

# The Mount David Summit

The Mount David Summit is an annual celebration of student research, artistic work, and community-based scholarship at Bates College. Each year students from all classes present their work to each other and to faculty, staff, family, and community members in a symposium format at the end of the winter semester. The Summit spotlights the rich and varied academic activities of Bates students across the disciplines, and honors the vibrant intellectual life of the college.

Named for the landmark "mountain" on the campus, the Summit is guided by the motto of the college

—*Amore ac Studio*—

loosely translated, With Love and Zeal, With Ardor and Devotion:  
devotion to scholarship, creativity, and the life of the mind.

The Mount David Summit is sponsored by the Office of the Dean of the Faculty.  
We are grateful to Ralph T. Perry '51 and Mary Louise Seldenfleur,  
who have been generous and devoted supporters of the Summit since its first year.

## ~ About the 2013 Summit ~

The 2013 Mount David Summit, held on March 29, features the research, creative work, and performances of students from all Bates classes. It is organized into four sessions, three in the afternoon and one in the evening. The presentation abstracts are published in this booklet; the schedule of events for the summit is available in a separate booklet or on the Web.

The faculty believes that each Bates student will develop into a scholar in his or her own right, and will be ready to articulate and defend his or her ideas in a public forum. The college's General Education program, major programs of study, and the senior thesis/senior project requirement are designed both to prepare students and challenge them to conduct original research and contribute to our knowledge of the world. Many students who present their work at the Mount David Summit are senior thesis writers, approaching the summit of their academic career at Bates. Their presentation—which might be a research poster or a short, 15-minute talk—represents hundreds of hours of work, remarkable dedication to their studies, and a synthesis of all that they have learned at Bates. Other presenters are at different points in this journey; they may be in the process of developing the skills and insights that will serve their thesis work in the future. The artists who participate in the summit—the poets, fiction writers, dancers, musicians, and photographers—bring to their work a combination of technique, cultural and intellectual context, ways of thinking and seeing the world, and raw talent that is nurtured in a liberal arts environment.

The role of faculty advisors in the kind of individualized education that is celebrated at the Mount David Summit is enormous. Faculty work one-on-one with seniors on the thesis; in this process they are both demanding and supportive, guiding research methods, thoughtful interpretation, and effective writing. Many Bates staff members—assistants in instruction, lab technicians, writing and quantitative reasoning specialists, museum curators, theater designers, digital media specialists, librarians and archivists, and community-engagement staff—also work closely with student-scholars. These members of the Bates community offer students a wide range of skills and expertise.



~ ABSTRACTS ~  
(in alphabetical order)

**Francesca Aborn '13**

Emily Kane, Sociology

***Healthy Food: The Newest Guard against Incarceration Aggression***

Previous research has provided evidence that serving healthy foods to incarcerated individuals strengthens their health status and lowers levels of aggressive behavior. This thesis explores issues surrounding the effect food has on inmates' health status and behavioral patterns in correctional facilities. The study explores the numerous positive features garden or farm programs have on inmates. Research was conducted through looking at incarceration facilities that changed the food distributed to inmates. Some incarceration institutions with farm or garden programs were explored. Primary source information came from three institutions. I visited and spoke to staff members jails in Auburn, ME, and Augusta, ME, and I spoke to the director of nutrition for the New York City Department of Corrections. There was some knowledge and acknowledgment of healthier foods and improvement of mood and behavior, as well as the success of garden and farm programs. Due to multiple barriers, however, not all incarceration facilities have been able alter the food they distribute and the programs they offer.

**Alexandra Abry '13**

Amy Douglass, Psychology

***Social Anxiety and Memory Conformity in Eyewitnesses***

Two experiments examined memory conformity in an eyewitness context which can produce devastating effects. The aim of these experiments was to determine whether state anxiety (Experiment 1) and trait anxiety (Experiment 2) affect memory conformity. Experiment 1 revealed that state anxiety was resistant to influence from a one-way mirror in the context of an identification decision, precluding a test of state anxiety's effect on memory conformity in this context. Experiment 2 examined anxiety as a dispositional variable by testing the differential effects of social avoidance on memory conformity. In the first phase, participants completed a measure of social anxiety and viewed 60 photographs of faces. Later that week, participants were paired and asked to look through 120 photos and indicate whether the photos were old (previously seen) or new (previously unseen). Participants were randomly assigned to one of three conditions: *no motivation*, *monetary incentive*, or *forced unanimity*. In the *no motivation* condition, participants were not given any instructions beyond the basic task instructions. Participants in the *monetary incentive* condition were told that the most accurate participant would receive a cash reward, and participants in the *forced unanimity* condition were told that they would have to engage in a face-to-face discussion to resolve discrepant answers, should any occur. The conditions were designed to direct attentional focus to cause socially avoidant individuals to be more likely (*forced unanimity*), equally as likely (*monetary incentive*), and less likely (*no motivation*) to engage in memory conformity, when compared to non-socially avoidant individuals.

