

*Abstracts*  
*(in alphabetical order by author)*

**An Integrated Computational Intelligence Approach for Predicting Biological Activity of Potential HIV-1 Protease Inhibitors**

*Abdul-Wahid, Sarah; Collar, Catherine J.; Salim, Nicholas*

*Faculty Mentor(s): Dr. Razvan Andonie, Computer Science; Dr. Levente Fabry-Asztalos, Chemistry*

*Session: 1 (Oral Session 8:00-9:40 in 135)*

Using a neural network-fuzzy logic-genetic algorithm approach, we generate an optimal predictor for biological activities of HIV-1 protease potential inhibitory compounds. We use genetic algorithms (GAs) in the two optimization stages. In the first stage, we generate an optimal subset of features. In the second stage, we optimize the architecture of the fuzzy neural network. The optimized network is trained and used for the prediction of biological activities of newly designed chemical compounds. Finally, we extract fuzzy IF/THEN rules. These rules map physico-chemical structure descriptors to predicted inhibitory values. The optimal subset of features, combined with the generated rules, can be used to analyze the influence of descriptors. This information can assist medicinal chemists in designing new inhibitory compounds more efficiently. Once designed using sophisticated modeling software, the biological activities can be predicted so that time and money spent synthesizing inferior compounds can be reduced.

**¿Somos Parientes?: A Study on the Linguistic Parallels between Chabacano and Spanish**

*Adamson, Rebekah*

*Faculty Mentor(s): Dr. Natalie Lefkowitz, Foreign Languages*

*Session: 22 (Posters in Ballroom A & B)*

Chabacano, a name derived from a Spanish term meaning clumsy, ill-fated, and vulgar, is a living Spanish Creole. Spoken predominantly on the Philippine island of Mindanao, Chabacano is a blended variety of Filipino native substrates, and Spanish Castilian lexicon. In addition to examining its history, language processes and vocabulary, this research focuses on the linguistic similarities between Chabacano and Spanish attempting to assess whether these parallels enable speakers from each language to communicate effectively. Other than the many Spanish lexical items adopted into Chabacano, the Spanish Creole also radiates a sound of a dialect called

'lowland Spanish', a variation of Spanish spoken in Andalusia, the Caribbean, the Yucatan, and Venezuela, among other places. Along the Mediterranean Sea, Andalusians brought a Spanish dialect distinct from Spain's Standard Castilian. It was also different from modern standard Latin American Spanish. These lowland Spanish speaking countries are comparable linguistically in their use of some or all of the following linguistic processes: lateralization of /r/, velarization of /n/, lenition of "d," distinction between /ʎ/ and /j/, and vowel raising. Since Chabacano shares so many linguistic features with Spanish, it is hypothesized that speakers of both languages will be able to communicate. However, when considering this conclusion, it should be mentioned that this study included only written, rather than oral samples of Chabacano.

## **How to Set up a Digital Signature**

*Alsoszatai-Petheo, Andrew*

*Faculty Mentor(s): Dr. David Rawlinson, Information Technology and Administrative Management*

*Session: 21 (Posters in Ballroom A & B)*

The federal e-sign bill, which was designed to make electronic signatures equivalent to traditional signatures, was signed into law in October of 2000. Since then, there has been no change in the way we do business. Why are law offices and accounting firms in the United States not doing business electronically by means of digital signatures? In addition to researching academic literature, my project was to create a "how to" paper for law offices and accounting firms. This paper is a step by step tutorial on how to acquire and utilize a digital certificate which is capable of digitally signing e-mail.

## **The Artist's Vision: A Struggle for Freedom**

*Amad, Margaret*

*Faculty Mentor(s): Dr. Chris Schedler, English*

*Session: 9 (Oral Session 9:50-11:30 in 140)*

Virginia Woolf was very much influenced by Roger Fry's concepts concerning art and its purpose; specifically art should serve as a medium in which one could sort out the complexities of this life; art was not meant to be merely a reflection of life, but another form of life altogether. Randi Koppen, author of "Embodied Form: Art and Life in Virginia Woolf's *To the Lighthouse*," suggests that Fry's ideas opened the door for Woolf, and many other authors of her time, to a new realm of language usage that had not yet been employed. Woolf felt that the current forms and styles that

dictated fiction were inadequate, and she yearned to create an artistic equivalent to life through language. Applying Fry's elements, Woolf uses Septimus, from *Mrs. Dalloway*, and Lily, from *To the Lighthouse*, to voice and make manifest the struggles of the artist attempting to sort through life's complexities and societal limitations. Both Septimus and Lily consistently struggle to make sense of their environments by defining what they see and feel in new modes of representation. Accordingly, the artistic vision, the need for uninhibited self-expression to clarify and solve life's intricacies, is more important than the form of expression it takes.

## **Interrogating the Role of Islam and Sharia on Women's Reproductive and Sexual Rights in Islamic States of Africa**

*Amutabi, Maurice*

*Department: History*

*Session: 4 (Oral Session 8:00-9:40 in 140)*

This paper will discuss the impact of Sharia (Islamic law based on the Holy Koran, Hadith and Sunnah) on women's reproductive and sexual rights in Islamic states of Africa South of the Sahara. With the introduction of Sharia ("Sharianization") in some parts of the continent, the Islamic clergy (ulama) have become extremely vigilant on women's actions in Africa. The ulama are mostly concerned with issues surrounding sexuality, marriage and divorce, but where only women are often targeted. The ulama use religious vigilantes and umma (community of faithful) to monitor women's activities, especially zina or unlawful sexual intercourse (adultery and fornication). The Islamic courts (qadi or Kadhi) created under Sharia have ensured that women continue to suffer marginalization at the hands of men, because under Sharia men are significantly privileged compared to women. Men are allowed to divorce (taliq) much easily than do women. This has had a negative effect on women's rights. I will argue that while Sharia laws are not uniform or given by God as claimed, the opposition between conservative and liberal jurisprudence has prevented societies from establishing Muslim laws that ensure equity and protection of the rights of women. I will highlight what has happened in the process of "Sharianization" and what has been done by development practitioners to oppose the implementation of Sharia. Using both local cultures and international human rights discourse I will argue that there is need for dialogue, not only to 'sanitize' traditional cultures and Sharia, but also to domestic Islam in Africa. I argue that this dialogue should bring about a "demystification" of Sharia for the Muslim communities in Africa and elsewhere, where repugnant laws in Sharia should be replaced by more humane and friendly ones that will not promote gender oppression.

## **Environment, Migration Histories, and Childhood Health: Uses of Folk Healing and Biomedicine among Hispanic Families in Central Washington**

*Andrews, Tracy; with Gray, Ian; Sainsbury, Ben; Aronica, Tony; Naragon, Jan*

*Department: Anthropology*

*Session: 22 (Posters in Ballroom A & B)*

This cooperative project with regional health and social service programs targets childhood health issues among Hispanic farm workers in, and recent immigrants to, central Washington State. We present the research questions, relevant aspects of the regional political ecology, and initial results. Family patterns of using folk healing and/or western medicine to treat young children, with a focus on diarrheal illnesses, are being assessed. We also are documenting biomedical clinician perspectives to identify complementary aspects of each healing approach, and practices and available remedies to assist vulnerable children. Global, and political economic factors in this region dominated by agribusiness, must be incorporated with individual experience and action, to understand ethnomedical beliefs and health care choices.

## **The Struggle for New Teachers**

*Angelier, Mario*

*Faculty Mentor(s): Dr. Rex Wirth, Political Science*

*Session: 18 (Oral Session 3:00-4:40 in 140)*

Many believe that life for a teacher fresh out of college is a cinch, consisting of receiving a classroom, teaching lovable children, and having summers off. However, before entering their own classroom many will have already entered a social issue far beyond their control. Standardized testing has increased the need for T-1 schools to hire well-qualified new teachers to educate their students, but has also created hidden risks that result in these instructors having to gamble with their own careers. Incentives to bring top new teachers into struggling school districts are taken away by both the high turnover rate, and the high cost of living in these areas. This presentation will explore the dilemma new teachers face when they decide where to find their first job, focusing primarily in the South-Seattle region. It will show how the pressure for higher test scores may result in lower job security, and how the rental rates in these areas make it extremely difficult for these teachers to live where they work. The professional and financial risks that go along with teaching in a T-1 school can ultimately scare new teachers away, resulting in the students not receiving the best chance to succeed, however with minor policy adjustments, and specific city developments these problems facing struggling school districts can begin to be resolved.

## **Sulfate-Reducing Bacteria of Soap Lake**

***Aragon, Anna***

*Faculty Mentor(s): Dr. Holly Pinkart, Dr. Steven Wagner, Biological Sciences*

*Session: 21 (Posters in Ballroom A & B)*

Soap Lake contains a unique, highly challenging environment for microorganisms. Two distinct alkaline layers have formed since its creation 10,000 years ago from glacial floodwaters: a lower, colder, and highly saline monimolimnion, and a warmer, upper mixolimnion. Extreme salinity of the bottom layer has impeded the two levels from mixing in over 2,000 years. In addition to high salinity, levels of sulfide which are generally toxic to most organisms (300mM) have deterred the habitation of many animal and plant species. However, a diverse range of algal and bacterial species have recently been discovered, of which, there is little current ecological or taxonomic data. Therefore, we are isolating colonies of anaerobic, sulfate-reducing bacteria from both the monimolimnion and mixolimnion levels. Characteristics of these microorganisms, such as optimal saline and pH growth conditions are being investigated. We have determined a majority of the colonies are mineral precipitating Gram-positive cocci. In addition, mixolimnion cultures grown at low saline concentrations (10g/L) have exhibited halotolerance for the higher monimolimnion saline conditions (125g/L NaCl). Others' work with sulfate-reducing bacteria has determined that most of these species are within the delta class of the phylum Proteobacteria. Currently, we are using 16S ribosomal gene sequences from morphologically homogenous samples to compare the relationships of our species using phylogenetic methods.

## **Game Programming Optimization**

***Arntson, Luke***

*Faculty Mentor(s): Dr. James Schwing, Computer Science*

*Session: 1 (Oral Session 8:00-9:40 in 135)*

In the game programming industry, there are many key factors to making a successful product. Among these is one of the most important features of any game program: optimization. The purpose of this project is to investigate different game optimization techniques. Optimization in the game industry is necessary for all projects, big or small. Optimization is especially essential to console developers. Systems such as the Gameboy Advance have very slow processors in comparison to PCs; necessitating the use of many fewer commands per frame to run smoothly. By implementing thorough optimization techniques and taking advantage of every resource available, programmers are able to create fun, solid games running on slow processors. In this study, I have built several game engines and applied my own optimization to each. By

observing new ways to build each solution, I have created several optimized examples of commonly played games. For my presentation, I will present three games: a Tetris clone, a Bomberman clone, and a vertical shooting game. The first game, a Tetris clone, implements simple yet effective optimized code. Replacing large arrays for coordinates in block pieces, and compressing movement functions allowed a visual demonstration of the importance of optimization. For the second game, building a solution with real time world management became a challenge in its own. Doing this correctly while still keeping the code optimized became the key in building this type of game. The last game became a true challenge, as the backend along with the visual effects had to be optimized to keep the game running smoothly. By implementing a selective collision detection system, the game play felt just like a commercial product.

## **Synthesis and Characterization of $\text{SrY}_2\text{O}_4:\text{Eu}^{3+}$**

***Atkins, Ryan***

*Faculty Mentor(s): Dr. Anthony Diaz, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

Current research is on the synthesis and analysis of the  $\text{SrY}_2\text{O}_4$  compound doped with  $\text{Eu}^{3+}$ .  $\text{SrY}_2\text{O}_4:\text{Eu}$  is synthesized from  $\text{Y}_2\text{O}_3$ ,  $\text{Eu}_2\text{O}_3$ , and  $\text{Sr}(\text{NO}_3)_2$ ; the mixture was fired at 1200 °C for 12 hrs in air; structure identification was confirmed with X-ray diffraction. Once, identification was confirmed, UV spectroscopy was performed at room temperature. Excitation was run at 260nm, it was found that the emission peak was at 615nm. Emission data showed two emission centers from the  $\text{Eu}^{3+}$  site. Future work will be beginning of energy transfer studies on the  $\text{SrY}_2\text{O}_4:\text{Eu}$  compound.

## **The Real Time Measurement of Hydrogen Peroxide Produced by Mitochondria Under Conditions of Oxidative Stress: Does Complex II Contribute?**

***Barker, Grant***

*Faculty Mentor(s): Dr. Carin Thomas, Chemistry*

*Session: 10 (Oral Session 1:10-2:50 in 135)*

Reactive oxygen species (ROS) have been implicated in the causes of degenerative diseases of aging such as Parkinson's and Alzheimer's. Mitochondria are a source of ROS which include such chemical species as superoxide anion radical, hydrogen peroxide, and hydroxyl radical. In particular, Complexes I and III of the mitochondrial electron transport chain are known to produce ROS under conditions of

oxidative stress. Hydrogen peroxide is a commonly used indicator of ROS production in mitochondria. In this study, H<sub>2</sub>O<sub>2</sub> was measured using an electronic probe attached to the Apollo 4000, a computerized data manipulation device. The mitochondria used in this study were isolated from bovine heart tissue. Although Complex II is comprised of the same moieties (chemical components) as Complex I and these moieties have been implicated in ROS production, ROS production from mitochondrial Complex II has not been thoroughly investigated. Therefore, H<sub>2</sub>O<sub>2</sub> production from mitochondrial Complex II under conditions of induced oxidative stress was the focus of this study.

## **The Ecology of the Rubber Boa (*Charina bottae*) in Kittitas County, Washington**

***Bauer, Blake***

*Faculty Mentor(s): Dr. Daniel Beck, Biological Sciences*

*Session: 7 (Oral Session 9:50-11:30 in 137A)*

I studied the ecology of the Rubber Boa (*Charina bottae*) in Taneum Canyon, 36 km west of Ellensburg, WA. I collected dead and live snakes on the road by driving slowly through the canyon for over 80 hours on 15 days from April – mid- August 2005. Live snakes were sexed, weighed, measured, palpated for stomach content; reproductive status was determined in females. I recorded the time of capture, body, air and substrate temperatures. All snakes were released at site of capture. Dead snakes were brought into the lab, measured, weighed, and stomach content and reproductive status examined. I encountered 30 snakes, only three of which were dead on the road. Of 20 females encountered, 5 had recognizable ova, ranging from 2 to 5. Snakes were active at a mean air temp of 15.9° C, a mean cloacal temperature of 20.6° C between 21:00h and 02:30h at temperatures down to 12° C. Snakes were out regardless of moon phase and even during dry periods. At Taneum canyon, Rubber Boas appear to feed predominately on juvenile rodents. Many snakes had scars on their tails, which supports the idea that the blunt tail aids in protecting the snake from adult rodents defending their offspring.

## **Pilot Scale Production System for Making High Quality Biodiesel Fuel from Vegetable Oil**

***Beardsley, Roger***

*Faculty Mentor(s): Dr. Craig Johnson, Industrial & Engineering Technology*

*Session: 3 (Oral Session 8:00-9:40 in 137B)*

Biodiesel is a fuel made from vegetable oil for use in compression ignition internal combustion engines. This study outlines process chemistry for producing biodiesel and reviews the ASTM6751 quality specification requirements. The project reviews production process steps, analyzing how they may be affected by specification parameters. The project includes design and construction of a demonstration scale biodiesel processor unit built to produce 12-gallon batches of biodiesel to ASTM6751 specifications. The unit demonstrated the capability for producing fuel with a consumable material expense of \$1.13 per gallon of finished biodiesel. The quality of the finished fuel produced by the system was tested with a falling ball viscometer. The viscosity of fuel produced by the pilot system was within 2% of a commercial fuel sample viscosity.

### **When Mining Ends: A Comparative Case Study of the General Mining Law of 1872 and the Surface Mining and Control Reclamation Act of 1977**

***Beckley, Eric***

*Faculty Mentor(s): Dr. Gina Bloodworth, Resource Management/Geography and Land Studies*

*Session: 3 (Oral Session 8:00-9:40 in 137B)*

Numerous environmental problems surround the 1872 General Mining Law, which governs hard rock mining on public land in the United States. Contrasting this is the Surface Mining and Control Reclamation Act of 1977 (SMCRA) which contains environmental protections for the mining of coal. This thesis will address the water quality problems that remain when a mine is closed by examining mining under the 1872 Law and the SMCRA. Through a comparative case study, this paper will examine whether water problems could be reduced or eliminated if new legislation applied certain provisions of the SMCRA to hard rock mining. Previous research focuses on problems of hard rock mining but ends with suggestions for change without fully evaluating what we already have in place to deal with these problems. The expansion of the SMCRA to hard rock mining could produce an efficient and effective tool for the regulation of hard rock mining.

### **Detection and Prevalence of *Batrachochytrium Dendrobatidis* in Washington State.**

***Belmont, Susan***

*Faculty Mentor(s): Dr. Steven Wagner, Dr. James Johnson; Dr. David Darda, Biological Sciences; Eric Dean, Steve Germaine, Washington Department of Fish and Wildlife*

*Session: 7 (Oral Session 9:50-11:30 in 137A)*



Amphibian decline is a globally recognized issue and the role of the chytrid fungus *Batrachochytrium dendrobatidis* in species extirpation is becoming ever more prominent. *B. dendrobatidis* has recently been detected in Washington State. In March 2005, amphibian monitoring revealed a mass mortality event at Swamp Lake, located in the Central Cascades, in which 85 dead individuals were collected. Postmortem analysis through histology and PCR reveals evidence of *B. dendrobatidis* as the cause of death for collected specimens. Further, *B. dendrobatidis* has been detected through DNA extraction, PCR, and histology and appears to be the most likely cause of mortality of several *Rana pipiens* which are a critical endangered species in Washington. Recent implementation of a new, non-invasive swabbing technique, which can be used to detect *B. dendrobatidis* on living individuals, has greatly expanded the number of localities in which the fungus has been detected. Infected species include *Hyla regilla*, *Rana luteiventris*, *Rana cascadae*, *Rana pipiens*, *Ambystoma gracile* and *Ambystoma macrodactylum*. Currently, we are continuing to monitor Swamp Lake and analyze swabs from various localities throughout the state. This deadly fungus appears to be widespread and is a growing threat to regional amphibian diversity.

### **Production of Dehydrin Proteins as a Mechanism for Enhanced Environmental Stress Tolerance in Plants Grown Under Ambient Ultraviolet-B Radiation**

*Berkley, Amy; Poulson, Mary*

*Faculty Mentor(s): Dr. Mary Poulson, Biological Sciences*

*Session: 21 (Posters in Ballroom A & B)*

Ultraviolet-B (UV-B) radiation at ambient doses can increase mechanisms by which some species of plants can protect themselves from environmental stresses such as high light and low water availability. When plants are exposed to dehydrative factors such as drought, freezing, and salinity, they produce dehydrin proteins that seem to protect them from drought stress. WE are working to determine if growth of plants under an ambient dose of UV-B radiation leads to the production of dehydrin proteins and whether these proteins correlate with increased drought tolerance in *Arabidopsis thaliana* using electrophoresis and immunoblotting of proteins. Results will help us to understand the relationship between dehydrins and water loss through stomatal conductance in the protection against drought stress for plants grown under UV-B radiation.

### **The Role of Fire Disturbance in Forest Plant Community Seed Rain**

*Betz, Jonathan; Cottrell, Tom*

We studied Douglas fir forests one year and nine years post-fire, and stands with no burn evidence. We categorized burned forests by fire intensity (high = canopy removal, low = surface fire only). On three-week intervals we collected, counted and identified seeds from traps in each stand. Seed phenology, richness, and total numbers were related to fire intensity, burn age, and collection date. Proportions of species life-histories (native and non-native species that are annuals, biennials, or perennials) were related to burn intensity and age. Seed species and dispersal dates varied by burn age. Fire intensity plays a role in numbers of dispersed seeds. High- and low-intensity fires were evident in the seed rain nine years post-fire. Nine years post-fire, high-intensity burns had greater seed richness and greater average number of seeds than low-intensity burns. High-intensity burns show an increase in seed richness in late summer, a pattern not matched by low-intensity burn sites. One year post-fire seed dispersal richness also peaks in late summer regardless of burn intensity, however, contrary to nine year sites, one year post-fire sites have their highest total seed dispersal in early summer. Over time, proportions of species life-histories in burned sites converge toward proportions found in non-burn sites. Our data also suggest that some species adjust seed output in response to fire disturbance, initially increasing and then reducing dispersal numbers.

## **Analyzing Force Field and Charge Conditions to Enhance Biological Activity Predictions of Cathepsin D Inhibitors**

*Biles, Heather; Fabry-Asztalos, Levente; Collar, Catharine; Ellis, Michael*

*Faculty Mentor(s): Dr. Levente Fabry-Asztalos, Chemistry*

*Session: 10 (Oral Session 1:10-2:50 in 135)*

Cathepsin D has become an important target for drug design due to its association with the development of many biological processes, including cancer. Sybyl software was used to minimize inhibitors in ten different force field and charge combinations in order to determine the most favored conditions.  $K_i$  values for known inhibitors were predicted using a fuzzy-neural network and, in order to validate the efficiency of our model, they were compared to their corresponding experimental values. Novel compounds were designed and their biological activities will be predicted using the optimized fuzzy-neural network.

## **Kinetics and Spectroscopy: Determination of Reaction Rate via Fluorimetry**

*Bjorge, Krista*

*Faculty Mentor(s): Dr. Timothy Sorey, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

The purpose of this research is to explore chemical kinetic systems that are viable for inquiry-based general chemistry laboratory curriculum. The research uses methodology to support student learning of fluorescence and kinetics. An experimental procedure that utilized computer-based laboratory interfaces will be used to explore fluorescent chemical systems that are appropriate for students. Although fluorescence is usually introduced to students in their junior year in physical chemistry, it has many real world applications that have the potential for piquing students' interests as early as general chemistry. Some of these applications include fluorescent lighting, medicinal research, biochemistry, and forensics. Both fluorescence and kinetics are difficult concepts to teach and learn; therefore finding appropriate chemical systems for students to quantitatively explore is a worthwhile endeavor. By determining reactant and product orders, students' will not only evolve their personal knowledge of kinetics and fluorescence, but how it applies to the world around them.

## **Gender Difference in the Perception of Rape**

***Brett, Brandi; Williams, Wendy***

*Faculty Mentor(s): Dr. Wendy Williams, Psychology*

*Session: 22 (Posters in Ballroom A & B)*

For the past two decades, rape research has focused on individuals' perceptions of rape and how those perceptions help to define rape. One of those defining factors is prior familiarity between the victim and the perpetrator. The following study attempted to replicate findings that show this familiarity effect, to reassess the differences between male and female perceptions of rape, and to determine whether a randomized procedure would mitigate these effects. One hundred and sixty college students were surveyed. Results indicate that individuals continue to consider prior intimacy when analyzing potential rape situations. However, there was no evidence of a significant difference between genders nor across scenario orders.

