effectiveness of the sensor by granting it a larger sensing area, as well as more precise position detecting abilities. The newest design will utilize this improved sensor and place the lenses on a curved surface, thus further extending the viewing range. Any of these designs could be used to improve autonomous machine operations, security system sensitivity, and a host of other motion and object sensing applications.

My research led to a better characterization of the flat-surface sensor design, and the successful assembly of the curved surface sensor. Thus allowing for graduate research during the school year to characterize this sensor. My contribution to the project was beneficial, however the project is far from completion and future involvement would only aid more.

**Evidence of an Independent, Localized, GnRH System in the Mouse Heart**

Heather Talbott with Dr. Donal Skinner  
Zoology and Physiology  
University of Wyoming  
Oral Presentation

*McNair Scholars Program*

*Rock Springs, WY*

Gonadotropin releasing hormone (GnRH) is most widely known for its role in reproduction. Recent evidence, however, suggests that it may have roles outside of regulation of reproduction. One such place is the heart. We believe that the heart contains an independent, localized GnRH system. In order to verify this RT-PCR, western blots, and immunohistochemistry were used to determine presence and location. Also, the enzyme that degrades GnRH, EP24.15, was assessed for presence and activity levels in the heart. We found that GnRH, the GnRH receptor, and EP24.15 are all present in the heart, and that EP24.15 is active.

## **Non-Standard Analysis and Magnetohydrodynamic Shock Waves**

Arthur Terlep with Dan Stanescu

Department of Mathematics

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Elkhart, IN*

The basis for this theoretical research is the developing field of nonstandard analysis and its particular application to shock wave theory. The aim of the project was the “bridge” the discontinuity in the Heaviside function present in the equations of shock theory using the Hyperreal number system. My research primarily focused on learning the basics of shock wave theory, studying infinitesimal calculus and applying functions to the discontinuities. The reason and the result of this is that these equations are now smooth and easily differentiable, which simplifies the equations governing the wave. The applications of the various aspects of this research are far reaching: from supernovas to (potentially) string theory while the abstract nature of infinitesimal calculus is mind opening.

## **Antioxidant gene function in cyanobacteria**

Conner Thompson with Dr. Steven Herbert

Molecular Biology

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Cheyenne, WY*

Dose response experiments were performed to quantify the significance of three antioxidant enzymes to growth of the cyanobacterium *Synechococcus elongatus* PCC 7942 under different oxidative stresses. Our results generate new insights into the functions of the *sodB*, *katG*, and *tplA* genes in an oxygen-evolving photosynthetic organism.

**Differentiation between infections caused by *Brucella abortus* and *Yersinia enterocolitica* O:9 in Elk by Western Blot.**

Samantha Thompson with Dr Gerard Andrews  
Department of Microbiology  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Sequim, WA*

Brucellosis is a disease which impacts both domestic and wildlife animal populations. Elk have been misdiagnosed with brucellosis by the standard serologic laboratory assay (ELISA), because of potential cross-reactivity with non-*Brucella* antigens. This phenomenon is likely due to similarity of the composition of the O-polysaccharide side-chain of lipopolysaccharide (LPS) with *Yersinia enterocolitica*. Chronic infection by this enteric species in elk may, therefore, confound assay results. To address this problem, we examined LPS from *Y. enterocolitica* and *B. abortus* by immunoblot against sera from elk, infected with *Y. enterocolitica* O:9. LPS probed with sera from *Yersinia*-infected animals showed equally strong reactivity to o-polysaccharide from both species. We next evaluated the anti-*Yersinia* and *Brucella* serum samples against a purified recombinant *Yersinia* protein, LcrV, with no known homolog in *B. abortus*. Six of 8 samples from *Yersinia*-infected elk were positive, while none of the *Brucella*-POS samples showed specificity for LcrV. Conversely, all 8 anti-*Yersinia* samples were negative against a protein unique to *Brucella*, AfuA, while 8 of 9 anti-*Brucella* samples were positive. We conclude that that cross-reactivity can be abrogated through the use of protein antigens unique to each species. A modified/augmented assay may therefore delineate between yersiniosis, brucellosis, or co-infection.