**Canice Ahearn '13**

Karen Palin, Biology

***Increasing Exclusive Breastfeeding Practices in Somali Mothers Living in Lewiston, ME***

Breast milk provides the optimum nutritional benefits, immunological defenses, and neurodevelopmental benefits for an infant. Breastfeeding enhances a mother's postpartum weight-loss and acts as a natural contraceptive. Recent work has shown that the majority of Somali women living in Lewiston, ME, supplement breast milk with formula beginning at the day of birth. This is known to decrease the length of time a mother breastfeeds. Data about local women's breastfeeding practices were obtained in home visits and used to determine the content for culturally sensitive educational workshops. This thesis work aims to increase the knowledge about breastfeeding benefits and the possible effects of supplementation for both mother and baby. Through educational workshops, this knowledge will be shared with the mothers to increase exclusive breastfeeding rates among the Somali immigrant mothers.

**Kathryn Ailes '14, Catherine Strauch '14, and Devin Tatro '14**

David Das, Office of Off-Campus Study

***Getting Engaged Abroad***

Have you ever wondered what Bates students do outside the classroom while abroad? In this session, three Bates students share their experiences of how they became actively engaged in the host culture while studying in Scotland, Ireland, and Uganda.

**Joshua Ajamu '14**

Stephen Sawyer, Office of Off-Campus Study

***Changing Africa through Its Youth***

My interests in public health and social policy led me to study in South Africa. The program focused on the correlation between policy making and public policy, and took me outside the classroom. I spent three weeks at the African Leadership Academy making videos and researching the organization. This was the highlight of my experience in South Africa. My presentation focuses on my research about how the organization is working to improve the continent through youth empowerment.

**John Albanese '16, Emily Foden '14, Nolwazi Ngwenyama '16, and Conor Smith '14**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

***Conserve to Preserve: How Sub-Saharan Africans Protect Their Ecosystems, Cultures, and Communities***

Philosophies behind conservation in different African nations vary almost as much as the ecosystems they are trying to protect. This diverse range of rationales covers everything from a desire to preserve the cultural heritage of a nation to conservation for profit and the benefit of local people. We explore these differences by highlighting three key examples of styles of conservation: The Lake Nkuruba Nature Reserve in Uganda, the Burunge Wildlife Management Area in Tanzania, and the Khoisan reservations in South Africa, Botswana, and Namibia.

Though the three are quite different, we have found recurring themes that represent the fundamental aspects of conservation.

### **Eleanor Anaclerio '13**

Xing Fan, Chinese

#### ***Ai Weiwei and the Art of Politics***

For my senior thesis I researched the life and work of famed Chinese dissident artist Ai Weiwei. Through an analysis of his work and the political context of modern China, I argue that his art, known for its highly politicized character, was simply successful contemporary art, and the oppressive political environment of modern China adds the layer of dissidence and revolutionary power. While Ai Weiwei did not choose a life of dissidence, he has not shied away from it either, and his continued struggle with the Chinese government shows a passion for his work, for freedom of expression, and his hope for future generations of Chinese people.

### **Hannah Archibald '13**

Lee Abrahamsen, Biology

#### ***The Effects of Hyperbaric Oxygen on Chronic Wound Biofilms***

Chronic wounds are significant public health problem in the United States. One method of treating them is hyperbaric oxygen (HBO), a treatment in which the patient is put in a high-pressure chamber and breathes 100% oxygen. Chronic wounds are often infected, and the majority of them have bacterial biofilms present, making the effects of hyperbaric oxygen on chronic wound biofilms important to investigate. This study examined the effects of HBO treatments on planktonic cultures and biofilms made up of *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Alcaligenes faecalis* by exposing them to 100% oxygen at 2 atm and comparing the growth to that of controls. We found a shift in the proportions of bacteria present in our experimental cultures, with *S. aureus* present at a higher proportion in the treated biofilms. These results suggest that HBO treatments may affect the interactions between the bacterial species infecting chronic wounds.