## **Fluvial Response to Intra-Canyon Lava Flows, Southeast Oregon**

***Brossy, Cooper; Ely, Lisa***

*Faculty Mentor(s): Dr. Lisa Ely, Geological Sciences*

*Session: 20 (Posters in Ballroom A & B)*

North of Rome, Oregon, at least four lava flows entered the Owyhee River Canyon over the past 4 million years. I hypothesized that: 1) lava flows created significant obstacles for the river and reduced rates of river incision during dams' existence; and 2) failure of lava dams was a gradual process and no catastrophic outburst floods resulted. The Bogus Point and Bogus Rim lava flows are older. Details of their effects on the river are obscured by younger geologic units. However, field investigation showed that each lava flow entered a lake or river many tens of meters deep. The effects of the two youngest lava flows, the Saddle Butte (340 ka) and West Crater (37 ka), are more apparent. These two lava flows entered a paleo-Owyhee Canyon several kilometers wide via three different tributary drainages. The flows dammed the Owyhee River, created lakes, and pushed the river to the opposite side of the valley. Lava filled a paleo-Owyhee Canyon to depths of at least 25 m for distances of up to 49 km. Several minor paleo-channels were incised into the lava flows until the river began to incise into the less-resistant adjacent and underlying geologic units. Preliminary maximum estimates of incision through the lava flows range from 0.18 mm/yr to 2.3 mm/yr. No deposits from catastrophic outburst floods have been found; the river likely eroded around, and gradually incised through, the lava dams. Today, the river flows through a narrow inner gorge often less than 500 m wide.

## **Do the “Best” Golfers Break the Bank?**

***Brown, David; Larson, Carlee***

*Faculty Mentor(s): Dr. Yvonne Chueh, Mathematics*

*Session: 21 (Posters in Ballroom A & B)*

We use an Analysis of Variance (ANOVA) technique to determine any relationships connecting various golf attributes (i.e. income, scoring average, all-around ranking, driving distance and accuracy) during May 2005 to April 2006. We also develop confidence intervals on the likelihood of achieving par for each hole in the 2006 PGA Master’s Tournament. We also investigate the relationship between consistent performance and income to verify whether or not the most skilled golfer breaks the bank.

## **The Effect of Crystal Violet on Cellular Respiration**

***Bryner, Stephanie***

*Faculty Mentor(s): Dr. Carin Thomas, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

Millions of people are diagnosed with cancer each year and with every passing year cancers are becoming more aggressive. This aggressiveness has to be countered by more successful treatments and early diagnosis of cancer. One chemical that is still within experimental stages for the photodynamic therapy of cancer is crystal violet. Crystal violet is a triarylmethane dye that has been shown to migrate into respiring rat liver mitochondria. In this study, the effect of non-photostimulated crystal violet on bovine heart mitochondrial respiration was investigated. The results show that, in some cases, micromolar concentrations of crystal violet slightly inhibited mitochondrial respiration. In other cases, no inhibition was observed. These results differ from other published work and support the use of crystal violet in photodynamic cancer therapy.

## **The Roslyn Experience Audio Guide**

***Bui, Bryce***

*Faculty Mentor(s): Dr. Dorothy Chase, Family and Consumer Sciences*

*Session: 17 (Oral Session 3:00-4:40 in 137B)*

Roslyn, Washington, is a small city looking both to optimize its downtown development and to preserve its cultural heritage in the wake of a major emerging resort community. Both of these objectives are served by the initiation of The Roslyn Experience Audio Guide. By playing the audio guide, visitors learn about the city's history from its coal mining days to more recent events such as the filming of the TV series *Northern Exposure*, walk a self-guided city tour, listen to short tales, and hear anecdotes from longtime residents. The author discusses the process and complexities in developing this audio guide into a professional product in CD format. Throughout the project, four main principles of community tourism development were incorporated: authenticity, sense of place, local pride, and identity. Local historians, the Roslyn Historic Preservation Commission, and oral recollections from longtime residents were crucial to the completion of this project.

## **Preparation of Template Imprinted Silica Gel**

***Bulfinch, Vaughan***

*Faculty Mentor(s): Dr. JoAnn DeLuca, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

The goal of these experiments is to develop a new method for the preparation of template imprinted silica gel. In this scheme, template molecules will be attached to silica gel, followed by binding molecules. The template will then be removed in the hopes that a binding site will be created. The first two steps of this sequence have been tested using two organic molecules: 1-[3-(trimethoxysilyl)-propyl]urea as a model for the binding molecules and phenylphosphonic acid as a model for the template. The attachment of trialkoxysilanes to silica gel surfaces is well known. The reaction of silica gel with phosphonic acids has received less study. In two separate reactions it was shown that each organic molecule could be attached to the surface of the silica gel. It was then shown that the binding molecule could be attached without dislodging the template molecule.

## **Aggregation and Toxicity of Buckminsterfullerene in Water**

***Bullock, Eric; Lamberte, Travis; Wagner, Steven***

*Department: Chemistry*

*Session: 15 (Oral Session 3:00-4:40 in 135)*

Buckminsterfullerene is a form of carbon that was discovered only 20 years ago. This new material, with formula C<sub>60</sub>, quickly became the focus of intensive research and today shows promise in a host of technologies from solar cells to high-tech lubricants

to molecular electronics. New materials, and especially very small nanoparticles such as C60, are being produced for all sorts of high technology applications. However there is growing concern about the possible adverse health effects of these new materials. C60 itself is not soluble in water. In recent years, however, it has been discovered that under certain conditions, C60 can aggregate into larger particles which form a stable, dispersed suspension in fresh water. The stability of these preparations is clear but the underlying cause of this stability and the mechanism of formation of these aggregates is unknown. Although C60 is currently subject to the same EPA toxicity protocols as carbon black, these aggregates have recently been found to be quite toxic to fish and certain bacteria. In this study, we examine some chemical and physical properties of these stable water suspensions in an attempt to better understand why they are stable. In addition, three different species of Northwest tadpoles were exposed to varying concentrations of the C60 suspensions. It was found that these suspensions are very toxic to all three species with a mean time to death occurring between 1-3 days for concentrations of just 3 ppm.

## **Music Therapy for College Depression**

***Bush, Elizabeth***

*Faculty Mentor(s): Dr. Robert Sorrells, Psychology*

*Session: 19 (Oral Session 3:00-4:40 in 202)*

Music therapy has been explored extensively in recent years, but minimally among college campuses. Music therapy can alleviate pain, improve communication skills, enhance memory and promote wellness by lowering stress levels. College students are predominately recognized as an over-loaded stressed and fatigued group of individuals. The American Psychological Association reported that, "one out of four young adults will experience a depressive episode by age 24." Music therapy intervention among college students could be effective in alleviating or managing stress. For this research experiment, college students will be introduced to various styles of music, and within different environmental settings. The independent variable (IV) will be the music and various styles of genre: salsa, rock, jazz, country, and bluegrass. The dependent variable will be Becks Depression Inventory (BDI). The therapy begins with each student subject receiving each of the musical genres. The students will be asked to listen to each type of music and record their emotions on the BLDI scale. The students will be expected to keep a log each time they listen to either of these styles of music and or another style of music based upon their personal choice for the duration of a two-week period. Students will be asked to fill out a provided log, and the BLDI, recording how depressed they feel after listening to a selection of music.

## **Tephrochronology and Geomorphology at an Archeological Site in the Mexican Volcanic Belt**

***Buswell, Tessa; Trospen, Tabitha; Ely, Lisa; Gabany-Guerrero, Tricia; Cid-Aguero, Pedro; Hackenberger, Steve***

*Faculty Mentor(s): Dr. Lisa Ely, Geological Sciences*

*Session: 20 (Posters in Ballroom A & B)*

The primary purpose of this project was to gather geomorphological data and analyze geochemical data of multiple tephra layers used for stratigraphic correlations within a Mesoamerican archeological site in Michoacán, Mexico. The study site is located within the Michoacán-Guanajuato volcanic field, which is filled with numerous monogenetic cinder cone volcanoes. The archaeological site contains cliff paintings on the walls of a volcanic caldera in the vicinity of the Parícutín volcano that erupted in 1943-52. The stratigraphy of fluvial and lacustrine sediments exposed in trenches in the caldera floor indicates variations in the geomorphic environment of the caldera over the last few thousand years, which could have implications for the type of human use of the site. Stratigraphic zones of coarse, sand-sized, storm-deposited tephra alternate with zones of laminated silt that settled out in quiet pools. Tephra layers were used along with radiocarbon dates to correlate and date stratigraphic sections within the site. Geochemical data of tephra layers associated with at least three separate volcanic eruptions were obtained in the field using a portable X-Ray Fluorescence (XRF) instrument. These data were evaluated to determine whether this method is effective for correlating stratigraphic sections within the caldera and nearby sites. Geochemical signatures of the tephra were not distinct enough to indicate the XRF instrument effective for field correlation.

## **The Influence of Sediment Size and Lithology on Plant Density and Diversity, Sonoran Desert, Baja California, Mexico**

***Carpenter, Korin; Jones, Zach; Hayes, Callie***

*Faculty Mentor(s): Dr. Lisa Ely, Geological Sciences; Dr. Daniel Beck, Biological Sciences*

*Session: 20 (Posters in Ballroom A & B)*

Geology dictates whether or not certain forms of life can exist in a specified location. More specifically, weathering of different bedrock results in diverse sediment grain size distributions, which can influence the availability of moisture, and chemical composition of bedrock can also change the presence of different elements in the soil. These are a few of the factors controlling the quality of plant growing conditions. In this study twelve sediment samples were taken from six different locations in three separate bedrock types, tonalite, basalt, and metamorphic. In each plot of ten square meters plant density and diversity were recorded and a sediment sample was



collected. Overall plant density and diversity was lowest in the metamorphic region, which had a bimodal distribution sediment size, there was very little intermediate sediment, it was either very fine, or very coarse. In the alluvial fan, which contained sediment from all three rock types, plant life was much more diverse, however still sparse. The tonalitic sediment contained both the highest diversity and density of plant life. Certain species seemed to prefer the tonalitic sediment to all others, even on the same slope in adjacent plots. We surmise that sediment derived from rocks with heavier minerals and high variation in grain size produce lower plant species diversity and overall density.

## **Everything Theory**

***Carson, Eric***

*Faculty Mentor(s): Brian Goeltzenleuchter, Art*

*Session: 22 (Posters in Ballroom A & B)*

"Everything Theory" was a Farrell Scholarship art exhibition which ran from March 3-17, 2006 in a specially prepared space on the corner of 4th and Pine in downtown Ellensburg. This exhibition was the culmination of my career at Central Washington University. The heart of this theory, and my main objective as an artist, can be described as follows: "Everything Theory" examines the paradoxical system of representation which we use to experience our lives. The exhibition took the form of environmental matrix in which people, images, and objects were connected in seemingly random ways. To the viewer it appeared I was simply connecting things that might not otherwise have a meaningful connection in the world. The goal of this seemingly random connection was to suggest an interconnectedness of everything. My research in art and related fields has led me to believe each phenomenon is already, completely and spontaneously, part of a unified whole. Acknowledging this already existing unity, I only point at its manifestations for the viewer. The pointers vary from representational painting to mathematical diagrams, to three dimensional installations and performance art. At SOURCE I would like to develop a poster which presents documents from the exhibition, "Everything Theory," and suggests the potential of art to examine phenomenology.

## **Lichen Habitat Preference and Diversity on Boulders in the Sonoran Desert of Baja California, Mexico**

*Cartmell, Kathleen; Trosper, Tabitha; Duke, Paul*

*Faculty Mentor(s): Dr. Dan Beck, Biological Sciences; Dr. Lisa Ely, Geology; Dr. Steven Wagner, Biological Sciences*

*Session: 21 (Posters in Ballroom A & B)*

Lichens are a symbiotic relationship among cyanobacteria, fungi, and often green algae. We conducted a survey of lichen diversity in a boulder field at Catavina in the Vizcaino subdivision of the Sonoran Desert, Baja California, Mexico. We haphazardly surveyed 100 boulders that varied in shape and size. We divided each boulder into fifths based upon cardinal directions (North, East, South, West) and top. We then recorded the type (color) of lichen present with respect to those five boulder sections. We used a chi square analysis to test the hypothesis that lichens grow on particular regions of boulders. The most prevalent types of crustose lichen included: black, sage, paprika, mustard, lime and rust. Lichen growth patterns and colors varied greatly on boulder microhabitats. Lichens grew on all sides of the boulders, but seemed to avoid the tops. We found a relationship between color of lichens and directional location on the boulders suggesting that microhabitat features and interspecific competition drive lichen diversity.

## **Art and the Holocaust: An Artist's Story**

*Castro, Julie*

*Faculty Mentor(s): Dr. Heidi Szpek, Philosophy*

*Session: 22 (Posters in Ballroom A & B)*

Every artist has a story to tell, and each has their own style in which to express themselves, be it through realism, abstract art, or expressionism. A message is conveyed no matter what approach is taken. Art never ceases to be created no matter what the circumstances. This presentation will cover images that artists were witness to during the Holocaust, and artwork created in response to the Holocaust, both during or afterwards. Holocaust artists consist of survivors, empathizers, and second generation 'survivors', all of whom create a re-telling of the Holocaust story with the hope of educating others. Many have risked their lives in order to create an eyewitness account of the horrors that were going on all around them. The world would not believe what they could not see, so artists created a picture for them. The Holocaust, moreover, is an event that changed people's lives and in turned changed their artwork. Through their artwork, the world, in a distinct way, learned of the gruesome details of what transpired. Furthermore, I propose that by learning about these artists and the art that they created, people can be educated about the Holocaust

in a distinct way. Words can speak loudly, but a picture instantaneously conveys a startling visual manifold message. Pictures of pain, sadness, and cruelty bring hope that the past will not be forgotten and not repeated. The past can educate the viewer in order to live in the present more humanely.

## **Project CROAK! Community-Based Research**

*Charbonneau, Jeff; Englund, Tim; Wagner, Steven*

*Faculty Mentor(s): Dr. Steven Wagner, Biological Sciences; Dr. Jim DePeape, Education*

*Session: 2 (Oral Session 8:00-9:40 in 137A)*

Project CROAK! is an integrated High School science curriculum centered around a community-based research project that is focused on local field-based studies of amphibians. Students engage in population monitoring and ecological research on amphibians in agricultural system. During the past three years, students have investigated color change and gathered baseline data on population abundance. As a consequence of this interdisciplinary curriculum, student enrollments in science courses have significantly increased and the project has elicited widespread community support.

## **Myths Across Cultures: Oedipus and the Great Flood**

*Charlebois, Mikelle*

*Faculty Mentor(s): Dr. Lene Pedersen, Anthropology*

*Session: 13 (Oral Session 1:10-2:50 in 140)*

Both oedipal myths and flood stories are found in cultures throughout the world; however, occurrence patterns of key narrative elements suggest contrasting derivations for the two categories of myths. This project examines the global proliferation of two genres of myths - the oedipal and flood stories. Through a comparative, cross-cultural examination, I attempt to analyze why so many divergent cultures share seemingly parallel mythological stories. I will argue that while the flood myths show signs of direct or indirect transmission from culture to culture, the oedipal myths appear to have developed largely independently of one another.

## **Benefat is a Successful Partial Fat Substitute in Chocolate Cake**

*Cleveland, Megan; Erickson, Rosanna; Brown, Shawn*

*Faculty Mentor(s): Dr. David Gee, Health, Human Performance, and Nutrition*

*Session: 21 (Posters in Ballroom A & B)*

This study involved testing of three different chocolate cakes to determine the effects of the fat substitute Benefat on their physical structure and sensory qualities. Benefat is a triglyceride composed of one poorly absorbed long chain fatty acid and two short chain fatty acids. It provides 55% of the calories of a typical triglyceride molecule, and is a promising lower calorie alternative to conventional fats. The cakes in this study included a control, 50% Benefat substitution, and 100% Benefat substitution. Special objective testing equipment included a Universal Texture Analyzer (TA.XT2) and Warner-Bratzler Shear. Statistical tests included Analysis of Variance and Fisher's PLSD ( $p < 0.05$ ). Thirty untrained Central Washington University student judges evaluated the cakes for moistness, tenderness, density, preference, and general differences. Triangle tests revealed that the judges could tell the difference between the control and 100%, and the 50/50 and 100%, but not between the control and 50/50. Objective and sensory testing indicated that the control and 50/50 were not significantly different in moistness, preference, compressibility, cohesiveness, shear force, middle height, slope, or percent moisture loss. However, the 100% version was significantly less tender, moist, and preferred, and was more dense, compressible, and cohesive than the other versions. Replacement of 50% of the fat in cakes with Benefat produces highly acceptable results.

## **The Effects of Migration Distance on the Energetics, Morphology and Reproduction of Coho Salmon (*Oncorhynchus kisutch*) in the Wenatchee River**

*Collins, Matthew*

*Faculty Mentor(s): Dr. Anthony Gabriel, Resource Management/Geography and Land Studies; Dr. Paul James, Biological Sciences; Dr. Laurie Weitkamp, NOAA Fisheries*

*Session: 8 (Oral Session 9:50-11:30 in 137B)*

Since 1999, the Yakama Nation Fisheries (YNF) has been reintroducing coho salmon (*Oncorhynchus kisutch*) into mid-Columbia River tributaries where indigenous coho adapted to long migration no longer exist. A substantially extended freshwater migration of more than 500 km serves as the major selective force currently driving the rate and scale of local adaptation in developing populations. The present study examined the degree to which coho from a single tributary, the Wenatchee River, have phenotypically diverged from the parent stock of coho returning to the lower-Columbia River at Bonneville Hatchery. Primary objectives of this research were to;

1) measure lipid content, body morphology, and reproductive traits in both study populations; 2) analyze data based on several predicted responses to extended migration; and 3) characterize phenotypic changes while identifying key trait differences. Preliminary analysis suggests that coho bound for the Wenatchee River began their spawning migrations with similar levels of somatic energy, however, long migration appears to have selected proportionally smaller, hydrodynamic body types. Concurrently, energy allocated to reproduction was consistent among long and short migrating populations with the exception of a single trait. Ovary development was significantly greater in the Wenatchee River population and may suggest a potential shift in energetic strategy. Results from this study will contribute to a baseline of data used by YNF and the National Oceanic and Atmospheric Administration to monitor the progress of coho broodstock development in the mid-Columbia River and may have larger implications for restoration of other salmon populations.

## **Okonkwo's Gender Trouble**

**Collucci, Paula**

*Faculty Mentor(s): Dr. Paulus Pimomo, English*

*Session: 9 (Oral Session 9:50-11:30 in 140)*

At the heart of Chinua Achebe's *Things Fall Apart* is the story of a man, Okonkwo, seeking his manhood and maintaining its image, but the story ends with something entirely different. Okonkwo becomes the man he thinks he should be, but he finds that he does not fit in the society that his home, Umuofia, has become. This paper examines the importance of gender roles, power, and creating a life that manages these problems as in *Things Fall Apart*. Using a variety of critics, including Judith Butler and her theoretical book *Gender Trouble*, this paper investigates the possibility that Okonkwo, who *fiercely* defends clear gender divisions, may suspect that gender is artificial. This suspicion leads to a lifetime of violent repression that affects Okonkwo's entire family and results in death, exile, and failure. Okonkwo must maintain an image of extreme masculinity so no one will ever associate Okonkwo with his father, who has failed manhood. Despite recent criticism, this paper argues that Okonkwo is a tragic figure. Achebe may not have created a traditional Western tragedy, but he presents us with a story of man that will risk everything to remain committed to protecting Igbo traditions.

## **Community Places: Mapping Landscape Meaning in the Community of Ellensburg, WA**

*Cordner, David*

*Faculty Mentor(s): Dr. Anthony Gabriel, Dr. Robert Kuhlken Resource Management/Geography and Land Studies; Dr. Steven Hackenberge, Resource Management/Anthropology*

*Session: 17 (Oral Session 3:00-4:40 in 137B)*

The landscape is more than vegetation, soil, water, ecological processes, and cultural artifacts. It contains meaning for individuals and communities. Humans assign meaning to places and shape that meaning through transactions with the landscape. These meanings contribute to the quality of life, community identity, conflict over land use, and decisions that affect the ecological integrity of a region. Many rural communities perceived as having high amenity values are experiencing substantial in-migration. This can result in changes in land use that stress social, biological, and physical systems. A better understanding of local knowledge and perception of the landscape can help inform land use decisions that impact these systems. The goal of this research was to map the locations of places in the landscape that are important to the community of Ellensburg, WA. Preliminary results will be presented that document the different meanings associated with places, evaluate the strength of attachments to them, and compare differences in meaning and attachment between groups in the community. A result of this effort will be a geospatial database mapping landscape meanings in the study area.

## **When is a Yellowjacket Supercool?**

*Corrigan, Shawn; Irwin, Jason*

*Faculty Mentor(s): Dr. Jason Irwin, Biological Sciences*

*Session: 7 (Oral Session 9:50-11:30 in 137A)*

Insects use one of two survival strategies to survive cold winters: 'freeze-tolerance' or 'freeze-avoidance'. Freeze-tolerant species can survive sustained sub-zero temperatures by secreting ice-nucleating proteins into their hemolymph. These proteins stimulate ice crystallization so that freezing occurs as close to zero as possible. Freeze-avoiding species, instead, purge themselves of ice-nucleators and secrete 'antifreeze proteins' and various polyols which lower the 'supercooling point' (SCP), the temperature at which their hemolymph freezes. For insects that supercool, freezing is lethal. We studied two species of wasps, *Vespula germanica*, the German Yellowjacket, and *Polistes dominulus*, the European Paper Wasp, both significant pests, which have displaced native species. Since the physiology of cold tolerance has not been studied in these two species, we recorded and compared the limits of their abilities to survive sub-freezing temperatures. A significant statistical difference in

supercooling points was found between the two species of wasp, with  $p < 0.0046$  for a two tailed t-test. We report a mean SC of  $-18.9^{\circ}\text{C}$  for 22 *Polistes dominulus* queens tested and a mean SC of  $-23.1^{\circ}\text{C}$  for *Vespula germanica*. We also report multiple records of double exotherms: two observed freezing points in supercooling specimens. We conclude that both species employ supercooling of their hemolymph to survive the winter, rather than freeze-tolerance.