**The Power Behind the Taekwon-Do Punch**

Colleen Thompson with Dr. Matthew Bundle  
Department of Kinesiology  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Sheridan, WY*

Martial arts are practiced by millions of individuals worldwide and the power generated during striking maneuvers executed by martial artists can be dramatic and substantial. However, practitioners and scientists differ in their understanding of the mechanisms through which these impacts are possible. Here we contrast the metaphysical aspects of power as understood through the traditions of Taekwon-Do, to the mechanical measures obtained from traditional kinetic analysis. We focused on a fundamental power producing movement in Taekwon-Do called the sine-wave, and set out to determine its role in arm striking maneuvers. We measured center of mass movements, impact forces and impulses, while subjects stood on force plates and executed a reverse front punch to a pine board mounted in a custom instrumented vise. The results of these mechanical measures are evaluated within the context of the established teachings and doctrines of Taekwon-Do.

## **Characterizing the Performance of Models for Sequence Evolution and the Detection of Positive Selection**

Makayla Tisdell with Dr. David Liberles  
Department of Molecular Biology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Plevna, MT*

Proteins are constantly evolving and mutations are continually emerging. A point mutation can result in a change to the base pair sequence of a gene. Mutations can lead to positive selection in a population which is when an advantageous point mutation increases in frequency and eventually sweeps a population. Detecting positive selection is important because it can help deduce when a functional change has occurred in a protein. However, understanding where and when positive selection occurs has proven to be a challenge. Models of protein evolution have been developed that describe the probabilities of change in a protein resulting from mutations. Programs that use phylogenetic analysis and statistical methods (PAML, Yang 1997) combined with different models are powerful tools when attempting to identify positive selection. Using simulated data, I systematically evaluated the power of these models to recover positive selection. Positive selection has also been linked to evolutionary rate shifts. The Covarion model can be used to detect these rate shifts and identify positive selection. I hypothesized that in a population there is a time-dependent transition from the Rates across Sites model to the Covarion model and that positive selection will increase the rate of this transition.

## **System for Prioritizing Electric Loads**

Jordan Tolman and Wade Wittkop with Dr. Stanislaw Legowski  
Department of Electrical and Computer Engineering  
University of Wyoming  
Oral and Poster Presentation

*Department of Electrical and Computer Engineering*

*Worland, WY*

Demand Control is monitoring commercial or industrial demand spikes and automatically reducing them by controlling the on time of certain loads and or shifting them without hindering facility operations. Such loads could be air conditioning, fans, heaters, chillers, freezers, pumps, and other high energy consuming loads. Our senior design project will consist of a small scale version of industrial loads that are represented by light bulbs. Half of the light bulbs, non-essential loads, will be controlled by a microcontroller that will turn off these lights by lowest priority first when the total power capacity of the system surpasses 70% capacity. This will save energy costs by turning off non-essential loads when they are not needed.

## **Beetle-Killed Pinewood to Ethanol via Gasification and Bio-Fermentation**

Thomas N. Tolman with Dr. H. Gordon Harris  
Department of Chemical Engineering and Honors Program  
University of Wyoming  
Oral Presentation

*Department of Chemical Engineering  
UW Honors Program*

*Otto, WY*

Pinewood can be converted to ethanol using high pressure and high temperature gasification, a reaction including combustion and pyrolysis. Gasification produces a combination of methane, carbon monoxide, carbon dioxide, hydrogen, and various trace gasses. This mixture is called synthesis gas or syngas. Syngas can be cooled, decompressed, and fed to a bioreactor. The microbes in the reaction can metabolize the syngas to produce ethanol.

My senior design team has designed a plant for this conversion process. The design includes unit operations such as the gasification reactor and the bioreactor. The design includes economic analysis such as equipment cost as well as environmental concerns such as gas clean-up.

## **Automated America: Rise of the Mechanized Technology**

Dominick Tuñacao with Dr. Thorsten Janus  
College of Business  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Cebu City, Philippines*

The goal of this project is to learn about the economic and social consequences of a fully mechanized manufacturing industry. It explores the mobility of employment and how the labor landscape (highly skilled, skilled, and unskilled) would change. The project looks on effects in GDP and GDP per capita. The project includes particular effects in society – good or bad. It explores new opportunities that rising technology may deliver. It will explore the challenges that automation can cause, such as job loss and demoralization. Addressing this issue, we will also explore ways on how to help the people harmed by the new technology.

This paper is designed to use economic analysis to explore society's behavior in times of great technological leaps and how economic policies can regulate the economy during technological boom.

Fully mechanizing manufacturing in America will contribute to a new era of technological and economic development. This growth will yield new opportunities for the generations to come. However, challenges during the transitory period can be difficult to handle without proper regulation made by the government and cooperation of the people.