### **Jenna Armstrong '15, Lila Chalabi '15, Lydia Merizon '16, and Christina Stiles '15**

Bonnie Shulman, Mathematics

#### ***West Nile Virus Epidemic***

In 1999, a West Nile virus epidemic broke out in New York and spread to 46 other states by the end of 2003. This epidemic sparked many concerns about how disease spreads and the impact it has on the human population. As a result, there was a surge in mathematical research on the spread of epidemics. Mathematicians helped build models explaining how epidemics spread and how they can be prevented. We decided to look at one of these models,  $R_0 = \frac{ab}{\mu_A} \cdot \frac{ac}{\mu_V + g} \cdot \frac{S_{M_0}}{N_{B_0}} \left( \frac{k}{k + \mu_A} \right)$ , created by Mark Lewis and Marjorie Wonham. If  $R_0 < 1$ , the disease will die out, but if  $R_0 > 1$ , then there will be an outbreak. We examined each of the parameters in the model and explored what would happen with as they varied. We also studied the differential equation,  $\frac{dS_B}{dt} = -abI_M \frac{S_B}{N_B}$ , where  $S_B =$  susceptibles,  $I_M =$  infected female mosquitos, and  $N_B =$  population, and investigated the effects of manipulating the parameters on the long term progress of the disease. These models can shed light on important issues regarding the spread of infectious diseases and are important in expanding our understanding of epidemics.

### **Bernard Arnell '13**

Todd Kahan, Psychology

#### ***Perceptual Load and Music: Does a Change in Perceptual Load in One Modality Affect Performance in Another?***

Perceptual load theory combines the early and late views of attentional selection into a unified theory. Research (Lavie, 2005) has shown that under conditions of high perceptual load, filtering of irrelevant stimuli happens early in the processing stream, while low perceptual load results in late filtering. This study aims to explore whether perceptual load is affected across sensory modalities. It is hypothesized that listening to music while performing a visual task with distractors will be analogous to a high perceptual load condition, and distractor influence will be reduced when compared with the same task completed in silence (low load). If validated, these findings could have broad implications for reducing distraction in daily activities.

### **Clay Baldo '13**

Xing Fan, Chinese

#### ***Picturing the Enemy During the Great People's Cultural Revolution***

My thesis is focused on Chinese political propaganda from the Cultural Revolution, a time of great turmoil in China. During the campaigns of the Revolution, many politicians and ideas were labeled as enemies of the Chinese Communist Party. My thesis explores the implications behind how enemies are defined and how they are portrayed in Chinese propagandist art.

### **Gintare Balseviciute '15, Natacha Danon '15, Eliza Kaplan '15, Leah Schulz '14, and Adnan Shami Shah '15**

Loring Danforth, Anthropology

#### ***Bates to Saudi***

In this panel, five students who travelled to Saudi Arabia during Short Term 2012 discuss different aspects of contemporary Saudi society and culture. We draw on our experiences in Saudi Arabia and on research we have done since we have returned. We want to confront the misconceptions many Americans have about Saudi Arabia. We also want to discuss the unexpected and more personal aspects of Saudi culture that we would not have experienced if we had not visited the Kingdom. Topics include women's clothing, the foreign work force, youth culture and social change, gender mixing, and contemporary Saudi art. We also discuss the impact of Wahhabism on Saudi religious and social life.

### **Christopher Barr '13**

T. Glen Lawson, Chemistry

#### ***The Relationship between High-Risk HPV E6, Cell Immortalization, and Cervical Cancer***

High-risk HPV (16&18) DNA is found in nearly 100% of cervical cancer specimens. HPV has a remarkably simple genome, coding for just eight proteins, yet its presence is clearly tied to cervical cancer. One of these eight proteins, E6, has a profound effect on the immortalization and subsequent carcinogenesis of infected cells. E6 has been shown to interact with two key tumor suppressors, p53 and Bak. E6 also interacts with E6AP, and this E6/E6AP complex mediates the ubiquitylation and degradation of these tumor suppressors. Furthermore, E6 has been demonstrated to interact with both the promoter for hTERT, the catalytic subunit of telomerase, and the activated telomerase complex. The presence of E6 both increases the transcription rate of hTERT and the activity of the telomerase complex. I hypothesize the presence of E6 will inhibit tumor suppressant proteins and promote telomerase

activity, thus immortalizing the cell. Once immortalized, cells can undergo a great deal of mutation that often results in uncontrolled replication and cancerous growth. This process is beneficial to the virus as cellular immortalization aids in viral proliferation.