### **The effect of pulse duration on laser-induced damage by 1053-nm light in potassium dihydrogen phosphate crystals**

***Cross, David***

*Faculty Mentor(s): Dr. Michael Braunstein, Physics; Dr. C. W. Carr, Lawrence Livermore National Laboratory*

*Session: 6 (Oral Session 9:50-11:30 in 135)*

Laser induced damage in potassium dihydrogen phosphate (KDP) has previously been shown to depend significantly on pulse duration for 351-nm Gaussian pulses. In this work we studied the properties of damage initiated by 1053-nm temporally Gaussian pulses with 10ns and 3.5ns FWHM durations. Our results indicate that the number of damage sites induced by 1053-nm light scales with pulse duration ( $t$ ) as  $(t_1/t_2)^{0.16}$  in contrast to the previously reported results for 351-nm light  $(t_1/t_2)^{0.35}$ . It was also determined that the size of damage sites produced by 1053-nm light scale linearly with fluence similarly to damage sites induced by 351-nm light. Because scattered light can limit laser performance, these results are used to estimate the amount of light scattered from damage induced both by the measured laser parameters and in general for 1051-nm pulses of duration between 1ns and 10ns.

This work was performed under the auspices of the U.S. Department of Energy by University of California, Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

### **Interaction of Morphological Color Change and Demography in *Hyla regilla*.**

***Cusack, Alicia***

*Faculty Mentor(s): Dr. Steven Wagner, Biological Sciences*

*Session: 21 (Posters in Ballroom A & B)*

Balancing selection may drive the diversity and patterns of color in *Hyla regilla*. There appears to be three main morphological types of *H. regilla* which include: green, non-green and changers. Demography, season and sex/age class may interact to select for different color morphologies. Our field research, based on mark-recapture data suggested that most juveniles are green, while adults are non-green. In addition, most of the field data suggested individuals that change mainly turn from green to non-green while overwintering. However, these results contradicted previous research that suggests all changers can change back and forth among colors. Therefore, we examined recaptured individuals for their ability or inability to change among colors in controlled laboratory experiments on different backgrounds. Our results suggest that some changers can color switch, while others just switch unidirectional. Therefore, different demographic and seasonal selection pressures may select for a majority of non-green individuals.



## **Evaluation of Sensory and Objective Changes to a Fruit-Based Smoothie after the Addition of Two Different Quantities of Tri-Calcium Citrate**

*Damian, Letitia; Mc Corquodale, Kim; Richardson, Amanda*

*Faculty Mentor(s): Dr. David Gee, Health, Human Performance, and Nutrition*

*Session: 21 (Posters in Ballroom A & B)*

Calcium intake is not adequate for many people. Fortification of foods with calcium is a potential method to increase intake. The objective of this self-funded study was to evaluate differences in sensory tests, objective tests and overall acceptability after adding different amounts of calcium to a commercial fruit smoothie. Tri calcium citrate (TCC) was added until the beverages contained either 100mg or 290mg added calcium per eight ounce serving. The control sample contained no added calcium. Judges (n=22) participating in the triangle tests were only able to distinguish the control sample from the 290mg. No significant differences were found during descriptive tests evaluating the samples for sourness, sweetness, texture, and preference (n=30). The specific gravity of the beverages increased significantly with increased added TCC. Turbidity was significantly higher in the 290mg sample. A large portion of the TCC precipitated out of solution in the 290mg sample. This was not noticed by the judges because the samples were shaken before serving; however, this could affect acceptability if the 290mg sample were not shaken during consumption. The 100mg sample had no difference in preference from the control and contained no TCC precipitate. Based on our study results, a smoothie product supplemented with 100 mg of TCC would be accepted by consumers. Such a product would have health benefits and could be produced at little added costs.

## **Metabolic and Cardiovascular Responses to Running on Sloping Surfaces**

*Dickinson, Jared; Hovey, Greg; Matanane, Kenny; Schaefer, Tracy; Garver, Matt; Nielsen, Leland; D'Acquisto, Leo; Nethery, Vince; Bergman, Ethan*

*Faculty Mentor(s): Dr. Leo D'Acquisto, Dr. Vince Nethery, Dr. Ethan Bergman, Health, Human Performance, and Nutrition*

*Session: 21 (Posters in Ballroom A & B)*

**PURPOSE:** To investigate the metabolic and cardiovascular responses of running on sloping surfaces between two groups of distance runners who differ in running ability. **METHODS:** Trained, male distance runners were categorized into a fast (F, n=7) and slow (S, n=8) group based on cross-country performance times. Subjects performed a 20-min level run at 14.4 km/hr followed by a maximal test. On a separate occasion, subjects completed a 20-min sloping-surface run (5 min at 0, -5, 5, and 0%

grade) at 14.4 km·hr<sup>-1</sup> followed by a self-paced 3-km trial consisting of downhill, uphill and level running. Metabolic response and heart rate (HR) were monitored for all tests. Net VO<sub>2</sub> values (run VO<sub>2</sub>–standing VO<sub>2</sub>) are reported. **RESULTS:** VO<sub>2</sub>max was greater for F (60.1) than S (54.4 ml/kg/min) (P<0.05), whereas both groups had similar max HRs (~192 bpm). Both groups completed the level run at a steady VO<sub>2</sub> of ~ 40-42 ml/kg/min; however, F accomplished the level run at a lower %VO<sub>2</sub>max (68 vs.79) (P<0.05). HR was found to drift upward during the level run regardless of group, while F maintained an overall lower heart rate response (P<0.05). Both groups had a similar steady-rate VO<sub>2</sub> during the first 5 min. (0% grade) of the sloping run test (39-40 ml·kg<sup>-1</sup>·min<sup>-1</sup>). Relative to the first 5 min. of level running, the % change in VO<sub>2</sub> for F and S was -24 and -20 for downhill, +40 and + 32 for uphill, and +8 for both groups during the final 5 min of level running; no difference observed between groups. In addition, during the sloping run test, F ran at a lower %VO<sub>2</sub>max compared to S (P<0.05). Three-km performance time for F was 629 compared to 749s for S (P<0.05). F ran at a greater %VO<sub>2</sub>max compared to S (86 vs 81%). **CONCLUSIONS:** The high metabolic cost to run uphill suggests that runners need to pace accordingly during uphill portions to avoid premature fatigue. In contrast, runners should maximize running pace during the downhill portion of a race in order to minimize the overall detrimental effects of a hill on velocity. Running economy was not a discriminating factor during the 3-km performance run. Instead, the difference in 3-km finishing times was due to F's ability to maintain a greater %VO<sub>2</sub>max.

## **Using Benthic Macroinvertebrates to Evaluate Stream Habitat for Steelhead Trout (*Oncorhynchus Mykiss*) Reintroduction**

*Didricksen, Daniel*

*Faculty Mentor(s): Dr. Anthony Gabriel, Resource Management/Geography and Land Studies; Dr. Paul James; Biological Sciences Dr. Karl Lillquist; Geography and Land Studies*

*Session: 8 (Oral Session 9:50-11:30 in 137B)*

Manastash Creek, Kittitas County, Washington historically supported a healthy steelhead trout population. Habitat degradation due to irrigation practices extirpated steelhead and has resulted in portions of the creek being dewatered for months at a time, conflicting with anadromous fish migrations. Based on the federal listing of Middle Columbia River steelhead as a threatened evolutionarily significant unit in 1999, legal action was proposed against Manastash Creek managers and irrigators in 2000 unless the creek habitat was rehabilitated as a step towards steelhead reintroduction. This study assesses aquatic habitat quality upstream from the irrigated section of Manastash Creek for steelhead spawning and rearing. Habitat was evaluated using an index that focused on the ecologically sensitive aquatic insect orders Ephemeroptera, Plecoptera, and Trichoptera in combination with the family biotic index to indicate benthic macroinvertebrate community health. In addition,

relevant physical habitat characteristics were analyzed such as physical water quality parameters, pebble counts, and large woody debris surveys.

## **Using Best Practices to Create an Early Intervention Program for Young Children with Autism Spectrum Disorder**

*Downs, Robyn Conley*

*Faculty Mentor(s): Dr. Debra Prigge, Education*

*Session: 19 (Oral Session 3:00-4:40 in 202)*

Several comprehensive comparison studies were reviewed to identify and document recommended practices for programs serving young children with autism spectrum disorder. Additionally, 27 surveys inquiring about program practices were sent to educational service districts, school districts, and neurodevelopmental centers in Oregon and Washington that had a program specifically designed to serve young children with autism spectrum disorder. The recommended practices identified in the literature were reviewed in conjunction with the survey and recommendations were made to guide development of an early intervention program for children with autism in Yakima, Washington.

## **Who Read What?: Depictions of Reading in Nineteenth-Century British Novels**

*Durgan, Jessica*

*Faculty Mentor(s): Dr. George Drake, English*

*Session: 9 (Oral Session 9:50-11:30 in 140)*

This presentation will look at how nineteenth-century novels present reading within their text and what these presentations may suggest as proper reading material, technique, and settings to their audience. The nineteenth century was a time of stringent social ideas on correct and incorrect behavior—delineated along the lines of sex, class, and education—which designated even appropriate reading material. The genre of the novel was seen as lowly and potentially dangerous reading at the beginning of the nineteenth century, but by the end of Queen Victoria's reign had become widely popular and socially acceptable. At the turn of the twentieth century, fiction (or at least, certain forms of it) had created a place for itself within high literature through the development of the realistic novel. I will explore how the movement of realism overcame societal prejudice, proposing that the English novelists used three different depictions of reading: warnings against misreading, the promotion of didactic or functional reading, and characterization through reading.

Together, these depictions of reading helped novelists control the reader's reaction to their work as well as achieve the goal of promoting the genre of the novel.

## **A Whole Genome Similarity Comparison between *Nuphar* and *Nymphaea***

***Dziubek, Chris***

*Faculty Mentor(s): Dr. Linda Raubeson, Biological Sciences*

*Session: 11 (Oral Session 1:10-2:50 in 137A)*

The chloroplast genome of the water lily *Nuphar advena* has recently been completed by the research group of Dr. Raubeson. As part of this group I compared the annotated DNA data with another close relative, *Nymphaea alba*. Using BLAST2, a DNA sequence comparison tool, and MULAN, a coarser whole genome comparison tool, I constructed a novel comparison figure that displays the relatedness of genomic regions – each gene or non-coding region individually. This new figure graphically displays percent similarity of each region by grouping it into one of six levels: 99-100%, 95-98%, 90-95%, 80-89%, 70-69%, and less than 69%. The chloroplast genome is highly conserved throughout the angiosperms, and we expect to see only high levels of similarity between homologous regions of these two genomes. That expectation has been confirmed in this study. What makes this new method so interesting is that it compares both coding and non-coding regions with the same stringency. Only a handful of scientific papers have been published comparing non-coding regions of two related plant genomes, and mine is the first to compare the non-coding regions for the whole genome. Surprisingly, some non-coding regions are more conserved than some coding regions.

## **Education Denied: Drug Offenders Attempt to Reform**

***Elerson, Sarah; Eshghi, Breanna***

*Faculty Mentor(s): Teresa Francis, Law and Justice*

*Session: 19 (Oral Session 3:00-4:40 in 202)*

Re-entry into the community is one of the most difficult obstacles felons face upon release from prison. Incarceration is often a revolving door and in order to break the vicious cycle of recidivism, individuals released from prison need support and access to alternative means to achieve success. Education is one of the most promising ways for felons to reform their lives. Many ex drug felons attempting to get an education are often denied financial assistance from the government. Our research focuses on barriers that convicted drug felons face when trying to obtain an education. We explore the difficulties drug felons must overcome when reintegrating back into the community as well as the tremendous negative effects the anti-drug policies have on communities of color.

## **An Examination of Geovisualization Using Building and Power Infrastructure Development Projects**

*Fairbanks, Marc*

*Faculty Mentor(s): Dr. Robert Hickey, Resource Management/Geography and Land Studies*

*Session: 17 (Oral Session 3:00-4:40 in 137B)*

For millennia, visualizations have been a form of spatial communication and technology has evolved to a where three dimensional virtual reality models are common in movies and video games. This technology is being utilized by geographers, government agencies, and developers as geovisualizations and virtual environments. Specifically, geovisualizations were created for: 1) the Wild Horse Wind Farm project, Kittitas County, Washington; 2) the new Student Union and Recreation facility, Central Washington University, Ellensburg, Washington; and 3) the re-licensing of Snoqualmie Falls Hydro-electric Dam, Snoqualmie Falls, Washington. These geovisualizations aided in illustrating how the natural and built landscapes could be affected by planned development.

## **The Tryon Creek Site Revisited, Hells Canyon, OR: 3-D Visualization and Statistical Analysis**

*Fairbanks, Marc*

*Faculty Mentor(s): Dr. Steven Hackenberger, Resource Management/Anthropology*

*Session: 22 (Posters in Ballroom A & B)*

House 2 was excavated by the University of Idaho, the University of Wisconsin Centers and the US Forest Service during the summers of 1991 and 1992. Frank Leonhardy directed house excavations. Wayne Thompson used the results of the house excavation to complete his graduate research project at Idaho State University in 1994. Hackenberger compiled expert analyses and completed report documentation for the Forest Service in 1995. Analysis of the assemblage has continued as part of undergraduate and graduate research projects at CWU. For the past three years Fairbanks and Hackenberger have been building a model of the house occupations (1600-500 BP) and house excavations using ArcGIS 9.X 3-D. Recent teaching and research application include spatial statistical analysis (Kolmogorov-Smirnov goodness of fit test) for shell distribution vs. debitage distribution and reveal the structure of domestic activities and site formation processes. A Spearman Rank correlation was conducted to test relationships between faunal remains, fire cracked rock and lithics.

## **The Social Construction of Tolerance: From Narrow-Mindedness Towards Softheadedness**

*Fairfield, Randy*

*Faculty Mentor(s): Dr. Heidi Szpek, Philosophy*

*Session: 13 (Oral Session 1:10-2:50 in 140)*

The importance that Western society has placed on tolerance as a virtue has played an integral part in shaping history. Numerous wars and conflicts have occurred due to intolerance manifested between religions, races, and classes. Yet even more important than the value that Western society has placed on tolerance is the way in which the term has been socially constructed—for if tolerance is defined in a perverse way, then valuing it can have the effect of accomplishing the opposite of that which was intended. As with most all Aristotelian virtues, Aristotle defined the most favorable level of tolerance as the mean existing between two extremes: narrow-mindedness (under tolerance) and softheadedness (overtolerance). Looking back on the history of Western civilization one finds that it has started at the first Aristotelian extreme and linearly moved closer the other. This evolution has developed principally in correlation with major periods of change in Western philosophy—specifically the Reformation, the Age of Enlightenment, and the Age of Modernism. These intervals of history have engendered much discussion about the topic of tolerance, and as a matter of primacy such discussion has generally resulted from Western society's struggles with intolerance as manifested through violence. Despite centuries of discussion, the evolution of tolerance to its present understanding is extraordinarily insufficient to face the current challenges presented to modern society.

## **A Comparative Study of Dietary and Health-Related Risk Factors of Mexican Women in Morelia and Mexican-American Women in Yakima Valley**

*Fernyhough, Liane; Wiseley, Laura*

*Faculty Mentor(s): Dr. Virginia Bennett, Dr. David Gee, Dr. Ethan Bergman, Health, Human Performance, and Nutrition*

*Session: 21 (Posters in Ballroom A & B)*

**Purpose:** Determine dietary and other health-related risk factors contributing to the higher risk of chronic disease in Mexican-American women living in the US. **Methods:** During the summer of 2005 data were collected from 59 women between the ages of 18 and 50 years living in Morelia, Mexico. The information obtained included dietary intake, anthropometric data, blood pressure and fitness level. A 24-hour recall was the dietary assessment tool used. Anthropometric data included height, weight, and waist circumference. Fitness level was taken by a modified

Harvard Step Test. This information will be compared to similar data collected from Mexican-American women in the Yakima Valley in Washington during the summer of 2006.

**Results:** Initial analysis revealed the following information regarding the sample population in Morelia, Mexico. Most of the women were either overweight or obese (34% and 39%) and had a waist circumference that put them at risk for health problems (56%). In contrast, a surprisingly high percentage of the subjects had a healthy blood pressure (74%). Fitness level cannot be determined at this time as comparative data is needed for analysis. Dietary analysis suggested adequate intake of carbohydrate and protein and appropriate intake of fat.

**Summary:** Based on current estimates of the prevalence of overweight and obesity in Mexican-Americans, the sample population in Morelia indicates similar weight trends. Data collected during the summer of 2006 will be used to determine additional similarities and/or differences in health-related risk factors.

## **The Need for Instream Flow Protection in New Mexico: A Comparative Analysis of Yakima River Basin Farmers with San Juan River Basin Farmers**

*Fitzpatrick, Josh*

*Faculty Mentor(s): Dr. Gina Bloodworth, Resource Management/Geography and Land Studies*

*Session: 12 (Oral Session 1:10-2:50 in 137B)*

Instream flows are an important requirement of successful riverine health. Instream flows are defined as the minimum stream flow needed to protect and preserve instream resources and values, such as fish, wildlife, recreation, Native American treaty guarantees, and the aesthetic values of a free flowing river. The state of New Mexico has very few laws protecting and promoting instream flows, which have subsequently allowed many river flows to be diverted in an effort to irrigate local agriculture. This thesis will examine a stretch of Washington's Yakima River downstream of the Sunnyside dam as a case study analog of successful instream flow protection vis-à-vis agricultural irrigation needs to the San Juan River in northern New Mexico. I will: 1) use semi-structured interviews to determine what Yakima River basin farmers have done to mitigate irrigation needs for the lack of diverted water and then present these documented analyses of successful non-diverted river water practices used in the Yakima River basin to San Juan River basin farmers in New Mexico; 2) analyze the legal structure of laws protecting Washington instream flows as a surrogate for New Mexico instream flow protection and; 3) utilize GIS to conduct spatial analyses that map water/land use and water/land tenure at each area comparing the presence and absence of irrigation diversions over the past century. I expect that San Juan River basin farmers will be open to new suggestions on how to efficiently manage irrigation sources when presented with successful alternative methods used by Yakima River basin farmers. The significance of this study is



important as irrigation diversions are becoming increasingly scrutinized as society is faced with growing water needs. Upon completion of this study, I will submit my findings to water managers in the state of New Mexico.

### **Deep East-West Division of the Wood Frog, *Rana Sylvatica* Based on the Sequence Analysis of the Cytochrome *b* Mitochondrial Gene**

***Fry, Joseph; Cox, Stanley***

*Faculty Mentor(s): Dr. Jason Irwin, Dr. Steven Wagner, Biological Sciences*

*Session: 16 (Oral Session 3:00-4:40 in 137A)*

Historical morphological studies of the wood frog divided the species into several morphotypes. To examine the validity of the morphotypes, a phylogeographical analysis of the species was performed. Wood frogs were sampled across their very broad distribution from South Carolina to Ontario (Canada) and across to western Canada and Alaska, as well as relict populations in Arkansas and the Rocky Mountains. The mitochondrial cytochrome *b* gene sequences were used to construct phylogenetic trees to investigate population relationships. Results indicate a deep division between populations in eastern North America and those in the West. A relict population in Arkansas contained both of the haplotypes. There was little sequence variation within the two major clades, suggesting a rapid recolonization following glaciation.

### **Toward the Romantic Sublime: Imagination and Creative Power in Mary Shelley's *Frankenstein***

***Gay, Lindsey***

*Faculty Mentor(s): Dr. Sura Rath, Douglas Honors College*

*Session: 4 (Oral Session 8:00-9:40 in 140)*

Romantic poets and authors valued the imagination, above all else, as elemental in the creative process; they also believed that all true creative power came from within the individual. That is, inspiration was not found in empirical study or sensible (sensory) knowledge, but was a product of one's imagination applied to a desire to come to a deep understanding of the sublime. Though some scholars read Mary Shelley's *Frankenstein* as a Romantic work because of its themes of nature and isolation, this paper argues that the theme of creation within *Frankenstein*, as well as the way Shelley herself created the novel, parallels the general Romantic creative theory. *Frankenstein* also exemplifies the Romantic tradition because of the character of Dr. Frankenstein in relation to this theme. Victor Frankenstein is the antithesis of the

Romantic artist, doomed because he neither understands nor accepts the core Romantic tenets of artistic creation. However anti-Romantic Frankenstein as a character may be, *Frankenstein* is an unmistakably Romantic novel despite and because of him.

## **Geochemical Studies of Surface Water-Groundwater Interactions in the Upper Yakima River Drainage, Washington**

***Gazis, Carey; Taylor, Sarah***

*Faculty Mentor(s): Department: Geological Sciences*

*Session: 15 (Oral Session 3:00-4:40 in 135)*

The Yakima River is one of the largest rivers in Washington draining 15,760 square kilometers of forested, range, and agricultural land. In the upper Yakima River drainage area, which includes Kittitas County, river water is diverted into an extensive network of canals and laterals in order to irrigate approximately 90,000 acres of agricultural land. This research project uses geochemical signatures to examine the effects of this irrigation on groundwater quality and recharge and discharge patterns. Groundwater samples are being collected bimonthly from private and municipal wells along a transect across the Yakima River near Ellensburg and analyzed for major-ion and trace-element geochemistry. Major cations are typically dominated by magnesium and calcium. However, the southernmost wells have relatively high concentrations of sodium, while deep municipal wells have intermediate sodium concentrations. Anion geochemistry is dominated by bicarbonate, with elevated nitrate and sulfate concentrations in several domestic wells during the irrigation season. Concentrations of selected trace elements (Ti, V, Cr, Mn, As, Rb, Sr, Ba) tend to be distinctly different from well to well, but remain relatively constant throughout the year in any given well. These geochemical patterns can be interpreted in terms of a combination of water-rock interaction within different aquifers and sub-aquifers and anthropogenic effects due to current irrigation and past land use practices.

## **Acid drainage and metal ion transport at Holden Mine, Lake Chelan, Washington**

***Gilliam, Katharine***

*Faculty Mentor(s): Dr. Paul Hoskin, Biological Sciences*

*Session: 15 (Oral Session 3:00-5:00 in 135)*

Acidic ( $pH \sim 3$ ) metal-laden waters from abandoned rock waste at Holden Mine percolate into Railroad Creek which drains into Lake Chelan from which the City of Chelan draws its water supply. The acid mine drainage is produced by the oxidation of sulfide minerals that occur unexploited within the Holden deposit, in waste rock at the mine mill, and as millimeter-sized grains in the mill tailings. Field-based (conductivity,  $pH$ , temperature) and analytical (XRD, ICP-MS, SEM/EDAX) measurements show that metals such as As, Cu, Fe, Hg, Pb, and Zn are liberated from oxidized minerals into acidified rain and surface waters where they begin transportation to Lake Chelan 18 km distant. Some metal ions precipitate into secondary minerals in the tailings, but most are transported to Railroad Creek where they precipitate out into orange-red colored oxides/hydroxides and form a thick and hard cement known as ferricrete. Metal ions may eventually be transported, either in solution or as particulates, into Lake Chelan. Based on our data and geochemical modeling we show that under ambient moderate-flow conditions, goethite [FeO(OH)] of the ferricrete is stable, but that small water  $pH$  changes, perhaps during poorly planned remediation, may cause catastrophic release of toxic levels of As, Hg, Pb, *etc.* into Lake Chelan.