## **Minimization Technique for Phase Equilibrium Computation in Multi-component Two-phase Flows**

Irena Vankova, Dr. Frederico Furtado  
Department of Mathematics  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Prague, Czech Republic*

The focus of this research project is to develop a minimization procedure of the Gibbs free energy function for a multi-component two-phase flow problem. The procedure is based on the Newton's method. In order to make this method suitable for the problem, the following improvements were investigated: (i) modification of the Hessian matrix to guarantee its positive definiteness – this modification prevents the convergence to a saddle point (i.e., an unstable thermodynamic equilibrium); (ii) adjustment of the size of the Newton step in order to reach the local minimum with a low number of iterations, even when one starts relatively far from the equilibrium point, the same also prevents from overshooting the local minimum. One of the biggest difficulties related to the thermodynamic equilibrium problem is to find a method that accurately determines the Newton step of a nearly singular system. In second part of the method description, a modification to computing the Newton's step is discussed to address this problem. The nearly singular direction of the Hessian matrix is isolated by means of an orthogonal transformation (Householder Transformation). As a result, the matrix should be factorized accurately. A comparison of the two versions of the minimization method will be discussed.

## **Modes of Taxation & Sustainable Economic Growth in the United States**

Mark Ver Burg with Dr. Ann Alexander  
Economics & Finance  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Moorcroft, WY*

During the time that this research was undertaken, the Dow Jones Industrial Average was below 8,000 points, having recently registered as low as 6,600. With climbing unemployment, record budget deficits forecasted, and the evaporation of trillions of invested dollars, Americans considered a host of proposals, as to how the economic decline could be reversed. This study examines how fundamental change in U.S. tax policy could spur robust economic growth.

The research starts with historical data on revenue gathering policies which the United States currently uses and those that have been used in the past. It continues with a survey of taxation modes employed in countries with economies similar to that of the U.S. From that review of experiential economic instruction, the study derives a system of taxation, fundamentally different from the current U.S. tax code, which would curb the current economic free-fall and create an environment suitable for rapid but measured sustainable economic growth.

## **Computational Modeling of A Woven Fabric Composite Material**

Luke Walker with Dr. Mark Garnich  
Department of Mechanical Engineering  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Wilson, WY*

A trend towards composite materials has been made because they are stiff and strong for how incredibly light they are. Simple composite structures have been modeled with some success. However, when the weave of the fibers in a composite material gets more complex the analysis gets significantly harder. The research project aimed at developing more effective methods for analyzing such complex materials.

A graduate student has created a model of a complex composite weave while he continued work on improving the model analysis was preformed. The analysis approach involved breaking down the material into small volumes that retain the properties of the entire volume of material. The models have been developed on a computer and involve detailed representation of woven fiber.

The objective was to obtain a good model of a particular composite that utilizes a triaxial weave reinforcement. The models produced stress and strain data that was used to validate a failure theory developed by the local small business, Firehole Technologies, Inc. This will provide a basis for the prediction of failure in many different structures and a better understanding in the material properties allowing for more productive material usage in all kinds of applications including aircraft and spacecraft.

## **Mountains and Valleys and Bifaces: The Impact of Landscape on Projectile Point Retouch**

Cole Barron Wandler, Dr. Robert L. Kelly  
Department of Anthropology  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Gillette, WY*

Previous measurements of resharpening on hafted bifaces were subjective. The possibility of inter-observer error was great and reliable comparisons of results were difficult. As a result of this, data on retouch have often been useless for broader and more pertinent archaeological questions. William Andrefsky developed a reliable and objective method for measuring retouch that is proven in both an archaeological and experimental context. I hypothesized that disparities in the availability of material caused by the landscape create a difference in the use life of projectile points and therefore a difference in retouch. This paper uses Dr. Andrefsky's method to record retouch on typologically separated projectile points from Nevada. The landscape was divided into "valley" and "upland". Results show that projectile points found in valleys are slightly more resharpened than those found in upland terrains. This indicates that the more abundant sources of material in the upland regions and the lack of material in valley regions changed the use life of projectile points and ultimately altered the way prehistoric peoples used hafted bifaces and conserved material.