#### **Eric Barry '13**

Beverly Johnson, Geology

#### ***A Comparison of the Major Ion Chemistry of Two Maine Watersheds, Pleasant River (Bethel, ME) and Stetson Brook (Lewiston, ME)***

This study compares the major ion water chemistry ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{+}$ ,  $\text{Na}^{+}$ ,  $\text{K}^{+}$ ,  $\text{HCO}_3^{-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{Cl}^{-}$ ) and nutrient levels of two watersheds in Maine. Water chemistry is largely determined by rock weathering, and can be severely altered by humans in many ways including through inputs of road salt, detergents and fertilizers. The Pleasant River watershed near Bethel, ME, is over 87% forested with less than 2% developed land. The Stetson Brook watershed in Lewiston, ME, is 56% forested with over 24% developed land.  $\text{Ca}^{2+}$ ,  $\text{Na}^{+}$ ,  $\text{HCO}_3^{-}$ , and  $\text{Cl}^{-}$  were the most abundant ions in both watersheds. There were higher concentrations of all major ions and increased levels of nutrients ( $\text{NH}_4^{+}$ ,  $\text{NO}_3^{-}$ ,  $\text{PO}_4^{3-}$ ) in the Stetson Brook watershed relative to the Pleasant River watershed. Of particular interest is the fact that  $\text{Ca}^{2+}$  and  $\text{Na}^{+}$  are the dominant cations in both watersheds, and concentrations of these ions in the Stetson Brook are approximately five times greater than in the Pleasant River. The differences in these major ion concentrations can likely be attributed to anthropogenic impacts because of the differences in land use between the two watersheds.

#### **Kristen Barry '15 and Kristen Poulin '13**

Bonnie Shulman, Mathematics

#### ***Modeling HIV Infection and the AIDS Epidemic***

It is estimated that over 34 million adults and children are currently living with HIV/AIDS worldwide. This staggering number, in conjunction with the nearly 35 million related deaths since the disease's outbreak in the early 1980s, has placed the HIV/AIDS epidemic among the worst in recorded history. Though significant emphasis has been assigned to development of a cure as well as to preventative measures, it is also important to examine the spread of HIV/AIDS from epidemiological and immunological perspectives. Using mathematical models, it is possible to elucidate how the disease spreads, not only through the world population, but also through a single human body. By establishing this multifaceted image of HIV/AIDS, we are able to identify key parameters that govern the stability of an individual's immune response to the viral infection, as well as the large scale population parameters that contribute to the rapid spread of the disease. Understanding these key elements is crucial to establishing appropriate protocols and prevention methods for not only HIV/AIDS, but for other large-scale viral epidemics.

#### **Allison Beaulieu '13**

T. Glen Lawson, Chemistry

#### ***Effects of Mutant Ubiquitin in the Ubiquitin-26S Proteasome System of 3C Protease in the Encephalomyocarditis Virus***

The *Picornaviridae* family, which includes *encephalomyocarditis virus (EMCV)*, causes a wide array of human and animal illnesses. The EMCV 3C protease catalyzes many of the cleavages required to obtain mature viral proteins and also helps optimize host cell support for virus replication. The ubiquitin-26S protease system (UPS) limits the 3C protease

concentration by tagging the 3C protease with a ubiquitin chain, which signals the protein for degradation by the 26S proteasome. The ubiquitin chain is elongated through subsequent attachment between lysine residues. The K48 linkage is the most commonly used linkage for this degradation pathway. The objective of this research was to determine whether ubiquitin chain elongation can occur without the K48 linkage in the labeling of EMCV 3C protease with ubiquitin for protein degradation. A ubiquitylation assay using ubiquitin lysine substitution mutants, SDS-PAGE, and Western blot were used to visualize lysine linkages *in vitro*. A polyubiquitin ladder on the Western blot showed chain elongation of the K48R and K480 ubiquitin mutants with the E2 enzymes UbCH7 and UbcH5 mix. Ubiquitin can be attached to EMCV 3C protease through lysine linkages other than K48. The K48 linkage is the most common ubiquitin chain linkage for protein degradation by UPS. However, after substituting arginine for a lysine residue, disallowing the ubiquitin chain to form linkages at K48, polyubiquitylation still occurred. Therefore, there are other linkages in the polyubiquitin chain that may also contribute to degradation of EMCV 3C protease by the host cell or serve other cellular purposes. Understanding this portion of the viral replication pathway is essential in determining methods to combat illnesses caused by the viral *Picornaviridae* family.