## **Comparison of Reptile Species Diversity Between the Catavina Boulder Field and Bahia de los Angeles Habitats of the Sonoran Desert**

**Gilliam, Katharine; Ebinger, Sara; Coward, Kanani**

*Faculty Mentor(s): Dr. Daniel Beck, Biological Sciences; Dr. Lisa Ely, Geology*

*Session: 21 (Posters in Ballroom A & B)*

Reptile diversity depends on many variables, such as climate, food supply, and topography. We investigated the lizard species compositions in Bahia de los Angeles and the Catavina Boulder Field of northern Baja California. Over the course of a week, we monitored lizard diversity and climate (temperature) at the two locations. In Catavina the habitats include washes, boulders, rock spalls, and a wide plant variety. In Bahia de los Angeles there was mostly uniform bajada with a limited plant variety, very similar to the washes in Catavina. Bahia de los Angeles had a higher overall temperature but a smaller species diversity (1 species) when compared to Catavina (6 lizard species). This difference could be explained by the much larger variation in microhabitats in Catavina. At both sites, the most abundant lizard was *Uta stansburiana* (side-blotched lizard), a species showing peak activity coinciding with the timing of our study (late winter and early spring). A similar species composition reported in the literature for both sites may be due to the timing of our visit (late winter) and limited sampling in Bahia de los Angeles where the habitat better suits some species.

## **Long-Term Slip Rates of the Longitudinal Valley Fault Inferred from Uplifted Terraces of the Bieh River, Eastern Taiwan**

**Gray, Brian; Rubin, Charles; Chen, Wen-Shan; Chen, Yue-Gau**

*Faculty Mentor(s): Dr. Charles Rubin, Geological Sciences*

*Session: 20 (Posters in Ballroom A & B)*

The island of Taiwan is located within a dynamic tectonic setting characterized by back-arc spreading in the north, active thrust faulting in the Central Range, and oblique convergence in the southeast. The Longitudinal Valley Fault (LVF), located along the southeastern edge of the island, forms the suture zone between the stable Eurasian Plate, and the obliquely converging Philippine Sea Plate. Current geodetic measurements suggest the LVF accommodates nearly half of the 82 mm/yr convergence between the Eurasian and Philippine Sea plates. However, paleoseismic data suggest slip rates of 20-25 mm/yr on the LVF. In order to constrain Holocene geologic slip rates, we mapped tectonically uplifted terraces along the Bieh River on the Chihshang Segment of the LVF. Eight separate terraces in the Bieh River drainage were excavated in the hopes of recovering detrital charcoal samples. Detrital charcoal from three uplifted terraces yielded radiocarbon ages between 610 AD and

1440 AD. Assuming constant incision rates, uplift rates along the Bieh River are between 8.4 and 14.5 mm/yr with an average rate of 11.3 mm/yr. Based on a fault dip of 45-55° and the age of the terrace, radiocarbon ages yield a minimum horizontal shortening rate of 5.9 mm/yr and maximum horizontal shortening rate of 14.5 mm/yr. This yields an average horizontal shortening of 8.2 to 11.3 mm/yr, significantly lower than the present day GPS rate of 40 mm/yr.

## **New Phosphors for Modern Display Applications**

**Groce, Lindsay**

*Faculty Mentor(s): Dr. Anthony Diaz, Chemistry*

*Session: 10 (Oral Session 1:10-2:50 in 135)*

With the advent of new display technology, such as plasma display panels (PDPs), comes new technological problems. Three phosphors that emit blue, red and green light when excited at specific wavelengths are used to produce a color image in PDPs. However, there are problems with each phosphor, including degradation over time of the blue phosphor, the slower than optimal luminescent decay time of the green and the incorrect timbre of the red. Our research group is searching for new luminescent materials. My specific project looks at the ternary systems SrO-La<sub>2</sub>O<sub>3</sub>-B<sub>2</sub>O<sub>3</sub> and SrO-Y<sub>2</sub>O<sub>3</sub>-B<sub>2</sub>O<sub>3</sub>. There is very little published about these systems and, though much information is available on the binary compounds, the ternary compounds remain elusive and no phase diagrams are published for either system. We are working towards constructing these phase diagrams and studying their optical properties using vacuum ultraviolet spectroscopy to determine their candidacy as novel phosphors.

## **POST-CONFLICT and Self-Directed Behaviors in a Population of Tibetan Macaques (*Macaca thibetana*) at Mt. Huangshan, China**

**Hartel, Jessica; Matheson, Megan; Sheeran, Lori; Li, Jin-Hua; Wagner, Steven**

*Faculty Mentor(s): Dr. Megan Matheson, Psychology*

*Session: 5 (Oral Session 8:00-9:40 in 202)*

As ecotourism continues to increase, it is important to determine how it affects the indigenous flora and fauna of the area. Specifically, several researchers have found that high tourist density can have a significant influence on the aggression levels of several species of macaques causing aggression to increase among the populations. Thus, it is important to analyze post-conflict behaviors, such as self-directed and reconciliatory behaviors, to determine how the populations are “coping” with increased aggression rates. This study focused on the post-conflict and self-directed

behaviors of Tibetan macaques in a group located on Mt. Huangshan, China. The macaques exhibited increased self-directed scratching in the provisioning zone closest to the tourist platform as the tourist density increased. Following bouts of aggression, this social group exhibited increased signs of stress after direct and substitute reconciliation occurred, but exhibited decreased signs of stress after triadic affiliation occurred.

## **Teaching Geology Students about Water Quality: Integrating Chemical Data Analysis and Interpretation into General Education Geology Classes**

***Hayes, Callie; Bohrson, Wendy; Gazis, Carey; Ferland, Marie; Brugger, Carrie; Salisbury, Morgan***

*Faculty Mentor(s): Dr. Carey Gazis, Geological Sciences*

*Session: 20 (Posters in Ballroom A & B)*

Students taking an introductory environmental geology class at Central Washington University participated in a project in which they collected and analyzed their drinking water to better understand its chemical composition and the health concerns associated with high concentrations of particular elements. Water samples were collected by participating students from various locations in Washington State and were analyzed for major and trace element concentrations using an Inductively Coupled Plasma Mass Spectrometer in the Department of Geological Sciences. Student learning outcomes, accomplished through a series of three assignments, include the ability to (1) explain how water is collected, (2) analyze and interpret data (e.g., graphically display data, perform calculations, and answer specific questions), (3) discuss safe vs. hazardous levels of elements using the concept of maximum contaminant level set by the Environmental Protection Agency, and (4) evaluate the importance of water source characteristics on water quality (e.g., well vs. municipal source, type of pipe, age of house). Results indicate overall knowledge of water quality, including health concerns and chemical composition, improved among students participating in the project. In particular, students seemed excited by the opportunity to collect and analyze water from their own homes. We suspect that this approach increased the students' enthusiasm for learning about water quality.

## **Synthesis of Novel Boronated HIV-1 Protease Dual-Mode Inhibitors**

*Heer, Tajinder; Nguyen, David; Jia, Yinshan*

*Faculty Mentor(s): Dr. Levente Fabry-Asztalos, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

HIV-1 protease specifically cleaves gag and gag-pol polyproteins into functional viral proteins, and is thus an ideal target for antiviral intervention. Although current HIV-1 protease inhibitors on the market show high specificity, a number of side effects can result from their administration. Furthermore, quick drug resistance is developed due to the generation of mutant forms of the HIV-1 protease enzyme, which have a lower affinity for the inhibitors. Consequently, there exists a great and urgent need for the development of novel HIV-1 protease inhibitors that have low toxicity, greater bioavailability, and exhibit distinct resistance profiles. Recent studies have shown that borinic acid HIV-1 protease inhibitors, which can act as both associative and competitive inhibitors, have a higher affinity for HIV-1 protease variants than compounds that are strictly transition state analogs. In the current study, six novel borinic acid HIV-1 protease inhibitors will be synthesized. Biological assays of the compounds will be performed in order to determine their toxicity and affinity.

## **Phylogeography Of A Rare Endemic Mature Forest-Associated Salamander (*Plethodon vandykei*)**

*Heer, Tajinder; Crisafulli, Charlie*

*Faculty Mentor(s): Dr. Steven Wagner, Biological Sciences*

*Session: 7 (Oral Session 9:50-11:30 in 137A)*

Van Dyke's salamander (*Plethodon vandykei*) is an extremely rare amphibian endemic to mature forest habitats in Washington State that displays a discontinuous population distribution. In the current study, the genetic variation among 54 individuals from 48 distinct populations of *Plethodon vandykei* was investigated. A phenol-chloroform method was used to extract DNA from field collected salamander tissue samples. Polymerase chain reaction (PCR) was then used to selectively amplify a 491bp section of mitochondrial DNA cytochrome-b gene. These amplifications were sequenced, and the resulting data was analyzed using phylogenetic reconstruction algorithms. Parsimony and maximum likelihood analyses resolved the populations into three distinct clades, which are correlated to differences mediated by geographic barriers and geological events. The observed genetic variation in *Plethodon vandykei* suggests that conservation efforts should be focused on separate management units.

## **Pedestrian Door use at Brooks E. Library at Central Washington University**

*Higa, Midori; Collins, Matthew; Heniff, Keri*

*Faculty Mentor(s): Dr. Lixing Sun; Biological Sciences*

*Session: 11 (Oral Session 1:10-2:50 in 137A)*

Student traffic on university campuses tends to ebb and flow every hour, much the way tides do each day and night. Similarly, chaotic pedestrian traffic enters and exits through all five doors at the library on Central Washington University's campus. Previous research indicates that high traffic situations result in the automated response of individuals with movement to the right side representing an involuntary plan to avoid obstacles or opposing traffic. In the present study, we predicted that pedestrians entering the library would use doors on the right-hand side more often than the center or the left-hand side doors. Analyses revealed a pattern of pedestrians entering doors on the right-hand side. Secondly, individual pedestrians demonstrated a high degree of fidelity to their direction of travel by entering doors closest to them, even if it meant entering doors on the left-hand side. An understanding of pedestrian traffic patterns and how environmental conditions can shape this may be applied to designing functional pedestrian facilities.

## **Transfigured**

*Hoang, David*

*Faculty Mentor(s): Brian Goeltzenleuchter, Art*

*Session: 22 (Posters in Ballroom A & B)*

Throughout history, stories have been passed down orally, written, and pictorial images. *Transfigured*, sponsored by the C. Farrell Merit Scholarship, was a visual exploration of narratives derived from the Christian tradition. The research involved included signs and symbols used in early Medieval art. The other aspect of my research was studying narratives derived from Roman Catholic, Jewish, Byzantine, and Eastern Orthodox Traditions. These stories were then re-presented on painted linens. The paintings explicitly disregarded historical iconography, instead emphasizing the emotions inherent in the narrative. For two quarters I painted and drew with the aid of live models and source photographs to compose these new renditions. Over twenty-five works were created for the project, which became a multimedia environment, complete with theatrical lighting and commissioned music. My poster presentation at SOURCE will document the 2-dimensional, 3-dimensional and time based aspects of this project.



## **STEP (Science Talent Expansion Program): The Data and Response Behind the Three-Year Pilot Program.**

*Huddleston, Kimberly*

*Faculty Mentor(s): Dr. Martha J. Kurtz, Science Education*

*Session: 20 (Posters in Ballroom A & B)*

In answer to a national challenge, Central Washington University began a new program called STEP (Science Talent Expansion Program) in 2003 to aid in engaging and retaining students interested in STEM (Science, Technology, Engineering, and Mathematics) fields. The program, funded by the National Science Foundation, consists of three parts; Summer Science Institute (SSI), a two-week summer science camp for high school students between their junior and senior year, Freshman Science Seminar (FSS), small group course with extra hands-on experience, and Sophomore Research, an opportunity to conduct undergraduate research with a CWU faculty member. After three years of the program, data has been collected to demonstrate if STEP is achieving its goal of retaining more students in STEM fields at CWU. Overall, STEP has been a positive experience to the students who have participated. It has aided in making life-long decisions and provided confidence to those who were unsure about attending college and once there, what to study.

## **What's So Special About "Law and Order: Special Victims Unit"?**

*Hughes, Tycy; Saltzman, Kurt; Stroh, Colin; Britto, Sarah*

*Faculty Mentor(s): Dr. Sarah Britto, Law and Justice*

*Session: 19 (Oral Session 3:00-4:40 in 202)*

The popularity of "Law & Order: SVU," a prime time television show that focuses on police investigation of "sexually based offenses" in Manhattan, New York, may shape public opinion about sexual assault and criminal justice responses to these crimes. Using a content analysis of the 2003-04 season of "Law & Order: SVU" the present study will quantitatively assess how age, race and gender are used to construct images of "special" victims, offenders and the criminal justice system. Whenever possible, comparisons will be made with relevant victim and offender statistics for Manhattan, New York. A qualitative analysis will provide information about the context of these portrayals, examining the meaning of justice on crime dramas, including: the efficiency of the criminal justice system in terms of the outcomes of the cases, civil rights violations by criminal justice officials, as well as, the presence of rape myths.

## **Natural Freezing in Pacific Treefrogs (*Hyla regilla*) Overwintering at Engelhorn Pond, Ellensburg, WA**

*Irwin, Jason; Wagner, Steven*

*Department: Biological Sciences*

*Session: 16 (Oral Session 3:00-4:40 in 137A)*

The purpose of this study was to measure the body temperature of Pacific treefrogs, *Hyla regilla*, during the winter in Ellensburg, WA. This species has been recently described as one of several frog species that hibernate in terrestrial sites and can freeze solid during the winter, but thaw and recover when the weather warms up. This phenomenon has been studied under laboratory conditions but has never been described in nature. We tagged frogs with passive integrated transponders, and used a scanner to locate them in their hibernation sites during the winter. Hibernating frogs were carefully uncovered and a thermocouple wire placed alongside each frog to measure body temperature. Frogs that chose to overwinter in shallow burrows froze, whereas those deeper in the soil were below the frostline and did not freeze. Of those that froze, not all survived. Given the variability of freezing conditions in nature, laboratory experiments will likely be required to examine the depth and duration of freezing tolerated by Pacific treefrogs in this area.

## **Laughter, Number of Play Partners, and Play Bout Duration in Captive Chimpanzees (*Pan troglodytes*)**

*Jensvold, Mary Lee; Sheeran, Lori; Halberg, Rachel; Keyser, Jennifer*

*Institute: CHCI*

*Session: 5 (Oral Session 8:00-9:40 in 202)*

Numerous behaviors are associated with play in mammalian species. Many of these behaviors also occur in aggressive contexts, while other behaviors, such as laughter, are unique to play. Laughter is hypothesized to signal the laugher's playful intentions, but it likely has additional functions throughout the play bout. We viewed videotaped sessions of social play spanning 8 years taken from 5 chimpanzees living at the Chimpanzee and Human Communication Institute (CWU, Ellensburg, WA). For each play bout, we recorded presence/absence of laughter, number of play partners, and play bout duration. A hierarchical regression analysis showed that the presence of laughter and more partners significantly predicted longer play bout duration, but the former variable was the stronger predictor of increased play bout duration. Our results support data from humans and other species that indicate that laughter is a signal that maintains playful interactions.

## **Synergistic Interactions Among a Herbicide and Amphibian Pathogens: a Potential Evolutionary Arms Race**

**Johnson, James; Chestnut, Tara; Wagner, Steve**

*Department: Biological Sciences*

*Session: 16 (Oral Session 3:00-4:40 in 137A)*

Increasing evidence suggests the recent, dramatic decline of amphibians is mediated by the effects of environmental stressors such as chemical pollutants and ultraviolet radiation that can weaken the immune defenses of a host and increase the virulence of pathogens. In order to address the potential interaction of a widely used herbicide (Roundup®) and a common introduced pathogen, *Saprolegnia sp.*, we conducted infection experiments on *Rana aurora* embryos. We exposed embryos to four different treatment levels of Roundup® (0ppm, 1ppm, 2ppm and 4ppm) and two different strains of *Saprolegnia* (*Saprolegnia ferax* isolated from *R. cascadae* embryos and a novel strain (B1) isolated from *Rana aurora* embryos). Significant differences in infection rate, mortality, and hatching occurred among treatments with *Saprolegnia* exposure and increasing Roundup®. Specifically, an increased rate of infection and mortality, and decreased hatching occurred with the novel *Saprolegnia* strain B1. The results suggest that Roundup® does increase the susceptibility of amphibian embryos to pathogen infection and that the strain B1 maybe in an evolutionary arms race with its host because it has a greater virulence toward the species from which it was isolated.

### **(I love you)**

**Johnson, Mary**

*Faculty Mentor(s): Brian Goeltzenleuchter, Art*

*Session: 22 (Posters in Ballroom A & B)*

“(I love you)” is a multimedia art project that aims to create an environment in which the rules of social expression become relaxed. The artwork functions as a transitional space, suggesting a rite of passage into make-believe through the use of space as a literal transition, and a perceptual transition through the theatrical ritual of masking. A rite of passage is a ritual in which an individual is first disconnected from a social group, experiences a transition, and is then reunited with a group. The effects of this transition are inherent with a social or emotional change in an individual. As a mask literally transforms the face of the wearer, rites of passage transform people’s potential perception of the world, which affect how they experience the world. The art project (and transformation) begins with the participant putting on their mask and crossing a threshold that instigates the perceptual change of masking, representing the separation of the individual from the group. As the person moves through a long

hallway, the light gradually increases, leading them to a second threshold, the culmination of the transitional space, and the integration of the individual back into the group. My poster presentation at SOURCE will document this opportunity for human interaction and emotional expression, and suggest how the experience might act as a catalyst for reflection on social restrictions concerning these expressions.

## **Method Development for the Collection and Analysis of Atmospheric Ultrafine Particles for their use in Toxicological Studies on Mitochondria**

*Johnston, Justin; Anne Johansen; Eric Bullock; Carin Thomas*

*Faculty Mentor(s): Dr. Anne Johansen, Chemistry*

*Session: 15 (Oral Session 3:00-4:40 in 135)*

Recent studies have shown that atmospheric ultrafine particles (UFP, mass median aerodynamic diameter  $< 0.1 \mu\text{m}$ ) cause major disruption of the inner mitochondrial membrane that may lead to mitochondrial dysfunction. However, a clear connection between the surface composition and chemical and physical properties of UFPs and their toxicity has not been established. UFPs for this study will be collected on Beacon Hill, Seattle, and on the roof of Dean Hall at CWU. I have been working on optimizing techniques for the extraction of UFPs from the collection substrate into solution that would allow for reproducible UFP spiking of biochemical assays. After extraction, particle matter is quantified and analyzed for ferrous iron and surface chemical composition, which may be responsible for the detrimental effects of UFPs.

## **Functionalization and Characterization of a Silica Gel Surface**

*Jorgensen, Ryan*

*Faculty Mentor(s): Dr. JoAnn DeLuca, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

The goal of this work is the preparation of template imprinted silica gel surfaces. A silica gel surface will be modified by binding template molecules to the surface followed by binding molecules. In preliminary studies, model template and binding molecules were attached to silica gel surfaces. The template and binding molecules used in this study were phenylphosphonic acid and phenyltrimethoxysilane, respectively. These materials were characterized by infrared spectroscopy (IR), and methods have been developed to optimize the infrared absorption in these analyses. Conditions have also been established for the removal of the template from the silica

gel surface. These studies will be extended to a dicarboxylic acid template and a guanidinium functionalized binding molecule.

## **"I don't want no change:" A Study of Multiple Negation**

***Karl, Keri***

*Faculty Mentor(s): Dr. Natalie Lefkowitz, Foreign Languages*

*Session: 22 (Posters in Ballroom A & B)*

Many factors affect particular language phenomena. An example is the use of multiple negation (MN) in the English language, particularly in the United States. One could speculate that this nonstandard usage is a reflection of a number of variables, including gender, socioeconomic status, education, and age, among others. However, very few studies have been done specifically on MN. This pilot study examines the use of MN in Grays Harbor County, Washington, USA. Not only does this study explore the factors listed above, it also considers the relationship between MN and covert prestige. Covert prestige is a term that describes positive attitudes toward a type of language that is non-standard (Holmes, 2001). It is hypothesized that the use of MN in Grays Harbor County is a reflection of both socioeconomic status and covert prestige. The data were collected through a survey completed by 33 people from various towns in Grays Harbor County. This instrument includes demographic data of the participants, along with a questionnaire with two sentences employing MN. The results of the study partially confirm the relationship between covert prestige and MN by revealing that this ungrammatical phenomenon is commonly employed and even favored in some environments. However, the findings indicate more convincingly that the use of MN reflects the participants' levels of education and socioeconomic status.

## **Investigation of Ice Age Flood Geomorphology and Stratigraphy in Ginkgo Petrified Forest State Park, Washington: Implications for Park Interpretation**

***Karlson, Ryan***

*Faculty Mentor(s): Dr. Karl Lillquist, Resource Management*

*Session: 12 (Oral Session 1:10-2:50 in 137B)*

Documentation of Ice Age flood evidence in Ginkgo Petrified Forest State Park, Washington fills a gap in landscape-scale analysis and interpretation of cataclysmic flooding in the Vantage Reach of the Columbia River Valley. High-energy floodwaters exiting Frenchman Hills Gap excavated soil and modified underlying

basalt bedrock up to 600 ft above the paleo-Columbia River. Subsequent hydraulic pooling behind Sentinel Gap reached maximum depths of at least 783 ft. Eddy bar, rhythmite, and ice-rafted deposits were documented within low-energy flood environments. Isolated, low-density cluster, high-density cluster, and bergmound ice-rafted erratic deposits were documented. The highest frequency of iceberg deposition was observed above 1,100 ft on erosional landforms. High-density erratic cluster and bergmound deposits, resulting from deposition of large icebergs, were limited between 917 and 1,218 ft. Public interpretation of research results is prescribed within a three-level park interpretive network comprised of pre-visit and on-site orientation, interpretive hubs, and site-specific story points.