**“THIS JUST IN...”**  
**A Look at Improvisational Theatre through Creative Production**  
Joelle M. Weber with John O’Hagan  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Centennial, CO*

The main background behind my project has been to create an improvisational theatre team within the Theatre/Dance department. I wanted to be able to produce and direct a show, as well as design all of the publicity materials to promote it. I felt by doing so, I could combine skills that I have learned from both of my majors. After graduation, I intend on entering the field of Arts Management, and I felt like this creative project was a great way to build onto my resume and gain first-hand experience as a producer. In order to create this production, I did initial research on improv theatre techniques and its roots in Commedia dell’Arte. From there, I auditioned actors and formed my teams back in January; therefore, my primary method for conducting research for this project has been through weekly rehearsals and observations of my actors. The final production entitled, “THIS JUST IN...” was performed on April 8 & 9, 2009 in the Fine Arts Building Crane Studio. My final presentation on research day will review highlights from the shows, display my publicity designs, and briefly cover the history of improv theatre.

**Trained To Take Care Of You, But Who Is Taking Care of Them?: An Inquiry Into The Experiences Of New Graduate Nurses**

Lindsey A. White with Ann Marie Hart, APRN, RC, FNP  
Fay W. Whitney School of Nursing  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Cheyenne, WY*

The nursing shortage across the United States has become a prominent and serious issue facing today’s healthcare system. Nursing schools have been forced to handle a high demand of students seeking a nursing education to secure the very foundation of patient care. Nevertheless, while many nursing students are graduating each year, many new graduates are quickly leaving the field due to overwhelming patient loads and the stressors of being an inexperienced nurse. My project is an investigation of experiences of nurses who have recently graduated from nursing school and have entered the nursing work force independently for the first time. By providing new graduates with a thorough orientation and a continued support system, new graduate nurses obtain greater job satisfaction and self worth in their profession. My presentation offers recommendations for new graduate nurses seeking employment and their employers on how to develop a professional working collaboration to improve the retention rates among this population.

**Original Screenplay**

William Whyde with Professor Bill Downs  
Department of English  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Casper, WY*

Since the Honors Program provides the opportunity to attempt a creative project for Senior Research Day, I decided to write an original screenplay. Since I enjoy film and would like to pursue a career in writing (at least in some form), I thought it would be interesting to try something like a screenplay. I did not have any experience with screenwriting, so I attended Bill Downs' screenwriting class in order to learn the basic procedures for proper formatting and how to (hopefully) create an engaging story. I chose to complete a spec. script for what would probably be a short film (somewhere from 25 to 35 minutes). Besides deepening my appreciation for the craft that goes into writing a script for television or film, writing a screenplay has provided valuable experience in a fascinating and rewarding artistic medium.

**“The Effects of Culture on Graphic Design in Advertising”**

Ashley Wimmer with Jennifer Venn  
Department of Art  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Aurora, CO*

Graphic Design is a means of visual communication used worldwide in marketing and advertising. The purpose of this research is to compare and contrast graphic design in international advertising to understand how culture effects design as well as what elements of design remain the same cross-culturally. I specifically focused on the advertising from four countries of Japan, Persia, America, and Germany. The designs were analyzed through the cultures, religions, and histories of those countries as well as the specific elements of graphic design of color, form, type, image, and line. I examined various printed materials, including magazine and newspaper advertising, billboards, and signs.

Through this analysis of graphic design within diverse cultures, one can identify the best means of advertising to a diverse international group, and clearly communicating through design. This research project demonstrates the ways in which design reflects the culture from which it derives, and how these aspects of design in turn create a cultural identity. The impact of this project is its analysis of how some design is universal, while other design can only truly be understood within the culture it was created.

## **Paleontological Research on Fossilized Bone's Ability to Stick to a Person's Tongue**

Shana Marie Wolff with Steve Cassells, Trina Riegel, and Anne Wolff

Anthropology and Geology Departments

Laramie County Community College

Poster Presentation

*NSF EPSCoR*

*Cheyenne, WY*

It is well known among archaeologists and paleontologists that fossilized bone has the ability to stick to a person's tongue if one licks the bone. Fresh bone, weathered bone, rocks, and minerals do not stick to the tongue. My hypothesis was that fossilized bone, because it is at least 10,000 years old and up to 145 million years old, would have all the organic material removed and replaced with minerals, but the Haversian and Volkman canals would still be present to drain the saliva away and adhere the tongue to the bone. Research was performed on fresh weathered bone, fossilized bone, rocks and minerals, and petrified wood that were unsealed and sealed with various commercial products. Saliva stained with methylene blue was applied to the bone and examined microscopically to see how far it penetrated into the canals or into the bone matrix. Results of microscopic examination indicated that the stained saliva penetrated equally in all unsealed bone and petrified wood. Thus, the stickiness of fossilized bone to the tongue is not due solely to the presence of canals within the bone but may be an interaction of the glycoproteins in saliva, traces of organic compounds such as collagen and elastin in even fossilized bone, and the high mineral content of the fossilized bone.