#### **Emily Bechtold '13**

Donald Dearborn, Biology

#### ***Effects of Habitat Diversity on Genetic Variability of the Jefferson Salamander***

Habitat fragmentation is a leading cause of genetic isolation resulting in decreased fitness of organisms. Amphibians have the highest proportion of species threatened to any other group of animals, leading to questions about the effects of landscape variables on genetic isolation and gene flow. Samples were collected from 122 *Ambystoma jeffersonianum* (Jefferson salamander) from different vernal pools in Pennsylvania. Genetic variation of these individuals was measured using microsatellite analysis at eight different loci for each individual. Genetic variation from each pond was then compared with the surrounding landscape of the pond to determine if landscape variables affected genetic variation. This information is important to help guide conservation efforts of vernal pool animals, but more research in the genetic variable of other vernal pool inhabitants is needed to help create effective conservation guidelines.

#### **W. Evan Beinecke '14, Mariya Manahova '14, and Zena Sabath '14**

William Seeley, Philosophy

#### ***Consciousness Studies***

The lens of consciousness shapes our experience of the world, yet a complete understanding and objective articulation of the inner workings of the mind are beyond our grasp. In the field of cognitive science, philosophical questions of consciousness ground empirical investigations of awareness, perception, orientation, assignment of meaning and understanding. Thus, the study of consciousness seeks to identify and understand the interaction between first-person, phenomenologically rich experiences of "qualia" and other accounts of what-it's-like, with the empirical third-person account of modern cognitive science. Over the course of a semester, we have engaged with the literature of major scientific and philosophical accounts of consciousness and have produced a website to serve as a resource for those wanting to acquaint themselves with the field.

As there is a vast wealth of theories, much still remains to be done, and we hope to continue to developing the site as our knowledge of the subject deepens.

### **Andria Bhagwandeem '15**

Leslie Hill, Politics

#### ***Sexual Violence and State Accountability: Citizens Put Women on the Agenda***

The gruesome rape and death of a woman in India sparked national protests against the state. Protesters charge that the police routinely ignore reports of rape and that state officials fail to halt sexual violence against women because of social norms of male dominance. Can the Indian state be held accountable for protecting all of its citizens? My research examines citizens' proposals and identifies existing challenges to reducing sexual violence against women. If protesters succeed in holding the state accountable for women's security, India could become a model of women's empowerment.

### **Gabriel Borland '13**

William Ambrose, Biology

#### ***Timing of Growth Line Deposition in the Soft-Shell Bivalve Mya Arenaria***

Understanding how the commercially important soft-shelled bivalve *Mya arenaria* grows is economically and ecologically important. The accreting tissue of many phyla is known to deposit sequential growth lines during growth, which can contain detailed information on the organism's physiological state as well as their surrounding environmental conditions. My study sought to determine the timing and stimulus of growth line deposition in the chondrophore of *M. arenaria*. Samples were collected monthly from June 2011 to February 2013 from Maquoit Bay Brunswick, ME (Latitude 43° 50'39" N and Longitude: 070° 01'11" W). Chondrophores were embedded in epoxy resin and cut along the axis of maximum growth. The samples were finely polished and then imaged using a Nikon stereoscopic zoom microscope SMZ1500. I also correlated the timing of growth line deposition with environmental conditions such as surface water temperature, chlorophyll, precipitation, and salinity that could explain the cause of deposition.

### **David Born '13**

Rachel Austin, Chemistry

#### ***Structural and Mechanistic Characterization of the Integral Membrane Non-heme Diiron Protein, Alkane Monooxygenase, from the Oil-degrading Bacterium, Alcanivorax borkumensis***

Structural and mechanistic insight into the non-heme diiron proteins will likely lead to advances in bioremediation, biomimetic catalysis, and rational protein engineering. Iron metalloproteins are capable of catalyzing a wide variety of chemical reactions. The non-heme diiron proteins represent a distinct class of metalloproteins able to activate molecular oxygen and perform key reactions in biological systems including alkane C-H bond oxidation, alkene epoxidation, and aromatic ring hydroxylation. This thesis focuses on the structural and mechanistic characterization of the integral membrane non-heme diiron protein, alkane monooxygenase (AlkB), from the oil-degrading bacterium, *Alcanivorax borkumensis*. The purification of active AlkB was optimized and crystallization methodology was developed with the goal of complete structural resolution. In combination with work on the other diiron proteins, it may be possible to develop a coherent

model with which to explore the unique chemistry of this metal-active motif.