## **Use of a Small Volume Sodium Iodide Detector for Observation of Cosmic Rays**

*Kendall, Taylor; Cross, David*

*Faculty Mentor(s): Dr. Michael Braunstein, Physics*

*Session: 6 (Oral Session 9:50-11:30 in 135)*

Sodium Iodide (NaI) detectors are most commonly used to detect gamma and x-rays. Cosmic rays are energetic charged particles produced by various astrophysical sources. However, by the time these particles reach a detector on the earth's surface most have decayed into other particles or decayed completely into high energy photons. We hypothesize that through detailed analysis of a NaI detector output signal it should be possible to differentiate between charged particle and photon interactions with the detector. For our experimental setup, we connected the NaI detector to a Tektronix oscilloscope, which was in turn connected to a computer through a General Purpose Interface Bus (GPIB). Using LabVIEW software, we automated the process of collecting signals from the oscilloscope. Generating a multi dimensional histogram of the compiled data should allow us to differentiate between different types of events in the NaI detector. Knowing how a NaI detector interacts with charged particles and photons should allow for the use of small volume NaI detectors to study cosmic rays.

## **Incorporation of Guest Molecules on the Self-Assembled Supramolecular Complex on Graphite**

*Klein, William; Bullock, Eric*

*Faculty Mentor(s): Dr. Eric Bullock, Chemistry*

*Session: 15 (Oral Session 3:00-4:40 in 135)*

The advent of the scanning tunneling microscope (STM) 25 years ago gave researchers the ability to peer inside the fascinating yet complex world of individual molecules. Using this technology over the past year at Central Washington University, I have studied the supramolecular self-assembled layer of an organic compound known as PL-147 on the surface of highly ordered pyrolytic graphite (HOPG). Once self-assembled on the surface PL-147 orients in a patterned array of cavities which can be used as a host for a second type of molecule known as a guest molecule. These host-guest systems are prototypes for a wide variety of applications such as molecular recognition, sensors, and other new materials. Such materials may someday be used to design molecular-based circuitry or to develop better catalysts. Research techniques for consistently reproducing the self-assembled PL-147 layer were established and perfected which then allowed for the testing of different guest molecules and the influence of the solvent on the resulting assembly. Varying the concentrations of solvents used to apply the PL-147 and the guest molecules was seen to have an enormous effect on the final self-assembled layer. Using a solution which consisted of trichlorobenzene, phenyloctane and PL-147 has resulted in a structure in which the cavities appear as to be replaced by regular array of protrusions of very high corrugation. These preliminary results suggest that either a guest-host system has been successfully created or the choice of solvent significantly affects the structure of the self-assembly by a process known as polymorphism.

## **Widower's Peak: A Novella**

***Klepach, Scott***

*Faculty Mentor(s): Joseph Powell, Dr. Christopher Schedler, English*

*Session: 4 (Oral Session 8:00-9:40 in 140)*

My project is a novella titled Widower's Peak, which will be set in central Washington. This novella will explore two protagonists, Jacob Whitmore and Lucas Bell, who are loosely based on the biblical characters Jacob and Esau, as they attempt to discover what has become of Jacob's wife Rachel after she vanishes mysteriously. Because the protagonists are both Caucasian males, I will be employing the limited third-person perspective as I explore the unfolding events of the plot through their eyes. These perspectives will allow me to comment on the racial and cultural tensions that are pervasive in the Yakima Valley and the rest of the nation, and illustrate how these protagonists' views of the bizarre events that transpire might be skewed because of their historically dominant gender and ethnicity. For instance, through various flashbacks readers will observe Rachel's character, who is half Caucasian and half Mexican, but because we only see her through Whitmore and Bell's eyes, it is questionable whether Rachel is ever portrayed objectively. Widower's Peak will begin as a detective story but will soon cross over into the ontological realm, where though the characters will still seek the truth about Rachel's disappearance, they begin to focus on questions of their existence. This novella will not only deal with

race and gender relations, but by including supernatural elements commonly found in magical realist texts, it will also cover spirituality, death, separation and loss, and the nature of love.



## **Effects of Irrigation in the Columbia Basin**

***Kosters, Kolten***

*Faculty Mentor(s): Dr. Gina Bloodworth, Geography and Land Studies*

*Session: 3 (Oral Session 8:00-9:40 in 137B)*

The Columbia Basin Project brought water from the Columbia River to Central Washington through a series of reservoirs and canals. This fresh, clean, nutrient laden water when combined with the fertile topsoil of Central Washington allowed farmers to grow nearly anything, and so it has been done. The Columbia Basin grows a plethora of fruits and vegetables that feed thousands of people across the United States. As new farming techniques were developed throughout the years however, the introduction of fertilizers and pesticides to supplement the demands of high yield crops became a common practice in the basin. The fertilizers and pesticides when combined with irrigation water from the Columbia can cause a severe degradation to the quality of the irrigation water as it is reused from one region to another. To better understand these effects, if any, I will be conducting interviews and observing irrigation practices implemented by farmers and resource managers within the basin. Through observing and actively participating with the people who live in the Columbia Basin I hope to gain a better understanding of current and future problems regarding water resources in the Columbia Irrigation Project and maybe help protect their most vital resource, water.

## **Religious Upbringing & Shame-Proneness**

***Lance, Leslie; Grundberg, Mark***

*Faculty Mentor(s): Dr. Marte Fallshore, Psychology*

*Session: 22 (Posters in Ballroom A & B)*

Research has shown a relationship between strict, religious upbringing and perfectionism. Other research has suggested that perfectionism is often the result of pervasive feelings of shame. The present study brings these ideas together to look at a possible relationship between religious upbringing and shame-proneness. In order to investigate this, we will use an original Religious Upbringing Survey (written by the authors) in order to measure participants' religious upbringing and view of God. In order to measure shame proneness, we will use the TOSCA-3 instrument developed by Tangney, Dearing, Wagner & Gramzow (2000). The participants will be students at Central Washington University. Based on the research mentioned above, it is expected that the present study will find that shame-proneness is greater for people who are raised in some religions as opposed to others and that shame-proneness will be greater for those who have a judgmental view of God as opposed to a loving, forgiving view of God.

## **The Effects of Moisture on the Ectomycorrhizae on *Pinus ponderosa***

**Lau, Helen**

*Faculty Mentor(s): Dr. James Johnson, Biological Sciences*

*Session: 2 (Oral Session 8:00-9:40 in 137A)*

Ectomycorrhizae are a type of mutualistic symbiotic association between the roots of forest trees and a fungus. This association benefits both participants, and trees such as pines, grow poorly in their absence. Few ectomycorrhizal communities are well characterized and how ectomycorrhizal communities change along environmental gradients is unknown. The proposed research will utilize both molecular methods and fruiting structures to characterize the biodiversity, species composition, and relative abundance of ectomycorrhizal fungi associated with ponderosa pine (*Pinus ponderosa* Lawson) growing in moist and arid environments. The proposed research represents the first attempt to characterize the community of ectomycorrhizal fungi associated with natural stands of ponderosa pine and the diversity of ectomycorrhizal fungi along an environmental gradient. This study will build the foundation needed in order to answer other ecological questions about the effect and function of these mycorrhizae on plant health and community composition.

## **Harvesting Legibility: Coffee and the Forging of Identity in Soconusco, Chiapas**

**Laurent, Patrice**

*Faculty Mentor(s): Dr. Jason Knirck, Dr. Michael Ervin, History*

*Session: 4 (Oral Session 8:00-9:40 in 140)*

During the Porfiriato, Mexico endured a period of intense state-sponsored development aimed at transforming the nation into a viable and "modern" entity. Dreams of modernity extended into many peripheral areas of Mexico, including the region of the Soconusco, literally and figuratively located on the fringes of the republic. This paper examines the Soconusco during the Porfirian period as national identities forged in the crucible of order and progress were built upon coffee cultivation. Coffee was the engine fueling moves to define national boundaries and develop a disciplined indigenous workforce. Through coffee production, the "backwards" and unproductive region of the Soconusco was rendered into a legible space that, in part, accomplished the goals of the state.

## **Washington Water Law: Is the Prior Appropriations Doctrine Still the Right Choice?**

***Leadingham, Scott***

*Faculty Mentor(s): Dr. Rex Wirth, Political Science; Dr. Allen Sullivan, Geography and Land Studies*

*Session: 18 (Oral Session 3:00-4:40 in 140)*

Washington, like all of the Western United States, incorporates the Prior Appropriations Doctrine into its water allocation scheme. This doctrine, a product of the California gold rush camps of the mid 19th century, dictates that surface water be allocated on the basis of who first made claim to use the water. While this worked well in the agricultural, ranching, and mining boom days of the West, issues of fairness and economic feasibility have arisen since the doctrine's most notable codification in Washington, the 1917 Surface Water Code, that question the feasibility of continuing to appropriate water in this way. Despite these claims, there has not been a push to stray away from the Prior Appropriations Doctrine, even by those who are potentially hindered from obtaining water under the law. However, a backlash has occurred, not against the law, but against the agency responsible for the apportionment of water, the Washington State Department of Ecology. Suggestions and policy alternatives are given concerning how to address these issues.

## **Islamic Law: the Need for Western Understanding**

***LeMieux, Adam***

*Faculty Mentor(s): Dr. Heidi Szpek, Philosophy and Religious Studies*

*Session: 13 (Oral Session 1:10-2:50 in 140)*

During periods of imperialism and economic expansion by the Western developed countries, resistance was great to foreign systems in the Middle East. Eras of French code in the judicial system in the Middle East failed and were replaced with a native system of law, *Shari'a*. *Shari'a*, or Islamic Law, is a judicial system based on the most sacred texts of Islam. Islamic Law is a system that has been in development since the death of the prophet and has survived some of the most tumultuous periods in history and outlived or been practiced longer than many of today's Western systems. Fear of Western intervention and Islamic Law's traditional practices have reduced transparency in Islamic Law allowing for foreigners to make assumptions and become afraid of court practices and rulings. As U.S. led coalitions of foreigners try to rebuild Afghanistan and Iraq, and tensions mount with Syria and Iran, it becomes important, even desperate at times, for increased education and understanding in the cultural practice and cultural system differences between nations.



## **Stabilization of Medical Images with Modified Autocorrelation**

***Lemley, Joseph***

*Faculty Mentor(s): Dr. Boris Kovalerchuk, Computer Science*

*Session: 1 (Oral Session 8:00-9:40 in 135)*

Imaging has become essential for the medical community and the large number of images that are required for some treatments need an automated method of aligning these images. Our approach was to allow a knowledgeable user to freely and interactively select important areas in an image with no restrictions on shape or size. The selected area is then used to determine shifts for the remaining images with subpixel accuracy without the need for further user input. This is useful because it permits the addition of human understanding to our algorithm that is typically not available to most traditional algorithms such as global auto-correlation of images. In addition we increase the computational efficiency of auto-correlation by using the selected area a window for the auto-correlation algorithm.

## **Biologically Inspired Solution for Load Balancing Distributed Data**

***Lemley, Joseph; Widger, Jonathan; Mednick, Virgil; Abdul-Wahid, Sarah***

*Faculty Mentor(s): Dr. James Schwing, Dr. Razvan Andonie, Computer Science*

*Session: 1 (Oral Session 8:00-9:40 in 135)*

The goal of this project is to investigate the use of computational intelligence techniques, such as swarm intelligence, to solve the load balancing problem in a distributed database. The amount of information stored in databases can be enormous. The current trend is to distribute the information across a network, rather than store all information on a single supercomputer. This provides advantages, most notably preserving data integrity by providing the option of partially replicating the data. However, this also generates the problem of how to distribute the data in order to minimize the time required to perform a query. This load balancing process is computationally complex. Some researchers have utilized a heuristic solution which incorporates the concept of establishing communication between groups of data. This method is still computationally intense and does not provide a solution for a dynamic system. Our approach is to decompose the database to its most flexible level, which is the cell. This cell retains all necessary information to maintain the relational integrity of the database. In addition, it stores information on which nodes have requested it in a query. This information forms the basis of the swarm intelligence algorithm. Our project consists of the following four modules: 1. Set up a partially replicated distributed database on a peer-to-peer network. 2. Implement communication between peers on the network using TCP/IP. 3. Write the methods to implement complex queries to the distributed database. 4. Implement swarm intelligence concepts to

dynamically relocate data across the network. The goal is to reduce the time to process queries from all nodes on the system. Each node submits a unique set of queries.

## **Better Nutrition for Low Income Families: Can the Current Food Stamp Program Become More Effective?**

*Libby, Kimberly*

*Faculty Mentor(s): Dr. Rex Wirth, Political Science*

*Session: 18 (Oral Session 3:00-4:40 in 140)*

This is a policy analysis on the effects the current food stamp program is having on recipients, and possible reforms to make the program more efficient and nutritious. There is a proven increase in the number of obese people in the United States today. It is such a great increase that it has been upgraded to epidemic proportions. A large number of the obese cases are appearing among lower income families. It is believed and being researched that a partial cause is the higher price of fresh foods in the supermarkets. These higher prices act as a disincentive for welfare recipients to purchase these fresh goods. Instead, they are replaced by prepackaged, overly processed items that could sit on a shelf for years without going bad. The primary targets of this policy analysis are the recipients of food stamps through the national welfare system. If no action is taken the long term effects will be tremendously weighty upon the government's budget and health care system. By interceding in the eating habits of these individuals we can save Medicare and the insurance system a significant amount of money. Not to mention the improved health of the nation. Overall, the reformation of this program is meant to decrease government waste due to poor choices by its beneficiaries. This will be done by placing tighter controls over what the recipients purchase through an integrated barcode and debit card system.

## **What an Ass!: The Use of Animal References for Men and Women**

*Lloyd, Nicole*

*Faculty Mentor(s): Dr. Natalie Lefkowitz, Foreign Languages*

*Session: 22 (Posters in Ballroom A & B)*

This study investigates the use of animal references for humans and whether these references are more derogatory when applied to women than to men. Research previously done on this topic heavily emphasizes the subjects of feminism, sexist language and animal rights. In fact, the literature was almost exclusively about women, with little to be found on animal references related to men. However, the

results of this study proved quite different. The data gathering instrument for this research was a survey distributed to 39 participants from Central Washington University. Seven were male and 32 were female. The ages of the participants ranged from 16-45, with 32 falling into the 16-24 range, six in the 25-35 range and one in the 36-45 range. All of the participants spoke English, but 10 had primary languages other than English, such as Vietnamese, Spanish, and German. The survey was designed to compile examples of gender-specific animal references, and to categorize these terms as positive, negative, or neutral. Some examples that participants responded to on the survey included: "What a pig!", "What a bitch!", "What an ass!", "What a cow!", "That person is so batty!", and "I'm going stag." This research revealed the surprising finding that derogatory animal references were directed more frequently toward men than they were toward women-- a dramatic departure from the position presented in the literature on sexist language.

## **Initial Excavations at the Wenas Creek Mammoth Site Near Selah, Washington**

***Lubinski, Patrick; Shapley, Jake; Barton, Bax; Lillquist, Karl; Uebelacker, Morris***

*Department: Anthropology*

*Session: 12 (Oral Session 1:10-2:50 in 137B)*

With a six-week field school in summer 2005, Central Washington University began investigation of mammoth bones found during road construction near Selah, WA. The bones lie in colluvial sediments on the valley wall above Wenas Creek, well beyond the extent of flooding from Glacial Lake Missoula. Recovered bones, including near-complete left and right humeri each about a meter long, are from a yet-unidentified species of mammoth. Although there is no indication of human activity at the site, it is being excavated with archaeological methods to allow potential demonstration of an association. Information on species, age, and contemporary paleoenvironmental conditions will be forthcoming as laboratory analyses and future excavations proceed. The site is one of the very few mammoth finds in the region to be excavated using archaeological methods, providing excellent potential to inform about local environmental conditions in the late Pleistocene.

## **WASL: Alternatives to High Stakes Testing**

***Lybbert, Susan***

*Faculty Mentor(s): Dr. Rex Wirth, Political Science*

*Session: 22 (Posters in Ballroom A & B)*

Competition in the global market caused educators and policy makers to begin realigning educational priorities in 1993. Beginning with Goals 2000 to No Child Left Behind, education reform has become a catch phrase that is leaving more than its fair share of children behind. The Washington Assessment of Student Learning, WASL, has made its way through many round table discussions. The test is meeting its goals and objectives, but what it's not meeting is overwhelming acceptance. The use of the WASL as a high stakes test has educators up in arms. The use of a single test goes against the foundation of educational philosophy. This exploratory case study focuses on the problem of using the WASL as a high stakes test. Currently there are few alternatives for students not passing the WASL to graduate. I will look at the history and development of the WASL, why the WASL graduation requirement is not working and what alternative can be presented.

## **Fuzzy Artmap for Chess Artificial Intelligence**

**Magill, Lukas; Lemley, Joe; Widger, John; Erkul, Berk**

*Faculty Mentor(s): Dr. Razvan Andonie, Computer Science*

*Session: 1 (Oral Session 8:00-9:40 in 135)*

The thrust in chess artificial intelligence recently has been to create thinking machines that can evaluate board positions well, thus producing a more accurate analysis of the game and win without evaluating as many move possibilities. One approach to solve this problem is the genetic algorithm, which was presented at SOURCE 2005. This approach allowed for mechanical fine tuning of a linear evaluation function. Since then, Central Washington University's chess A.I. team has built a learning model based off a completely different system: the Fuzzy ARTMAP neural network. This system has several advantages. First, it has the capability of learning non-linear functions. Second, it can learn incrementally, that is it can learn after each game. The 2005 chess program had to play 500 games before it could learn. Finally, the Fuzzy ARTMAP learns very quickly.

## **Characterization of Cell Differentiation using Viral Transduction and Immunocytochemistry**

**Maitem, Stephanie**

*Faculty Mentor(s): Dr. Daniel Selski, Biological Sciences*

*Session: 21 (Posters in Ballroom A & B)*

The monocyte is a precursor to phagocytic cells and is circulated in the blood stream until it differentiates into either an osteoclast or a macrophage. The cell type specific



Acp-5 gene, expressed in macrophages and osteoclasts, is the marker of differentiation. The aim of this study is to identify genetic correlates of the differentiation of a monocyte into a macrophage by analyzing the promoter region of this gene. A viral construct of the promoter sequence of the Acp-5 gene was used to control the expression of a reporter gene. With this construct, parts of the promoter sequence can be analyzed for how they contribute to cell type specific expression of the reporter gene. The application of immunocytochemistry on a monocyte cell line infected with the viral construct follows and visually confirms how parts of the promoter sequence contributes to the expression of the reporter gene.

## **Toward Peace: Peaceful Policy Methods in the Middle East as a Deterrent to Future Terrorism**

*Maley, Maley Eileen*

*Faculty Mentor(s): Dr. Rex Wirth, Political Science*

*Session: 18 (Oral Session 3:00-4:40 in 140)*

Evidence will be presented leading to the ascertainment that, *peaceful methods of dealing with the current political/military situation in Iraq are the only adequate methods of deterring future terrorist activities toward the United States of America or its allies.* This paper analyzes occurrences of violence and terrorism and their root causes. The potential for terrorism from the Middle East region is analyzed with an emphasis on the existing structure of trained individuals who have exhibited dissatisfaction with the current political situations. Current policies are discussed and the potential outcome of such policies forecasted.

## **Chloroplast Genome Rearrangements in Pinaceae**

*Margheim, Stephanie; Feysa IV, Peter; Murphy, Nicole*

*Faculty Mentor(s): Dr. Linda Raubeson, Biological Sciences*

*Session: 21 (Posters in Ballroom A & B)*

Early mapping studies by others showed that Pinaceae chloroplast genomes have lost one copy of the large (20-25kb) inverted repeat common to other land plant genomes and have other changes in gene order. When the *Pinus thunbergii* (PITH) genome was completely sequenced additional changes were detected. Here we are studying how these changes are distributed throughout Pinaceae. In the PITH genome there is a small remnant inverted repeat (ir) of 495 base pairs. We wanted to see if other members of Pinaceae had this ir, so we compared the two regions that might contain it. So far, we have determined that the small ir is present in four species widely

distributed within Pinaceae, suggesting that the ir occurs throughout the family. Other rearrangements in the pine genome are represented by five locations where genes that are normally together are no longer adjacent, indicating break points of inversions. To determine the distribution of these gene rearrangements, a PCR strategy is being applied. Different combinations of primers are used and the gene order is indicated by which combination produces product. So far, no non-Pinaceae has been found to share any rearrangements with PITH. Likewise, no Pinaceae tested has not shared the PITH gene order.

## **Deciphering the Signature of Magma Mixing: Examples from the Castle Creek Eruptive Period, Mount St. Helens, Washington**

***Mattos, Seth***

*Faculty Mentor(s): Dr. Wendy Bohrson, Dr. Paul Hoskin, Geological Sciences Dr. Michael Clynne, United States Geological Survey*

*Session: 20 (Posters in Ballroom A & B)*

On the morning of May 18, 1980 a cataclysmic debris avalanche initiated on the north flank of Mount St. Helens (MSH). The failure and collapse of the north flank was caused by oversteepening of the sector due to the intrusion of dacite (63-70 wt% SiO<sub>2</sub>) magma into the upper structure of the volcano. The last 40,000 years of eruptive history at MSH have been dominated by similar intermittent explosive activity involving dacite. However, the modern stratocone is built mainly of flows of low silica lavas, called basalts (45-55 wt% SiO<sub>2</sub>), which erupt in a style more closely associated with Hawaiian volcanism. Presented here are new whole rock major and trace element and isotopic data, along with electron microprobe and petrographic analyses from plagioclase feldspar found within basalts from the Castle Creek eruptive period (2500-1700 yr. BP.) of MSH. Also included are the results of computational thermodynamic models simulating the evolutionary history of basalts from Castle Creek time. These data allow us to draw conclusions about how the basalts relate to other lavas erupted from MSH, and how the apparent co-existence of compositionally diverse magmas might have influenced eruptive activity and lithology over time. Results indicate that crystal fractionation and magma recharge are critical. Understanding these processes, as well the interactions of multiple magma bodies, is fundamental to igneous petrology and may play a key role in volcanic hazard assessment.

## **Space use in Captive Chimpanzees**

***McCarthy, Maureen; Mary Lee Jensvold; Roger Fouts; Deborah Fouts***

*Faculty Mentor(s): Dr. Mary Lee Jensvold, CHCI*

*Session: 5 (Oral Session 8:00-9:40 in 202)*

Varied enclosures can promote species-typical locomotion and postures in captive chimpanzees. The present study examined differences in captive chimpanzees' use of structures and substrates in their enclosure during two time periods. Data collectors recorded a chimpanzee's location over two phases of data collection. Phase 1 was from 1996 to 1998 and phase 2 was from 2004 to 2005. There were differences in availability of structures between phases. In both phases, the chimpanzees used all of the structures available within their enclosures. In phase 2, the chimpanzees' most preferred structure was the wooden platform, a structure which did not exist during phase 1. There was significant interaction between structure and phase ( $F(24,72)=5.334$ ,  $p<.001$ ). Pairwise comparisons showed specific structure use differences between phases. The results demonstrate the importance of providing varied structure and substrate options. Regardless of enclosure size and design, all captive chimpanzees can benefit from variety, since this would allow them to engage in more species-typical behavior patterns.