## **Discoveries in *Myxococcus xanthus* Motility by *tgl* Mutagenesis**

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Oral Presentation

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Myxobacteria move via gliding motility and are capable of forming ripples, coherent S (Social) motile swarms. Tgl is necessary for the activation of the type IV pili (Tfp), which powers S-motility. When cells are isolated S-motility is absent, suggesting that this motility requires cell-to-cell contact for movement. One reason cell-to-cell interactions of Myxobacteria, more specifically, *Myxococcus xanthus* are being studied is because their cellular coordinating ability exemplifies a simple multicellular organism. For multicellular motility to be feasible, cells need to communicate for cooperative cell functions. We hypothesize that one way cells can communicate is through cell contact mediated transfer of the Tgl and CglB lipoproteins. In order to study how Tgl might function in cell-cell interactions we sought to create a library of mutants with varying genotypes and phenotypes in order to help elucidate structure-function relationship of Tgl. Error-prone PCR and hydroxylamine mutagenesis were utilized to create a range of *tgl* mutants. After experimentation, error-prone PCR did not provide a high quality library and the hydroxylamine mutagenesis experimentation finished with inconclusive results and was taken on by a graduate student in the lab. Additional adjustment of procedures should lead to further insight into the role of Tgl in *M. xanthus* motility.

**A Distant Brain is Better Than an Immersed Brain: Frontal Brain Asymmetry and Self-Distanced and Self-Immersed Emotional Expression**

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A large body of work on the prefrontal cortex (PFC) indicates that asymmetric activation within the PFC is associated with success in emotion regulation (Jackson, et al., 2003), emotional coping (Master, et al., in press) and psychological well-being (Urry, et al., 2004). However these studies have all been correlational, leaving several unanswered questions concerning the mediating processes between frontal asymmetry and emotion regulation, coping, and psychological well-being.

While not directly tested within their research on self-distant and self-immersed emotional recall, Kross and colleagues findings strongly suggest that individual differences in habitual use of either self-distant vs. self-immersed emotional recall might explain individual differences in either adaptive emotional expression or maladaptive rumination. Such an individual difference may help explain the relationship between individual differences in neural processes and emotion regulation and psychopathology (Davidson, Jackson, & Kalin, 2000).

Based on previous research concerning self-distanced and self-immersed emotional expression and frontal asymmetry, we hypothesize that greater relative left PFC activation will be associated with self-distanced emotional expression conversely greater relative right PFC activation will be associated with self-immersed emotional expression. We also predict that frontal asymmetry scores during emotional expression will mediate self-reported depressive affect and recounting/reconstruing statements made after emotional recall. The study proposed here will test these hypotheses by replicating the method used by Kross and Ayduk while EEG is recorded during emotional recall and essay writing.

**Geospatial Information for  
Habitat Quality Assessment in the Pinedale Anticline region of Wyoming**

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The Pinedale Anticline of Wyoming is an important area for wildlife habitat in particular because many plants and animals rely on sagebrush for resources. Yet, the oil pads in the area are fragmenting the landscape and threatening natural habitat environments. The purpose of this research is to produce an accurate land cover map of the Pinedale Anticline so that agencies such as the Bureau of Land Management (BLM) can establish management and monitoring practices to help preserve and maintain these lands. Spectral-spatial metrics, which are derived from one foot spatial resolution October 2007 color infrared orthophotograph mosaics, are ran through an algorithm to classify clusters showing different sage brush closures. These closures represent different densities of sage brush suitable for wildlife habitat. The final product updates a previous BLM map of various "big sage" categories. It will be used to help protect the wildlife important to the area as well as providing gas and oil companies with areas for development. Remote sensing and GIS is a valuable tool to utilize when creating a continuous thematic map of land cover for an area as large as the Pinedale Anticline.

## **U.S. Air Transportation Network Analysis**

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The U.S. air transportation network is a complex network that is constantly growing and changing. It can be represented as an overlaying of two networks – a ‘physical network,’ representing all possible single flight segments, and the ‘market network,’ which represents all the origin/destination pairs a customer could fly to and from. Understanding the relationship, representation, and the relation to geography of these two networks is a highly complex and difficult problem, one that is not solvable without the use of advanced computational methods and programming skills. With some careful analysis of the interactions of these two networks, we are able to hypothesize a given network interaction, such as the spread of disease across the network.