### **Christopher Boyd '13**

Amy Douglass, Psychology

#### ***Examining Perry***

In a 2012 United States Supreme Court ruling, the Court found that for cases with eyewitness identification testimony, suggestive identification procedures only warranted pre-trial hearings when suggestion arose from police actions (Perry v. New Hampshire, 2011). Current research examines the ruling of the Court by manipulating the source of a suggestive lineup procedure as well as the composition of the lineup itself. This research measures the influence of intentionally biased procedures on witnesses' identification. Participants watched a video of a fabricated carjacking, and then attempted to identify one of the culprits from a provided lineup. Participants were told that the (biased) lineup was either actively constructed for ease, or composed using the best available photos. Following this instruction, they viewed one of two target-absent lineups, where two individuals matching the culprit's description were added with either highly dissimilar, or somewhat similar fillers (Charman, Wells, and Joy, 2011).

### **Stephanie Boyle '13**

Michael Sargent, Psychology

#### ***Reactions to Anti-Egalitarian Humor and Regulatory Focus Theory***

Regulatory focus theory examines the ways people seek pleasure and avoid pain by proposing two different styles: promotion-focused (eager to experience positive outcomes) and prevention-focused (vigilant against negative outcomes). Studies have shown that high regulatory fit, when a person's actions or experiences match their regulatory focus orientation, increases a person's enjoyment of an action. The current study examines the role one's regulatory focus and the framing of egalitarianism (positively or negatively) play in reactions to anti-egalitarian humor (e.g., sexist jokes). I predict that when participants' regulatory focus condition is congruent with the framing of egalitarianism, participants will experience such humor as more offensive and less funny. To test this hypothesis, participants' regulatory focus was primed with a writing task after which they were asked to complete a survey and rate their reactions to different videos, including a public service announcement framing egalitarianism positively or negatively and two anti-egalitarian jokes.

### **Michaela Brady '14, Andrew Carranco '14, Emily Clark '15, Michael Creedon '15, Charles Munn '14, and Nicholas Steverson '15**

Dolores O'Higgins, Classical and Medieval Studies

#### ***Plautus's Captivi***

Titus Maccius Plautus, widely known today as Plautus, is one of the most renowned poets of the Roman classical age. The *Captivi* (*The Captives*) melds the Plautine comic tradition with serious issues. An old man tragically loses his two sons; one is kidnapped in childhood, the other is taken as prisoner in war. In an attempt to reclaim the son he still knows, the father unknowingly risks the life of his missing son. In a case of mistaken identities, tricky slaves, and a twisting storyline, the *Captivi* captures audiences within its dark comedic grasp. Students in LATN 202 (Introduction to Latin Poetry) undertake this great work in an attempt to convey both the comedic and serious themes it was written with centuries ago. Performing the

Prologus (Prologue) in Latin at this year's Mount David Summit, the students incorporate their own humor into the play with an original English translation in the backdrop, combining the serious questions of slavery and prisoners of war with Plautus's comedic voice.

#### **Lucy Brennan '14**

Stephen Sawyer, Office of Off-Campus Study

##### ***TIPNIS: Development or Conservation***

Currently in Bolivia there is a debate over the future of TIPNIS, *Territorio Indígena y Parque Nacional Isiboro Sécuré*. My research investigated the various paradigms and perspectives of the debate. First, I explored the need for development in Bolivia so this underdeveloped country can compete in a global capitalist arena. I examined the ways in which the construction of a highway would further this end. I explain the laws and decrees that have been signed in order to initiate and legitimize this project. Meanwhile, a strong movement in opposition to the construction of the highway works on behalf of conservation of the environment, natural resources, and the indigenous communities inhabiting the territory. The campaign has carried out marches, demonstrations, and other means to express its opposition to highway construction. The research explains the need for a consultation and the constitutional conditions for such a process. In order to avoid a lose-lose or win-lose situation, it is imperative that the sides arrive at an accord through the use of a consultative process or the development of an alternative route to the highway Villa Tunari-San Ignacio de Moxos.