## **Washington State Legislative Interconnectivity to Natural Resource Policy, An Inside Perspective**

***McCormick, Jason***

*Faculty Mentor(s): Dr. Gina Bloodworth, Geography and Land Studies*

*Session: 3 (Oral Session 8:00-9:40 in 137B)*

Policy and decision making concerning the management, quality, and health of natural resources in Washington State often occurs in the State Legislature. The Washington State Legislature consists of elected individuals from 49 districts of equal population. Resulting from legislative districts formed based on equal population, there is a variety of experience and educational backgrounds statewide, mostly focused around urban cores. Looking from the inside of the Legislature outward it is interesting to discover some interconnections between legislators at the state level and the formation of natural resource policy. A case study was developed using the Columbia River Initiative; ESHB 2860, during the 2006 Biennium of the 59th Legislature of Washington State. As a component of working for the Washington State Legislature, research was conducted by means of participant observation and socio-cultural analysis within the physical and social boundaries of Capitol Hill during the 2006 Legislative Session. Resulting from my research I found that direct physical connections between legislators and natural resource policy does not always exist, but often involves interest groups, non-profit organizations, constituents, state-level agencies, federal-level agencies and the Executive Branch. As a result, decision making at the state-level in Washington State is directed not only by the legislative body but by a multitude of outside interests.



## **The Complete Plastid Genome Sequence of *Welwitschia mirabilis***

**McCoy, Skip; Kuehl, Jennifer; Boore, Jeffrey**

Faculty Mentor(s): Dr. Linda Raubeson, Biological Sciences

Session: 11 (Oral Session 1:10-2:50 in 137A)

THE Gnetales are an enigmatic group of plants whose placement within the seed plant phylogeny has been problematic, partly due to a lack of data. Here we report on the completely sequenced plastid genome of *Welwitschia mirabilis* (WEMI), the first from a gnetalean. Draft sequence was generated from an RCA template amplified from isolated chloroplasts, the quality of the draft sequence was confirmed, and the Single Copy-IR boundaries were determined by PCR amplification and sequencing. The completed genome was annotated using Dual Organellar GenoMe Annotator (DOGMA). The WEMI genome is 119,724 base pairs (bp) long, with an Inverted Repeat (IR) of 20,006 bp, a Large Single Copy (LSC) of 68,556 bp, and a Small Single Copy (SSC) of 11,156 bp. The LSC end of the WEMI IR corresponds to the 495 bp remnant "IR" described in *Pinus thunbergi*. We have detected several anomalies in the WEMI genome, including the duplication of the *trnR*-CCG gene, the partial duplication of the *trnF*-GGA gene, and the loss of the *petD* intron. Plus, there are changes in gene order in both the LSC and SSC regions. There are also a number of genes absent (or present only as pseudo-genes), including all *ndh* genes, another feature shared with *Pinus*.

## **Using Genetically Engineered Bacteria to Remove Arsenic from Water**

**Moon, Curtis**

Faculty Mentor(s): Dr. Steven Wagner, Dr. Holly Pinkart, Biological Sciences; Dr. Anne Johansen, Chemistry

Session: 2 (Oral Session 8:00-9:40 in 137A)

Arsenic contamination of water is a problem in many parts of the world, including the United States. The World Health Organization has set guidelines of no more than 50 parts per million of arsenic for potable water sources, with 10 ppm being highly recommended. Recent research has demonstrated it is possible to genetically engineer bacteria to remove arsenic from water. However, no research has investigated methods to use this technology for the removal of arsenic from large quantities of water. Currently, we are engineering bacteria to over express an arsenic resistance gene (*ArsR*) that sequesters arsenic intracellularly removing it from the water. *ArsR* is a gene found in bacteria living in areas with high levels of arsenic. We will isolate bacteria from Soap Lake, a body of water with high levels of arsenic (410 parts per billion), and take the *ArsR* genes and insert them into *Pseudomonas aeruginosa*. *P. aeruginosa* is a very common bacterium that can create biofilms and survive in many

different environments. Microorganisms in response to stresses make biofilms, helping them to stay in close proximity and adhere to structures. Next we will induce the engineered *P. aeruginosa* to make a biofilm on beads in a column called a biofilter. This biofilter will allow water to pass through but retain the bacteria that remove the arsenic. The use of biofilters in combination with specifically engineered bacteria may provide an effective technique for the removal of arsenic from water.

## **Consequences of Dissolved Oxygen and Temperature on the Respiration of Pacific Northwest Stream Associated Salamanders**

***Mullen, Lindy; Wagner, Steven; Irwin, Jason***

*Faculty Mentor(s): Dr. Steven Wagner, Biological Sciences*

*Session: 7 (Oral Session 9:50-11:30 in 137A)*

Cascade Torrent salamanders (*Rhyacotriton cascadae*) are associated with cold, high gradient streams in mature forests; for that reason, we examined the hypothesis that the species is physiologically constrained to environments consisting of high dissolved oxygen (DO) content and cold temperatures. The interaction of temperature (10°C, 15°C) and oxygen concentration (2.0 ppm, 10.0 ppm, 17.0 ppm) on aquatic respiration rates of *R. cascadae* was compared to sympatrically occurring Pacific Giant salamander larvae (*Dicamptodon tenebrosus*) which inhabit a wider range of stream conditions. Results indicate that the metabolic rates of *R. cascadae* and *D. tenebrosus* differ in their response to dissolved oxygen content and water temperature when accounting for mass (ANCOVA;  $p < 0.01$ ). Least-square means of metabolic rates indicate *D. tenebrosus* are oxygen conformers that vary metabolic rates in response to environmental oxygen availability. On the contrary, *R. cascadae* are oxygen regulators with a lower critical oxygen tension at the higher temperature (15°C), which may be due to increased efficiency in oxygen transport. Most notably, under ecologically relevant conditions, *R. cascadae* is an oxygen conformer that maintains very low metabolic rates. This characteristic may be indicative of a low energy strategy that may reduce feeding requirements. Further, forest management practices resulting in increased stream temperatures may affect stream properties, thus elevating metabolic rates, altering feeding strategies, and affecting population densities.

## **Statistics and the Stock Market**

***Mun, Stephen***

*Faculty Mentor(s): Dr. Yvonne Chueh, Mathematics*

*Session: 21 (Posters in Ballroom A & B)*

For Poster Presentation at SOURCE For this project I will be looking at the Stock Market and certain sectors within the market including stock performance among specific companies. Also I will be analyzing commodities such as gold and oil and see how market conditions affect them. To do this I will be applying numerous statistical methods. To accomplish this I will be using numerous variables. The first variable I will be using is the discount rate since almost everyone would agree this interest rate has a huge effect on the stock market. Another factor I will be using is Gross Domestic Product (GDP). As GDP is another strong indicator of how the stock market tends to move. Also I am considering alternative variables such as Unemployment and the Housing market. I'll be tracking the movement of these variables as they pertain to the Stock Market by way of ANOVA and using both Boferroni and Tukey comparison tests. Currently, I am a novice when it comes to the world of finance. Therefore, one of my goals for this project will be to further my understanding of the stock market and other things of financial importance. Hopefully I will be able achieve that goal and provide some insight to others as well. I believe this project will make an excellent poster presentation at SOURCE. I will have multiple graphs, which will be highly informative and easy to understand.

## **Analysis of Historic Glass from the Grissom Site (45KT301)**

***Muramoto, Minori***

*Faculty Mentor(s): Dr. Patrick Lubinski, Anthropology*

*Session: 22 (Posters in Ballroom A & B)*

The Grissom Site (45KT301) is a multi-component archaeological site located about 10 miles northeast of Ellensburg, Washington. The site was excavated during 1967-1970 field schools, and thousands of artifacts were unearthed. Most of the materials derive from a prehistoric/ protohistoric Native American camp site, but there are also historical artifacts, such as glass and nails. None of these artifacts had been analyzed prior to this study. This study's goals are to comprehensively analyze the historical glass artifacts for all excavated units. A total of 1,247 specimens were examined from 53 units. These represent a minimum of 50 separate vessels, including alcohol or soda bottles, wine or champagne bottles, food containers, medical (druggist) bottles, plates, and a cosmetic or ointment/cream jar. All bottles were made with molding technology in use from the 1840s to the 1910s. The oldest vessel was probably made between the 1840s and the 1860s. One bottle fragment embossed with the name of an Ellensburg druggist, "D.O Woodworth," was produced between 1889 and 1893. Two other bottle fragments appear to be derived from a cooking product called "Dr. Price's Delicious Flavoring Extracts." Based on the glass analysis, the historic component of this site dates from about 1860 to 1920.

## **Stairway to Heaven**

*Nelson, Valerie*

*Faculty Mentor(s): Dr. Heidi Szpek, Philosophy*

*Session: 13 (Oral Session 1:10-2:50 in 140)*

Music is a phenomenal source of power, especially in a religious sense. Throughout my thesis I tackle this idea of religious music being able to have an amazing influence on a non-believer. I submit that a non-believer can 'feel' what a believer 'feels' for their particular faith, by listening to their music, even if it is just for a moment that the person 'feels' the spirit and strength of the faith. I focus on the music of African American Gospel, which has been very influential on musical genres that developed in America, concluding that Gospel music was influential because of the feeling that was transmitted to the listeners. I relate techniques found in Gospel music to other traditions' music, where there seems to be a common ground that influential music possesses. This 'feeling' of the faith brings the studying of traditions to a new level, a level where one can understand what the faithful 'feel'.

## **Determination of Reduction Potentials at Non-standard States for Aqueous Metallic Ions via Coulometry**

*Nguyen, David*

*Faculty Mentor(s): Dr. Timothy Sorey, Chemistry; Dr. John R. Amend, Montana State University, Chemistry and Biochemistry*

*Session: 20 (Posters in Ballroom A & B)*

Experimentally determined values for reduction potentials,  $E_{o,cell}$ , exist for a vast number of aqueous species at standard state and with the use of a Standard Hydrogen Electrode. These reduction potentials assist scientists and engineers in making important decisions that range from water analysis, such as measuring trace amounts of heavy metals, to construction, such as the compatibility of materials and their likelihood to spontaneously corrode. One of the main problems with these data, however, is the likelihood of being at standard state, 25°C and 1.0 atmospheres, in the real-world. A collection of preliminary data suggest an original electrochemical computer-based method showing promise in determining reduction potentials for aqueous metals at various experimental parameters. Work will be presented that include the optimization of experimental parameters for several aqueous metal/metal salt galvanic cells at non-standard states.



## Physiological and Metabolic Responses During Two Self Selected Cycling Time Trials

Nielsen, Leland; Garver, Matt; Dickinson, Jared; Campbell, Derek; Papadopoulos

Faculty Mentor(s): Dr. Charilaos Papadopoulos, Health, Human Performance, and Nutrition

Session: 21 (Posters in Ballroom A & B)

The lactate threshold (LT) has been used extensively to predict performance, prescribe exercise intensity and monitor training adaptations. The LT is usually determined by using an incremental exercise protocol. However, during prolonged exercise, physiological and metabolic responses are not always the same as predicted from an incremental protocol. **PURPOSE:** The purpose of this study was to investigate physiological and metabolic responses during two self-selected time trials (TT) and to compare these responses to three lactate threshold definitions (1.0 mmol above resting blood lactate concentration; LT<sub>b+1</sub>, fixed blood lactate of 4.0 mmol; LT<sub>4.0</sub>, and Dmax method; LTD<sub>max</sub>). **METHODS:** Five trained, competitive cyclists (age: 23.8 ± 3.8 yrs; height: 180.5 ± 4.1 cm; weight: 80.8 ± 8.8 kg; body fat: 10.4 ± 5.6 %; O<sub>2</sub>max: 58.1 ± 4.9 ml·kg<sup>-1</sup>·min<sup>-1</sup>) participated in this study. Each subject completed three testing protocols, which were separated by a minimum of 1 week. The first test consisted of an incremental maximal exercise test on a cycle ergometer. On two separate occasions, a self paced 20 kilometer (k) and a 40k TT was completed. During these trials, power output (PO), heart rate (HR), and blood lactate (LA) responses were measured. Blood samples were collected through a venous catheter placed in an antecubital vein to determine lactate responses. A dependent t-test was used to determine statistical difference for the mean power output, LA, and HR response between the two TT. In addition, a one-way ANOVA was used to compare the responses corresponding to the three lactate threshold definitions and the responses during the two TT. **RESULTS:** The mean lactate concentration during the 20k TT (6.22 ± 1.4 mmol) was significantly higher than the mean lactate concentration during the 40k (3.86 ± 1.0 mmol). Power output (p = 0.03) and HR (p = 0.0002) were significantly higher during the 20k compared to the 40k TT. Mean LA concentration during the 20k were significantly higher than those at the three LT definitions. Power output during the 20k was only significantly different from the LT<sub>4.0</sub>, whereas HR was significantly different from the LT<sub>b+1</sub> and LTD<sub>max</sub>. During the 40k, mean PO was significantly higher than the LT<sub>b+1</sub> and LTD<sub>max</sub>, but not for the LT<sub>4.0</sub>. Finally, HR response during the 40k was significantly different from the LT<sub>b+1</sub>. **CONCLUSION:** These results indicate that responses at different lactate thresholds may not be representative of responses during two different self-selected time trials.

## **Iron Photochemical Dissolution in Simulated Marine Aerosols Enhanced by Methanesulfinic Acid**

*Paulk, Nicole; Key, Jennifer; Johansen, Anne*

*Faculty Mentor(s): Dr. Anne Johansen, Chemistry*

*Session: 10 (Oral Session 1:10-2:50 in 135)*

Atmospheric iron (Fe) deposition from dust derived aerosol particles into remote open oceans has shown vital for phytoplankton photosynthesis in high nutrient low chlorophyll waters. Phytoplankton productivity impacts global carbon cycles and functions to release biogenic gases (e.g. dimethyl sulfide, DMS) that affect global climate, yet mechanisms that control atmospheric iron availability to these phytoplankton are largely unknown. Aerosol iron is mainly present in the form of insoluble iron(oxy)hydroxide particles that undergo chemical processing during transport over the ocean. To investigate processes that affect iron in the presence of biogenic sulfur species in the marine atmosphere, photochemical simulation experiments were conducted under semi-controlled conditions. Synthesized ferrihydrite was used as a representative atmospheric iron(oxy)hydroxide, to which varying concentrations of methanesulfinic acid--an oxidation product of DMS--were added. Reactants and products were quantified as a function of time using ion chromatography, UV-Vis spectrophotometry and electrochemistry (for H<sub>2</sub>O<sub>2</sub>). Fe(II) photoproduction is enhanced in the presence of MSIA and depends on MSIA concentration. These results suggest a direct link between the marine iron and sulfur cycles and will help constrain modeling efforts in this field.

## **Comparisons of Three Apiaceae (Parsley Family) Chloroplast Genomes: Dill, Fennel and Coriander**

*Peery, Rhiannon*

*Faculty Mentor(s): Dr. Linda Raubeson, Biological Sciences*

*Session: 16 (Oral Session 3:00-4:40 in 137A)*

Work by others has shown that, in Apiaceae chloroplast genomes, the extent of the inverted repeat (IR) varies. In a few lineages the IR has expanded slightly, but in most lineages different degrees of contraction have been detected. We have generated complete chloroplast genome sequence for *Anethum graveolens* (dill), *Foeniculum vulgare* (fennel) and *Coriandrum sativum* (coriander). Sequences were obtained via shotgun sequencing of RCA template at the Joint Genome Institute. Finishing at CWU involved additional sequencing to fill quality gaps, link contigs, and verify single copy-IR boundaries. The IR extent determined via complete genome sequencing is consistent with that determined by Plunkett and Downie [2000, Syst

Bot 25: 648] using Southern Hybridization. In comparison to *Panax ginseng* [NC\_006290], the IR in dill and fennel has contracted slightly and includes only 39 nucleotides of the 5' end of *rpl2*. In coriander Plunkett and Downie detected a 5.7 kb insertion of unknown origin in the LSC region adjacent to IRB that we have identified as a duplication of *trnH* and *psbA*. Thus, in coriander, it appears that the IR had formerly contracted to include only the rRNA gene region but then expanded to incorporate *trnH* and *psbA*. No other large-scale genome rearrangements have been detected in coriander, fennel, or dill but finer-scale genomic comparisons are currently underway.

## **Thai Flute and Thai Music**

### ***Petchprapa, Ninee***

*Faculty Mentor(s): Dr. Hal Ott, Music*

*Session: 14 (Oral Session 1:10-2:50 in 202)*

When I was younger, I remember being surrounded by Thai music everywhere I went. It helped me develop an appreciation for this field of music. Thai music is familiar to a small number of people. If no one continues to practice this valuable art, it could easily come to an end. I feel obligated that I must carry it on, even though I am pursuing a career in a western style of music. Therefore, a few years ago I started picking up a few Thai instruments, and have been able to study Thai flute in depth. Thai flute has given me opportunities to perform on various occasions. From those experiences, I was confident that I could make a very informative and exciting project. My project was divided into three distinct parts. During the summer of 2005, I went back home to study with one of the Thai flute masters in Thailand, Peep Konglaitong. When I came back to the United States in the fall I spent majority of time in recital preparation, practicing and organizing a recital program. Eventually, I gave a full recital on Thai flute, all from memory. During the summer I also conducted interviews with Thai musicians and collected information on Thai music. The information contains various styles of Thai music and types of ensembles that include Thai flute. In the winter of 2006, I gave a PowerPoint presentation to the flute students about Thai flute. I also demonstrated the techniques, fingering system, embouchure, and air control of Thai flute, pointing out the how it differs greatly from the western flute. To bring Thai music to the community of Central Washington University, during the winter and spring of 2006, I gave Thai flute demonstrations and detailed cultural aspects of Thai music in the World Music class.

## **The Scaffolds of Literature: An Examination of A Heartbreaking Work of Staggering Genius**

*Peters, Lucas*

*Faculty Mentor(s): Dr. Laila Abdalla, English*

*Session: 9 (Oral Session 9:50-11:30 in 140)*

We find ourselves in a period of history obsessed with the real, the genuine, and the authentic—or more precisely, we find ourselves obsessed with the qualities that create a genuine, authentic representation of reality. This obsession begins with the advent of reality television and the rising popularity of memoirs and continues with the questioning of these purportedly “authentic” representations of reality. Enter Dave Eggers and his memoir, *A Heartbreaking Work of Staggering Genius*, a memoir that, fittingly enough, spends time recounting the author’s attempt at being cast in *The Real World: San Francisco*. Of course, this attempt at being cast into the quintessential MTV program is only a piece of this puzzle of this work of reality-based literature. In places, Eggers’s memoir is problematically acknowledged as fiction and his admitted blending of criticism, non-fiction and fiction creates a truly novel experience for the reader in its attempt to explore the various levels of authentic reality and through tracing the various levels of authenticity Eggers explores, it becomes possible to identify the ways in which he arrives at a complex vision of a new representational reality, one that is honest and brutal and true to its purpose—a vision that may well prove to be a generational tome.

## **Predicted Environmental Noise Impact of the Proposed Kittitas Wind Power Project**

*Petersen, Travis; Piacsek, Andrew*

*Faculty Mentor(s): Dr. Andrew Piacsek, Physics*

*Session: 6 (Oral Session 9:50-11:30 in 135)*

The proposed Kittitas Valley Wind Power Project would place large modern wind turbines within 500 m of some existing houses. This study is an investigation of the acoustic impact of these towers on nearby residences. Of particular interest is the existence of individual frequency components of the turbine noise and how these components are affected by distance, wind direction, and wind speed. The methodology consists primarily of measuring noise from similar turbines at the 9-Canyon wind farm near Kennewick, WA. Data was collected by using a Quest sound level meter and a digital audio recorder to record sound from a target wind turbine. Wind speed, temperature, atmospheric pressure and wind direction were also recorded in order to correlate the sound recorded with environmental conditions.

Preliminary results indicate that the overall sound level from wind turbines is negligible in comparison to environmental noises. Data indicate that the total environmental noise is less than 50dBA at a distance 400 meters from source turbine for nearly all wind speeds. Observations also suggest that position to a turbine with respect to the direction of the wind has a significant affect on the level of sound at that point. However, it is observed that the turbine generator creates a high pitched hum that is independent of the wind speed while the blades have a complex lower pitch sound that varies with wind speed.

### **Phylogeography of the Stubby Squid (*Rossia pacifica*)**

**Peterson, Luke; Wagner, Steven**

Faculty Mentor(s): Dr. Steven Wagner, Dr. James, Johnson, Biological Sciences;

Session: 2 (Oral Session 8:00-9:40 in 137A)

Abstract:- North Pacific Bobtail squid or Stubby squid (*Rossia pacifica*) is one of the most abundant cephalopods along the west coast of North America. *R. pacifica* was originally described as two subspecies: *R. pacifica pacifica* and *R. pacifica diegensis*. However, the validity of *R. pacifica diegensis* has never been resolved. In addition, the taxonomic status of *R. pacifica pacifica* in Alaskan and Russian waters is questionable. Morphologically individuals from the North Pacific are much larger than their southern counterparts. We used mitochondrial sequence data from cytochrome b (305bp) and cytochrome oxidase III(641bp) to compare the phylogeography and evolutionary relationships of the different subspecies across the Pacific Shelf. The results suggest differentiation of a monophyletic southern group from Bering Sea squid. As a consequence, the subspecific designation of *R. pacifica pacifica* is polyphyletic.

### **Synthesis and Study of Two Silyl Phosphonates**

**Posekany, Robert**

Faculty Mentor(s): Dr. JoAnn Deluca, Chemistry

Session: 20 (Posters in Ballroom A & B)

In the context of research toward the development of methods for creating silica particles with template imprinted surfaces it was desirable to synthesize a small model compound which could be used to study the initial template bonding. A suitable synthesis for silyl phosphonates had been reported in the literature. This procedure was used and two such compounds synthesized from phenyl phosphonic

acid and t-butyl dimethyl silanol. The compounds were characterized using IR, <sup>1</sup> H NMR, and GC/mass spectrometry.

## **Seed Plant Phylogeny Based on Sequences from 61 (mostly) Shared Plastid Genes**

**Raubeson, Linda A.**

*Faculty Mentor(s): Department: Biological Sciences*

*Session: 11 (Oral Session 1:10-2:50 in 137A)*

Relationships among the five (or six) extant lineages of seed plants are poorly understood. Current controversies focus mainly on four hypotheses differing in the placement of the unusual gymnosperm group Gnetales – Gnetales sister to angiosperms, Gnetales sister to remaining seed plants, Gnetales sister to conifers, and Gnetales sister to Pinaceae within conifers. To address these questions, we assembled a data matrix including sequence data from 61 plastid genes. Our matrix includes angiosperms, one representative of each other extant seed plant lineage and multiple outgroup taxa. In our analyses, these data behave similarly to those reported by others in that different results are obtained with different subsets of the data and under different phylogenetic methods. For example, Gnetales are embedded within conifers using maximum parsimony when 3rd positions are excluded but not when they are included. Maximum parsimony on all data supports the Gnetales basal tree, whereas maximum likelihood supports Gnetales within conifers. The surprise here is that, any time *Welwitschia* is placed within conifers in our analyses, it is sister to *Podocarpus* not *Pinus* (probably due to rate heterogeneity). Statistical tests indicate that the likelihoods of a *Pinus-Welwitschia* grouping and a *Podocarpus-Welwitschia* grouping do not differ significantly. However Gnetales basal trees do have significantly lower likelihood.

## **Classification and Distribution of Lake Types in Washington State**

**Rhoades, Janet; Perkins, Andrew**

*Faculty Mentor(s): Dr. Anthony Gabriel, Dr. Karl Lillquist, Geography and Land Studies/Resource Management;*

*Session: 8 (Oral Session 9:50-11:30 in 137B)*

The biophysical characteristics of lakes, such as hydrology, watershed size, flushing rate, size, shape, depth and trophic state, are principally established when a lake forms. In turn, these characteristics influence a lake shoreline's ecological functions, as well as their sensitivity to ecological changes. Using a series of scoping questions

outlined in a Decision Support System for Lake Shoreline Assessment developed for the Washington Department of Ecology, almost 1,200 lakes over 20 acres in size were classified into several principal types: coastal, crater, coulee, glacial flood scour, glacial drift plain, kettle, glacial scour, cirque, oxbow, and impoundment lakes. Accessed through GIS datasets, aerial photographs, topographic maps, and lake reports, primary variables used by the classification framework included physiographic zones, surficial geology, basin shape, hydrology, and degree of human modification. This classification provides for a better understanding the physical characteristics influencing shoreline functions and processes, as well as each lake type's relative sensitivity in terms of nonpoint pollution, changes to recharge, littoral zone impacts, and alteration of wave energy regimes. Statewide distributions of lake types are also presented and linked to patterns of lake ontogeny.

### **FlexArt: a Test of Creativity**

*Robinson, Ellie; Lutz, Lauren; Szymanska, Ewa; Sorrells, Robert*

*Faculty Mentor(s): Dr. Robert Sorrells, Psychology*

*Session: 22 (Posters in Ballroom A & B)*

This project assessed the reliability of a new test of creativity: FlexArt. Participants viewed images and reported evident relationships and the fit of other images within that relationship. Participants additionally completed a battery of standardized tests. Item analyses, reliability coefficients, and relevant correlations are reported. Future test applications are explored. Robert Sternberg's triarchic theory of successful intelligence consists of three interconnected sub-theories that deal with distinct but related aspects of human functioning (i.e. the componential, experiential, and contextual sub-theories). While the theory's componential sub-theory has been validated, the experiential and contextual sub-theories require further testing. Mental flexibility, defined by Sternberg, as the ability to cope with novelty and to establish automatized levels of information processing. This plays a critical role on each level of the triarchic theory. In other words, mental flexibility is a key factor in the successful application of information processing components to adapting, selecting, and shaping the environment in novel situations. Mental flexibility, a precursor to creative thinking, functions as the theory's unifying device that interconnects the three sub-theories and enables a switch between practical, analytical, and creative thinking.

### **The Augustan Dichotomy: Propagandistic Anti-hellenism and the Preservation of Roman Values**

*Roy, Alyson*

*Faculty Mentor(s): Dr. Jason Knirck, History; Dr. James Pappas, Education; Dr. Sura Rath, Douglas Honors College*

*Session: 4 (Oral Session 8:00-9:40 in 140)*

In the final years of the first century B.C., the Emperor Augustus developed a program for cultural renewal designed to restore Roman traditions and curb moral decline. In order for his program to succeed, Augustus had to deal with Greece. Greek culture was inherently at odds with Roman culture, for it was decadent, refined, and luxurious, while Roman culture focused on primitive agricultural traditions. Roman fear of Greek cultural influence was traditionally expressed through anti-Hellenism, for it was an effective means for revitalizing Roman tradition and morality. When Augustus set out to create his propaganda program, he employed a more nuanced form of anti-Hellenism, which condemned aspects of Greek culture still considered ruinous, while allowing aspects of Greek culture which were already engrained or could prove useful to blend with Roman tradition.

### **Investigation of Possible Impacts of Tourist Density, Behavior, and Decibel Level on Tibetan Macaque Aggression**

***Ruesto, Lucy; Sheeran, Lori; Matheson, Megan; Li, Jinhua; Wagner, Steven***

*Faculty Mentor(s): Dr. Lori Sheeran, Anthropology/Resource Management*

*Session: 5 (Oral Session 8:00-9:40 in 202)*

Where tourism is used as a method of managing endangered species and habitats, it must also be examined and regulated to mitigate against stressors potentially created by tourists themselves. Data were collected from 3-26 August 2005 from a group of Tibetan macaques (*Macaca thibetana*) in the Valley of the Wild Monkeys (VWM), Anhui Province, P.R. of China. Three variables were hypothesized to be correlated with monkey threats: tourist density, particular tourist behaviors, and tourist decibel levels. Results suggest correlations between tourist behavior and macaque aggression and tourist decibel level and macaque aggression. However, no statistically significant relationships were found between tourist density and macaque aggression. Further data analysis will consider individual tourist behaviors from a behavioral ethogram, and their effects on monkey aggression. Recommendations for park staff and managers to reduce negative impacts of tourism on this population include regulating tourist behaviors toward the monkeys and increasing education through signage about safe interactions with the macaques throughout the VWM, as human behaviors could be linked to subsequent aggressive monkey behaviors.



## **Crucifixion Cave - the Resurrection: A Photomonitoring GIS Procedure to Evaluate Visitor Impacts in the Last 15 Years**

**Sainsbury, Benjamin**

*Faculty Mentor(s): Dr. Robert Hickey, Resource Management/Geography and Land Studies*

*Session: 17 (Oral Session 3:00-4:40 in 137B)*

Crucifixion Cave, located southeast of Flagstaff, Arizona in the Coconino National Forest, was discovered in 1984 when a group of recreational cavers enlarged a blowing hole in a large basalt collapse. The group discovered over two miles of passages in the subsurface Kaibab Limestone and named the cave 'Crucifixion' in reference to historic graffiti near the entrance. From 1985 to 1988, exploration and survey of the cave was completed with special note of the rare resources within. In June of 1990, recreational cavers completed a photo-monitoring evaluation of the most sensitive areas of the cave and plotted their locations on a survey map. Since this time, the cave has been informally closed to recreational visitation by order of the Forest Supervisor. This project evaluated visitation to the cave in the last 15 years by comparing the photo results of 1990 to those of 2005. A GIS was created to plot the monitoring points and hyperlink the comparative images for streamlined analysis.

## **Fuzzy-Neural Network Predictions of ic50 Values for Potential hiv-1 Protease Inhibitors**

**Salim, Nicholas; Collar, Catharine; Abdul-Wahid, Sarah; Fabry-Asztalos, Fabry; Andonie, Razvan**

*Faculty Mentor(s): Dr. Levente Fabry-Asztalos, Chemistry; Dr. Razvan, Andonie, Computer Science*

*Session: 10 (Oral Session 1:10-2:50 in 135)*

Quantitative Structure-Activity Relationship (QSAR) is a powerful study for finding correlation between physico-chemical properties of known compounds to their biological activities; which aids in the discovery of highly potential inhibitory compounds for many illnesses. In this study, a fuzzy neural network (FNN) and multiple linear regression (MLR) models were used to obtain IC<sub>50</sub> predictions of novel HIV-1 protease potential inhibitory compounds. The predictive ability of these two models was investigated. Both the FNN and MLR were comparable to one another. The fuzzy IF/THEN rules were extracted from the optimized FNN. These rules show correlation between physico-chemical properties of compounds to their corresponding biological activities. Our results indicate that FNN and fuzzy IF/THEN rules are powerful modeling tools for QSAR studies.

## **Synthesis of 5,6-Dihydropyran-2-one Analogues as potential hiv-1 Protease Inhibitors**

*Salim, Nicholas; Noridomi, Kaori; O'Connell, Tracy; Fabry-Asztalos, Levente*

*Faculty Mentor(s): Dr. Levente Fabry-Asztalos, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

In medicinal chemistry, finding the best possible drug for enzymes responsible for diseases is crucial. We designed new HIV-1 protease inhibitors and performed a Quantitative Structure-Activity Relationship study (QSAR) using a fuzzy neural network to predict biological activity. This network was used to correlate physico-chemical properties of the designed structures to their biological activities. To validate our predictions and to develop potential new inhibitors, which could be used for further drug development, we are synthesizing some of the designed compounds.

## **Radio Frequency Identification use in Schools**

*Schill, Wyatt*

*Faculty Mentor(s): Dr. David Rawlinson, Dr. Robert A. Lupton, Dr. V. Wayne Klemin, Information Technology and Administrative Management*

*Session: 21 (Posters in Ballroom A & B)*

Radio Frequency Identification (RFID) is and has been utilized throughout the world for many functions. The use by retail giant Wal-Mart for tracking inventory has widened public knowledge of the technology. Recently, a number of schools have begun using RFID. These uses provide administrators with information such as where and when students get on and off a bus, attendance records in the classroom, and admittance to school-sponsored functions. In my research, I was unable to locate any scholarly papers on the subject of this technology being used in schools, and a minor amount in regular publications. Three US schools have implemented the technology with two being successful, and more are scheduled to implement RFID in the coming years.

## **Preparation and Attachment of Binding Molecules to a Silica Surface**

*Schiro, Alenda*

*Faculty Mentor(s): Dr. JoAnn Deluca, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

Inorganic materials such as silica gel have been used in template imprinting, a process that offers binding sites for specific chemical recognition. These tailor made receptor sites are capable of identifying and binding to molecules related to the template used in the imprinting process. The purpose of this particular study is to synthesize a guanidinium chloride using 1-H-pyrazole-1-carboxyamidine hydrochloride and 3-amino-1-trimethylpropylsilane. This compound will be attached to the silica gel surface in order to create binding sites for carboxylic acids.

## **Recycling and Canvas Bags: Can Charging People Increase Recycling?**

*Schmidt, Emily; Wederquist, Carman; Aydelott, Serena; Fallshore, Marte*

*Faculty Mentor(s): Dr. Marte Fallshore, Psychology*

*Session: 22 (Posters in Ballroom A & B)*

Loss aversion refers to the finding that people tend to work harder to avoid losses than receive gains, all things being equal (Shalev, 2002; Tversky & Kahneman, 1992). The present study examined loss aversion with varying monetary losses or gains in order to investigate which amount would result in optimum cooperation with regard to reusing shopping bags. Subjects rated one of six scenarios involving their willingness to use their own shopping bags in local grocery stores. Scenarios involved situations that would result in a financial loss (being charged 5, 15, or 25 cents per grocery store bag they used in a given shopping trip) and one presented situations that would result in a financial gain (receiving 5, 15, or 25 cents per grocery bag they recycled in a given shopping trip). In addition, we investigated whether or not subjects recycle was related to their willingness to use their own bags. We anticipate a significant interaction between loss aversion and recycling. In addition, we expect higher losses or gains to result in greater compliance. This finding is important because dwindling resources are making conservation, including using one's own bags, a necessary behavior for sustaining resources. Therefore, if we want to reduce plastic bags littering our cities and save resources, we might want to consider charging people for not using their own bags.

## **Spectroscopy and Kinetics: Determining Reaction Order via Colorimetry**

*Scott, Elizabeth*

*Faculty Mentor(s): Dr. Timothy Sorey, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

The purpose of this research is to identify, test, and utilize colorimetric chemical kinetic systems that are viable for inquiry based general chemistry laboratory curricula. Viability for colored chemical systems includes affordability and safety of chemicals and chemical waste disposal, as well as the support of educational goals for students' inquiry of kinetics. Colorimetry is the proposed spectroscopic method via MicroLAB's 10-Color Colorimeter for determination of reaction order. The outcome of this project is to identify several research grade colorimetric experiments that offer students an opportunity to gain hands-on experience with chemical kinetics.

## **Siderophore Producing Microorganisms in the Marine Atmosphere**

***Shank, Lindsey; Lenington, Matt; Moon, Curtis; Pinkart, Holly; Johansen, Anne***

*Faculty Mentor(s): Dr. Anne Johansen, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

Iron is a limiting nutrient for phytoplankton primary productivity in the open oceans where other nutrients are available in excess amounts. The main delivery pathway for iron to these areas is through the deposition of crustal derived aerosol particles that contain mainly insoluble biologically inaccessible forms of iron. As a response to low levels of bioavailable iron some bacteria have adapted a mechanism for sequestering and acquiring iron from their environment by synthesizing and secreting siderophores which are low molecular weight, high affinity iron chelators. Aerosol samples, collected for iron analysis over the South Atlantic Ocean in January to March 2005, were used to culture microorganisms on Chrome Azurol S (CAS) agar plates, which are specific for the detection of siderophore production. Siderophore production was positive in a number of samples. Results from standard biochemical tests including morphology and gram stain determination on isolated microorganisms are presented. A variety of microorganisms were cultivated using this method.

## **Preliminary Attempts at Taxonomic Identification of the Wenas Creek Mammoth**

***Shapley, Jake; Barton, Bax; Lubinski, Patrick***

*Faculty Mentor(s): Dr. Patrick Lubinski, Anthropology*

*Session: 22 (Posters in Ballroom A & B)*

In the summer of 2005 an interdisciplinary team of scientists and students conducted an initial excavation of a reported mammoth find located in the lower Wenas Creek Valley. Taking into account the age and size of the two recovered humeri, the possibilities are limited as to what animal they could have come from, and all are in the Order Proboscidea. Based on overall morphology there is little doubt the humeri are from a mammoth (*Mammuthus* sp.) rather than its distant cousin, the mastodon (*Mammot americanum*). In general, long bones are not ideal for differentiating closely related species, but previously published data suggest a significant difference in average total length among the three possible species of mammoth found in the Pacific Northwest: Imperial (*M. imperator*), Columbian (*M. columbi*) and Woolly (*M. primigenius*). Based on initial length measurements the Wenas Creek mammoth could be any of these, but chronologically it is dated too late to be an Imperial. Compared to published data for total length, the Wenas Creek humeri could be from either a small Columbian or large Woolly mammoth. However, Woolly mammoths have not been

found west of the Rocky Mountains. The overlap in humeri metrics between small Columbian and large Woolly mammoths suggests that recovery of additional long bones is unlikely to be any more diagnostic of species. Ultimately, only the discovery of associated molars at this site is likely to answer the question of species definitively.

## **Translations of Lorca; Sharing an Experience in Cross-Disciplinary Collaboration**

*Sherwin, Michael; Grases, Christian; Scherperel, Stefan*

*Department: Art*

*Session: 14 (Oral Session 1:10-2:50 in 202)*

My SOURCE presentation will address the potential and actualization of an interdisciplinary collaborative project, between the Photography and Music departments, that took place in February 2006. During the Fall term I was approached by the current Director of Choral Activities, Christian Grases, about combining visual media with a choral piece he was conducting for the Spring 2006 term, titled "Suite de Lorca". This contemporary choral piece fluctuates wildly, creating mysterious moods with its shifts in tones and tempos. After listening to the piece, I knew immediately I wanted to work with video rather than still images. To assist me with the video production I contacted a recent graduate from the BFA program in Photography, Stefan Scherperel. Stefan became a key addition to the project, providing insight with his ideas, and knowledge of video editing software. For the first stage of the project, Christian provided translations to the Spanish lyrics, while Stefan and I began drafting ideas for visual analogies. Then, Stefan and I spent three days in the field acquiring nearly two hours of footage, which was later edited to synchronize with the six and a half minute choral piece. The final installation consisted of imagery projected on two separate 9 ft. x 12 ft. screens placed on either sides of the choir. On February 26th the collaborative project was performed in front of a live audience in the Music school's Concert Hall.

## **A Preliminary Analysis of Historic Ceramics from a Late Nineteenth Century Chinese Community in Ellensburg**

*Simmons, Stephanie*

*Faculty Mentor(s): Dr. Patrick Lubinski, Anthropology*

*Session: 22 (Posters in Ballroom A & B)*

In 1989, CWU's Anthropology department excavated a section of downtown Ellensburg which was once the location of several Chinese businesses and residences

around 1890. A large number of artifacts were recovered, including a sizeable ceramic assemblage, but they were not analyzed prior to this study. During Winter Quarter 2006, these ceramics were revisited with intent to study the site and its associated material culture using the framework of historical archaeology, which combines information discovered from archaeological sites with historical sources to provide a clearer picture of the past. More than 500 ceramic sherds were refitted, grouped into vessels, and their attributes recorded. These ceramics date from about 1870 to 1920 based on embossed trademarks. Six vessels were identified as being Chinese export wares, and another 7 vessels may be Chinese in origin, but the majority of vessels were Euro-American in origin. Additionally, vessel forms were typical of Euro-American table settings, inconsistent with expected Chinese diets. Historical documents reveal that the Chinese made up less than 1% of Ellensburg's total population in 1900, and that the Chinese properties were not located in one particular "Chinatown" area. These factors may have put more pressure to assimilate into the dominant culture, explaining the degree of acculturation seen in the ceramic assemblage.

## **Elastic and Vibrational Properties of a Regular Tensegrity Structure**

***Smith, Anthony; Piacsek, Andy***

*Faculty Mentor(s): Dr. Andy Piacsek, Physics*

*Session: 6 (Oral Session 9:50-11:30 in 135)*

The word tensegrity is used to describe a class of free-standing structures made from an interconnected lattice of strings and rods arranged in such a way that no two rods touch. The elastic behavior of the structures is investigated in order to develop a model for wave propagation in this new medium. Several structures were assembled in a tower configuration, which consists of symmetrical layers having the same number of rods. The effects of three factors on the stress-strain relationship (stiffness) of the towers were measured: average tension in the strings, the number of rods per layer, and the number of layers. It was found that increasing the string tension increased the overall stiffness of the tower. It is expected that increasing the number of rods per layer will increase stiffness, while increasing the number of layers will have negligible effect. For every tower tested, a nonlinear stress-strain relationship was observed, with hysteresis also being exhibited. Based on these results, it is anticipated that wave propagation in tensegrity towers will exhibit nonlinear wave effects, such as harmonic generation and dispersion.

## **Population Monitoring of the Mountain Stream Frog (*Rana spinosa*) in Huangshan, China**

***Smith, Cailin; Wagner, Steven; Matheson, Megan; Sheeran, Lori; Li, Jinhua***

*Faculty Mentor(s): Dr. Steven Wagner, Biological Sciences*

*Session: 21 (Posters in Ballroom A & B)*

During the past decade, there has been an increased rate of decline of amphibians worldwide. While this decline is attributed to many factors, there have been few long-term studies of amphibian abundance to use as a baseline for assessing population viability. Therefore, we initiated a baseline mark-recapture study of the mountain stream frog *Rana spinosa* during August 2005 in Huangshan, China. Three different altitudinal stream reaches (lower, middle, and upper) were systematically searched during 1 survey days. Captured individuals were marked using alpha-numeric tags and their snout-vent length was measured. A total of 75 *R. spinosa* were captured (62 from lower, 13 from middle, and 0 from upper). Ten individuals were recaptured in subsequent surveys. All *R. spinosa* were recaptured in the same reach where they were first captured in. The Jolly-Seber method was used to estimate population abundance, which was less than 200 individuals. The combined small estimated home range and low overall population size suggest that the population may be vulnerable to local extirpation.

## **Milltown Dam Removal**

***Smith, Talitha***

*Faculty Mentor(s): Dr. Gina Bloodworth, Geography and Land Studies*

*Session: 20 (Posters in Ballroom A & B)*

Dam removal is one of the most recent controversial trends in water management in this generation. The Milltown Dam in Montana has been slated for removal. The grounds for this decision are based on evidence that the dam structure is a safety hazard that must be fixed. Sediment behind the dam is contaminated with pollutants from a nearby mine and must be transported out of the reservoir before the dam can be removed. Will the removal of the dam cause further damage to the ecosystem around the dam? In order to help find out what potential environmental impacts the removal of the Milltown dam might bring, I will examine a similar location, the Whitestone Dam, in Washington where a dam has already been removed. Looking at the removed Whitestone dam in Washington, you get some sense of what happens when a dam is removed. A geographical Information System (GIS) will be used to look at how the dam removal has released polluted sediments and that pollution has contaminated the surrounding landscape. This contamination can cause further



damage once the dam is removed. This study will give an understanding of how controversies arise when dams are discussed. It will also provide a comparative study of what has happened in the case of Whitestone as a lesson for what could occur at Milltown.

## **The Conversion of Private Timberlands to Residential Development in Upper Kittitas County, Washington**

***Snider, Todd***

*Faculty Mentor(s): Dr. Gina Bloodworth, Resource Management/Geography and Land Studies; Dr. Robert, Kuhlken, Geography*

*Session: 12 (Oral Session 1:10-2:50 in 137B)*

Record residential development is occurring throughout Upper Kittitas County, Washington. To accommodate sprawl, many of the area's private forestlands are being converted, parcelized, fragmented, and ultimately lost to residential development. It has become increasingly profitable to convert many of the region's historical timberlands to residential land use, making it extremely attractive for continued growth. The ecological and socioeconomic effects of forestland conversion have received minimal attention, and great uncertainty remains regarding drivers responsible for the associated changes. However, despite the quantity of conversions and uncertainties, no efforts have been attempted to comprehensively document these changes and relate them to the historical context of the area. The purpose of this research will be to improve our understanding of the changes in the land throughout Upper Kittitas County.

## **What Develops in the Development of Art Appreciation?**

***Sorrells, Robert; Chang, Katherine***

*Department: Psychology*

*Session: 22 (Posters in Ballroom A & B)*

Five studies examined the development of art appreciation. Manipulations included the effects of providing information, the emotionality of the art, the frame of reference for the viewer, and the experience of the art viewer. Results specify significant differences in the way experienced and naïve art viewers rated the stimuli. Students with varying art experience viewed images of abstract art and responded to forced- and open-choice questions. Manipulations included the type of information presented with the painting, and the emotionality of the painting (low and high; as determined by pilot studies). Participants rated each stimulus for creativity,

meaningfulness, and liking, and indicated their frame of reference for viewing the art. All viewers rated the emotional paintings as more aesthetically pleasing, and the advanced art students rated the paintings as more enjoyable, creative, and meaningful than the novices. The information provided to the participants systematically affected their judgments of aesthetic value. The novices were more likely than those with experience to rate the aesthetic value of a painting in reference to their own experience. Additionally, for the art novice, judgments of creativity, liking, and meaningfulness were significantly less correlated than those judgments made by the experienced art viewer, suggesting that the development of art appreciation coincides with the merging of these constructs in the mind of the art viewer.

## **FlexArt**

***Sorrells, Robert; Elizabeth Robinson; Lauren Lutz***

*Department: Psychology*

*Session: 22 (Posters in Ballroom A & B)*

Our goal in the current project was to create and assess a new test of mental flexibility (FlexArt) and compare it with other tests designed to measure flexible, divergent, and convergent thinking. FlexArt is an ideological extension of other purposed assessments of mental flexibility at the experiential level. FlexArt stimuli were reproductions of paintings, drawings, and photographs. Decision to employ two-dimensional art images in the test of mental flexibility had been dictated by a need to move from the artificial problem-solving towards reasoning with more natural concepts (External validity objective), and to present a multifaceted stimulus that favors analysis from versatile perspectives (novel situation objective). The current test required participants to apply the components of successful intelligence and mental flexibility to classify pictures according changing criteria. FlexArt asked questions (adapt, select, shape) about the interrelatedness among the art images and the fit of other images within a discovered relationship. This project reports the inter-rater reliability of the FlexArt test (.94), along with item analysis, and factor analysis used in refining the test. Additionally, we explored and proposed applications of the refined test in different populations.

## **Practical Solutions for Developing Jazz Rhythm Sections**

***Steinert, Brent***

*Faculty Mentor(s): Chris Bruya, Music*

*Session: 14 (Oral Session 1:10-2:50 in 202)*

The most important element in a jazz ensemble is the rhythm section, which commonly includes piano, guitar, bass, and drums. These instruments play together in order to establish a rhythmic and harmonic foundation. Unfortunately many music educators are not rhythm section players, and as a result many jazz rhythm sections lack the conceptual understanding needed to perform jazz in an authentic manner. Therefore, music educators are in need of additional training specific to developing jazz rhythm sections. Key elements of jazz pedagogy necessary for developing jazz rhythm sections include: learning the basic jazz styles, how to accurately perform each style, learning the language commonly used in jazz, and listening to professional recordings which provide a model for performance. By acquiring knowledge pertaining to rhythm instrument pedagogy and rhythm instrument performance practice, the ability to rehearse a rhythm section is greatly enhanced. The goal of this presentation is to summarize procedures and strategies music educators can use to expand their knowledge of jazz rhythm sections. In this session, special attention will be given to the piano and bass, and a listing of modern materials and media resources relevant to this subject will be made available.

## **Chinese Brush Paintings**

***Sun, Key***

*Faculty Mentor(s): Department: Law and Justice*

*Session: 22 (Posters in Ballroom A & B)*

This presentation includes three creative works I did with brush, ink and watercolors, depicting mountains, bamboo, and horses.

## **Alternative Representations of Stream-Channel Dynamic in the Naches River, WA: Hydraulic Assessment with a Management Focus**

***Swan, Luke***

*Faculty Mentor(s): Dr. Anthony Gabriel, Resource Management/Geography and Land Studies; Dr. Graeme Aggett, Dr. Karl Lillquist, Geography*

*Session: 12 (Oral Session 1:10-2:50 in 137B)*

Detailed, spatially explicit mapping of fluvial landscapes serves several important functions, including the delineation of baseline conditions for examining channel evolution, determining the impacts of land use change, and acting as a guide for stream habitat evaluation and restoration projects. In gravel-bed rivers this task is complicated by the dynamism of their complex, three-dimensional channel and floodplain morphology, a configuration that varies throughout space and time in

response to the fluctuation of both the frequency and magnitude of governing process variables (e.g., discharge and sediment supply). While recent work has successfully applied advanced geospatial technologies to refine mapping of gravel-bed fluvial environments, few approaches have sought to explicitly incorporate spatial and temporal variability and uncertainty, and thus do not map their complexity – information critical for effective management. The goals of this research are thus to: 1) determine the ability of new geospatial technologies and modeling approaches to explicitly incorporate the system's variability; and 2) demonstrate their utility as resource management tools. This research examines a reach of the Naches River, a wandering gravel-bed river located in central Washington state. Stream gauge records are used to calculate flow probabilities, and River2D, a two-dimensional, depth averaged, hydrodynamic model, is combined with a high-resolution LiDAR data set to compute inundation extent, depth, and velocity. Model output is imported into a GIS where it is visualized with image and terrain data and analyzed as a hydraulic time series utilizing fuzzy representation. Dynamic process-based maps are created and evaluated for their management utility.

## **Constraints on the Formation Conditions of Ellensburg Blue Agate and Moganite (SiO<sub>2</sub>)**

***Tebbe, Michelle***

*Faculty Mentor(s): Dr. Paul Hoskin, Geological Sciences*

*Session: 20 (Posters in Ballroom A & B)*

Moganite is a recently recognized silica (SiO<sub>2</sub>) polymorph and is one of the most abundant mineral phases of Earth's crust. Unlike the most common silica polymorph, α-quartz, which can form large single cm-sized crystals, α-moganite occurs intergrown with cryptocrystalline α-quartz. A number of past studies have shown that the amount of phase intergrowth can be as high as 80% (*i.e.*, moganite:quartz ratio). Despite high crustal abundance, moganite is only detected analytically, and very little is known of the geologic conditions under which moganite forms. To investigate the formation conditions of moganite, samples of eleven banded crypto- and micro-crystalline quartz nodules ("Ellensburg blue agate") from Teanaway Formation basalt were investigated by X-ray diffraction analysis. Data were collected between 18 and 23 Å, 2θ and spectra were modeled to determine the relative intensities of partially overlapping moganite and quartz reflections. The presence of moganite was found for 45% of analyzed samples with intergrowths of between 1 and 4 vol%. Moganite-bearing Teanaway basalts are incipiently altered and include low-crystallinity secondary Fe-oxy/hydroxides on surfaces and in vesicles indicating low temperature alteration. A similar study of agate-bearing units of the Deccan basalts, India, found that moganite did not occur in samples that contained a secondary mineral assemblage indicative of temperatures >220 Å, °C. It is inferred, then, that moganite

formation both in the Deccan and Teanaway basalts occurs at temperatures lower than 220 Å, °C and at low water:rock ratios.

## **Looking Past Faults: Correlation of the Chiwaukum Schist and the Tonga Formation, North Cascades, Washington**

*Tiedeman, Andrew.; Alm, Steve*

*Faculty Mentor(s): Dr. Paul Hoskin, Geological Sciences*

*Session: 20 (Posters in Ballroom A & B)*

The Nason Terrane is a major basement unit of the metamorphic core of the North Cascades. It is composed largely of the Chiwaukum Schist, former sediments of an accretionary prism. The Terrane is likely related to other units that crop out in British Columbia, Canada, being off-set by 80 to 190 km of right lateral movement along the Fraser River/Straight Creek Faults. The Schist was metamorphosed at medium *P* and *T* conditions prior to exhumation. It is faulted out on the west by the Straight Creek and Evergreen Faults. Between these two faults occurs the Tonga Formation, typically phyllitic metapelite and metagreywacke, which may be correlative with the Chiwaukum Schist. It is of regional significance to figure out whether or not these two units are correlative across the faults. To "look past the faults" we present the results of mineralogical and whole-rock analyses of the Tonga Formation. In addition and using thermodynamically calculated equilibrium phase diagrams, a tectonic model is developed that accounts for the intensity of metamorphism of the Chiwaukum and Tonga, and other field observations.

## **Geomorphic Characterization of a La Alberca Archaeological Site in Michoacan, Mexico**

*Trosper, Tabitha*

*Faculty Mentor(s): Dr. Lisa Ely, Geological Sciences*

*Session: 15 (Oral Session 3:00-5:00 in 135)*

Located in Central Mexico, La Alberca, a volcanic caldera in the Michoacan-Guanajuato Volcanic Field, is a site of ancient occupation. On an interior caldera wall prehispanic cliff paintings were discovered and below, the oldest known burial in the state of Michoacan. Paleoenvironmental details from the last 7,000 years in the rockshelter and -2,000 years from the caldera floor indicate that the area has been influenced by local volcanism and climate. The archaeological site is represented by a bimodal system of low and high sedimentation environments. The sedimentation patterns indicate that during low accumulation rates there are longer lasting periods of

standing water; in the high sedimentation patterns sediments are coarser, inferring a higher permeability, therefore less ponding. This bimodal system would have influenced human occupation within the caldera and also have implications on classic and post classic settlements that are under archaeological investigation outside of La Alberca.

### **Influence of the Built Environment on Physical Activity of Adults in a Small Rural community**

*Twaddle, Brent; Papadopoulos, Charilaos*

*Faculty Mentor(s): Dr. Charilaos Papadopoulos, Health, Human Performance, and Nutrition*

*Session: 21 (Posters in Ballroom A & B)*

The requirements to maintain regular physical activity are complex. It has long been suspected that the physical or built environment in which people live can promote or hinder physical activity. Objective: To compare environmental factors (e.g. presence of sidewalks, access to parks and walking pathways, presence of recreational facilities, etc.) that promote physical activity between older and younger adults residing in the same rural community. Methods: Fifty-three subjects completed a face-to-face interview about their perception of the environment in which they live and their physical activity habits. Pearson correlations were used to show simple relationships between variables. Discriminant analysis was used to determine differences between age groups and their perceptions of the environment. Results: Younger adults (23.0±2.4 years) expended 4,614±2,886 kilocalories (Kcal) per week during moderate-intensity physical activity whereas the older adults (78.8±8.1 years) expended 1,413±1,541 Kcal per week. A significant ( $p<0.05$ ) inverse relationship ( $r = -0.559$ ) was found between Kcal expended during moderate intensity physical activity per week and age. Both groups perceived their neighborhood and community as pleasant and safe to engage in physical activity. However, younger adults utilized private membership clubs and schools that are open for physical activity, while older adults relied more on sidewalks for their physical activity. Conclusions: These results suggest that older adults living in a small rural community prefer to be physically active around their neighborhood and that health promotion professionals should encourage home or neighborhood exercise programs for this population.

### **Biological Soil Crusts: Analysis of Monitoring Techniques at the Yakima Training Center**

*Tyler, Kevin*

*Faculty Mentor(s): Dr. Karl Lillquist, Resource Management*

*Session: 8 (Oral Session 9:50-11:30 in 137B)*

Biological soil crusts are valuable components of the soil because they enhance numerous soil functions. Resource managers, including those at the Yakima Training Center (YTC), have shown growing interest as to the ecological importance of soil crusts in relation to management decisions. The overall objectives of this study were to test several techniques for monitoring soil crust cover and composition in relation to YTC's Land Condition-Trend Analysis (LCTA). The research involved several interrelated steps: (a) use of several techniques to measure soil crust cover and composition; (b) collecting and analyzing related environmental variables including soil texture and chemistry, vascular plant cover, slope, and disturbance regime; and 3) utilizing community relationship software to analyze correlations between soil crust composition and environmental variables. Analysis results showed that use of soil crust morphological groups combined with the point-line intercept technique would be the most appropriate for sampling biological soil crusts along LCTA transects. Additionally, recommendations to YTC resource managers include qualitative monitoring techniques for biological soil crusts, validated by the use of point-line intercept sampling, appropriate training, and the use of an herbarium collection of biological soil crust voucher specimens.

### **Recruitment Viability, Habitat Analysis, and Proposed Management Strategies for *Margaritifera falcata* Populations in the Yakima River Basin, WA**

***Vasereno, Amy***

*Faculty Mentor(s): Dr. Gina Bloodworth, Resource Management/Geography and Land Studies; Dr. Allen Sullivan, Geography*

*Session: 8 (Oral Session 9:50-11:30 in 137B)*

Little is known about freshwater mussels in the Northwest, even though they have been documented to be ecologically and culturally significant in much of the world. In order to establish a knowledge base in this region of Washington State, I will sample the Umtanum, Coleman, and Naneum tributaries of the Yakima River for *Margaritifera falcata* populations. I will determine the presence or absence of mussels, the age of the identified populations by counting their growth rings (called annuli), and the habitat requirements of *M. falcata* within these streams by analyzing water quality and substrate data. I will produce an age-at-length regression line which can be used to extrapolate additional age information. I hypothesize that there are surviving populations in these streams, but that they will not have undergone recruitment since the loss of their salmonid hosts and the construction of impoundments. Then, I will travel to Scotland to study management techniques,

which have been successful in conserving the world's largest populations of *M. margaritifera*. Finally, I will apply these management strategies to the Yakima River Basin and make recommendations to the appropriate resource managers.



## **Pestilence and Death: Studies of Amphibian Declines in the Pacific Northwest**

***Wagner, Steven; James Johnson***

*Department: Biological Sciences*

*Session: 2 (Oral Session 8:00-9:40 in 137A)*

Pacific Northwest amphibians have been extirpated or have declined in parts of their ranges. The declines appear to be mediated by a complexity of anthropogenic stressors (e.g. ultraviolet radiation, pollutants, introduced species, pathogens) that interact synergistically to cause morbidity and mortality. Further, individual species appear to have varying sensitivity to different stressors and pathogens. Recently, our research has begun documenting a number of immediate factors contributing the decline of Washington amphibians. Because of the complexity of the crisis, we have been taking an interdisciplinary approach involving field and lab studies to investigate individual species responses. In addition, we have suggested measures to mitigate the spread of pathogens and requested that state resources be allocated to address this threat.

## **Using Geomorphic Techniques to Characterize Structural Geometry of Folding and Faulting, Yakima Fold and Thrust Belt, Washington.**

***Walker, Kurt***

*Faculty Mentor(s): Dr. Jeffrey Lee, Geological Sciences*

*Session: 20 (Posters in Ballroom A & B)*

The Yakima Fold and Thrust Belt (YTFB), central Washington, is defined by a series of east-west trending asymmetric folds and thrust faults that developed in response to north-south compressional stresses during the last 8 million years; the YTFB is still active today. Movement along thrust faults at depth drives vertical and lateral growth of the asymmetric folds throughout the area. To determine the recent development of the YTFB we used a set of ArcGIS tools to characterize the geomorphology of the anticlinal ridges and synclinal valleys between Ellensburg and Yakima. We used the drainage densities, lengths, and longitudinal profiles to characterize the geometry of folds (i.e. wavelength, amplitude, degree of asymmetry). This data allowed us to determine fold and fault geometry at depth, fold propagation direction, and areas within the YTFB that are experiencing recent deformation and uplift. Our research focused on Umtanum Ridge which we were able to determine is asymmetric to the north and propagating to the east near the Yakima River, but is asymmetric to the south and propagating to the west near I82. Correlating fold geometry with the locations of confirmed wind gaps, abandoned river channels, we established that

Yakima Ridge is asymmetric to the north and propagating to the west. These geomorphology techniques can be employed throughout the YFTB in order to better understand this active region.

## **Kinetics and Spectroscopy; Determination of Reaction Order via Turbidity**

**Warren, Cassandra**

*Faculty Mentor(s): Dr. Timothy L. Sorey, Chemistry*

*Session: 20 (Posters in Ballroom A & B)*

The purpose of this research is to explore and analyze chemical systems through kinetics that can be applied to general chemistry laboratory curriculum. The research is a systematic process made to support the student learning of kinetics through turbidimetric chemical systems. An experimental procedure that involves the use of computer-based laboratory interfaces will be created to explore turbidimetric chemical systems to benefit student learning. The study of turbidimetric reaction systems has many real-world applications that have the potential to engage student interest as early as general chemistry. Although turbidimetric reactions and kinetics are difficult concepts to teach and learn, the use of a simple yet purposeful procedure can help these concepts. Therefore, finding an appropriate chemical system so students can explore kinetics qualitatively is an advantageous research project.

## **Using XML and SVG to Generate Dynamic UML Diagrams**

**Watanabe, Miho**

*Faculty Mentor(s): Dr. Ed Gellenbeck, Computer Science*

*Session: 21 (Posters in Ballroom A & B)*

The Unified Modeling Language (UML) defines graphical diagrams used in software development to model object-oriented designs. UML diagrams provide different views into a software system and aid communication among software architects, developers, and customers. Traditionally, UML diagrams have been constructed using computer-aided drawing tools that remove much of the semantic meaning of the object-oriented design. Our research approach has been to model the object-oriented design using Extensible Markup Language (XML) and then to transform the XML into UML diagrams represented as Scalable Vector Graphics (SVG). One advantage of this approach is that the components of the object-oriented design are represented as a hierarchy of XML elements. This facilitates validated for correctness against a schema, exchange of the data over the Internet, and processing by software. The

Extensible Stylesheet Language (XSL) is used to dynamically transform the textual XML into SVG, itself a standardized dialect of XML and easily transportable over the Internet. As part of this research, we are developing a web-based interactive tool that allows users to create, manipulate, and share UML diagrams over the Internet. One of the main advantages of this tool is that users do not have to purchase and install specialized software to draw or view the UML diagrams. In addition, this tool hides from users the underlying complexity of the XML and SVG representations.

## **Natural History of the Ring-Neck Snake (*Diadophis punctatus*) and the Sharp-Tailed Snake (*Contia tenuis*) in Washington**

**Weaver, Robert; Darda, David**

*Department: Biological Sciences*

*Session: 16 (Oral Session 3:00-4:40 in 137A)*

We investigated the ecology of two snakes, the Ring-neck (*Diadophis punctatus*) and the Sharp-tailed Snake (*Contia tenuis*). A total of 135 snakes were collected from April-October 2002-2005 in three counties (Kittitas, Klickitat, and Yakima). Forty-five specimens of *D. punctatus* were collected in Oregon white oak (*Quercus garryana*) savannah, and along riparian zones within the shrub steppe zone. Specimens were diurnally active, with most collected from 1200-1500 h in April and May, and September, at air temperatures of 18-23 °C. Prey items of snakes included Western Skinks (*Eumeces skiltonianus*) and small Gartersnakes (*Thamnophis* spp.). Limited data indicates the diet of juveniles and hatchlings are earthworms and insect larvae. Reproductive data showed female *D. punctatus* to have enlarged follicles and/or ova from mid May to June, with hatchling specimens collected in late August and early September. Eighty specimens of *C. tenuis* were collected from March-October. Specimens were collected during the day (0900-1600 h) and at night (2000-0300 h), and at a wider range of air temperatures (10-32 °C). Studies show that *C. tenuis* is active on the surface only after rain fall. However, during this study several specimens were collected on the surface during the hottest, driest times of the season (July-August). Like *D. punctatus*, specimens of *C. tenuis* were collected in the shrub-steppe zone, but also within coniferous forests, and areas of human disturbance (agricultural, residential, and commercial areas). Female *C. tenuis* with enlarged follicles or ova were collected from April-July.

## **A Computational Approach to Understanding Magma Chamber Processes: Application of the Energy-Constrained Eruption, Recharge, Assimilation, Fractional Crystallization (EC-ERAFC) Model and MELTS Algorithm**

**Westrich, Ahnna**

*Faculty Mentor(s): Dr. Wendy Bohrson, Geological Sciences*

*Session: 17 (Oral Session 3:00-4:40 in 137B)*

Crustal assimilation, magma recharge, and fractional crystallization are important processes that can alter the characteristics (major and trace element, and isotopic signatures) of a magma body as it travels from its source to the surface. The Paraná continental flood basalts are located in southeastern Brazil, were erupted 135-119 million years ago, and form one of the largest continental flood basalt provinces on Earth. Using the MELTS algorithm (Ghiorso 1987, 1997), I modeled the thermodynamics of crystallization and constrained the abundance and composition of mineral phases and melt. This information was integrated with the computational energy-constrained eruption, recharge, assimilation, fractional crystallization (EC-ERAFC) model (Bohrson and Spera 2001, 2003; Spera and Bohrson 2001, 2002, 2004) to investigate the trace element and isotopic ratios. MELTS and EC-ERAFC results were compared to observed geochemical data of samples collected from the Moreira-Gramado road section (Hawkesworth et al. 1988). Best-fit major element trends from MELTS indicate that fractional crystallization played an important role in the formation of these lavas, and isotopic and trace element trends suggest that wallrock assimilation and multiple recharge events were also critical. Studies such as this one are critical to the understanding of quantitative models of magma chamber evolution, which, in turn, provide constraints on how the Earth's crust and mantle have evolved with time.

**Urban Growth in The Columbia Basin****Willauer, Joe**

*Faculty Mentor(s): Dr. Gina Bloodworth, Geography and Land Studies*

*Session: 3 (Oral Session 8:00-9:40 in 137B)*

The Columbia River Basin is a man-made oasis. Construction of mainstream dams on the Columbia River turned what was once an arid basin into a lush agricultural empire. Small towns quickly sprung up throughout the basin with this growth. My research will be analyzing the growth of Ephrata, a small Columbia basin town which owes its existence to the Columbia River irrigation project and the construction of Grand Coulee Dam. To explore the region I will be using aerial photography; I will be conducting a comparison of aerial photographs taken prior to Grand Coulee Dams construction, and comparing this to photos taken post-construction. To continue exploration, I will be classifying the areas and providing data on the different amounts of growth in the different classifications. I will also be using census data to monitor the statistical growth of the region. To display my data I will use GIS to construct several maps charting growths within classifications. With new Columbia

River projects proposed and the region rapidly expanding, this research will be important in both analyzing past growth and providing a structure for monitoring future growth.

## **Motherhood and Power in Toni Morrison's *Beloved***

***Wilson, Shannon***

*Faculty Mentor(s): Dr. Chris Schedler, English*

*Session: 9 (Oral Session 9:50-11:30 in 140)*

Feminist author Adrienne Rich's ground breaking text *Of Woman Born: Motherhood as Experience and Institution* claims that the societal belief of what constitutes motherhood is an oppressive construction of the patriarchy. Toni Morrison's novel *Beloved* depicts the historical denial of the essentialized experience of motherhood from African American slave women. For the main character Sethe, the claiming of motherhood is integral to the successful navigation of the painful psychological and physical journey from slavery to selfhood. In this paper, I will examine how Sethe's claim to the identity of mother provides her the fortitude to escape slavery. However, while Sethe initially finds power in the patriarchal identity of mother, her journey to selfhood cannot be complete until she establishes her own identity, not as separate from her position as mother but as primary to it.