#### **Sarah Brooks '16, Gilbert Brown '15, Leah Humes '16, and James Walsh '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

##### ***Blood, Exploitation, and Murder, All for a Cell Phone?***

From illegal mines of the eastern Democratic Republic of the Congo, mine workers and civilians endure minimal wages, inhumane living conditions, and routine violence in order to harvest the mineral cassiterite, a component of all mobile telephones. In 2010, the United States passed the Dodd-Frank Wall Street Reform and Consumer Protection Act to better regulate the trade of cassiterite, ensuring American corporations are not supporting illegal mines and militant groups with their purchases. With no way of tracking the origin of cassiterite once harvested, however, major electronic companies including Nokia, Apple, and Nintendo continue to purchase with impunity the illegally mined mineral. Employing on the ground perspectives alongside professional research and analysis, we explore the origins and history of this conflict, what is going on now, and what effect, if any, U.S. law has had on the cassiterite trade and living conditions in the region.

#### **Blaine Brown '13**

Lee Abrahamsen, Biology

##### ***Examining the Effectiveness of Antimicrobial Solutions in Food Service Facilities***

The proper sanitation of food-service facilities is an essential public health measure due to the risk of microbial infection associated with food production and interpersonal interactions in common spaces. Improper hand hygiene and bacterial contamination of surfaces in dining facilities contribute to both fomite and interpersonal microbial transmission. The disinfectants and sanitizers used in these facilities control contamination and can help decrease pathogenic transmission. Samples of bacteria on preparation and presentation surfaces and utensils from the Bates College Dining Commons were obtained

through sterile swabbing and identified to the genus level. The efficacy of disinfectants and sanitizers used by the Bates College Dining Services staff were tested on each surface from which bacteria had been identified.

#### **Devon Brown '14, Alexander Francis '14, Matthew Perejda '14, and Brenton Talbott '14**

Bonnie Shulman, Mathematics

##### ***Three-species Lotka-Volterra Predator Prey Model***

In this study, we look at an ecosystem as a whole, focusing on three-species interactions within the ecosystem, using a matrix to order a hierarchical ecosystem with a large number of variables or species. This analysis is integral to understanding and ordering the structure of the ecosystem. Lotka-Volterra equations that provide the dynamical system model to investigate the three-species interactions is the backbone of our project. Using this system of differential equations, we analyze how each species alters the other population levels within the system. The flexibility of this system even allows us simulate drastic events, imitating shocks to the system and isolating their effects. We seek the equilibrium points necessary for stable populations and thus a stable ecosystem.

#### **Gilbert Brown '15**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

##### ***Blood, Exploitation, and Murder, All for a Cell Phone?***

-- see Sarah Brooks '16 for abstract

#### **Jennifer Brown '13**

Jennifer Koviach-Côté, Chemistry

##### ***Synthesis and Antioxidant Activity of Phenylpropanoid Glycoside Analogs***

Phenylpropanoids (PPs) relieve stress in plants by acting as antioxidants, or free radical scavengers. Because excess free radicals in humans has been linked to ailments such as cancer, Parkinson's disease, and Alzheimer's disease, the antioxidant power of the PPs makes them an important topic of study. This work examines the mechanism by which PPs scavenge free radicals. Seven compounds were synthesized, each containing one, two, three, or four PPs. The compounds were then analyzed for their radical scavenging activity by calculating the number of radicals scavenged after a fixed amount of time in both a proton rich and a proton deficient solvent. In the proton rich solvent, compounds with two and three PPs scavenged approximately twice and three times as many free radicals, respectively, as the compounds with only one PP. Compounds with four PPs, however, scavenged slightly less than four times as many free radicals as the compounds with one PP. Additional experiments in a proton deficient solvent will hopefully elucidate more information about the mechanism by which PPs scavenge free radicals in biological systems.

#### **Ashley Brunk '13, Eryn Gilchrist '13, Joanna Harran '13, Mollie Kervick '13, and Ashley Lepre '13**

Robert Farnsworth, English

##### ***Literary Reading by Creative Thesis Writers***

In this session, creative thesis writers will read selections of their work. The reading will feature a wide range of literary works by dedicated, emerging writers.

**Jordan Buetow '14 and Sean Woods '14**

Bonnie Shulman, Mathematics

***Modeling Lobstering Policy in Maine***

Modeling lobstering policy is relevant to the economy of Maine; it is also important to properly maintain our ecosystem and livelihood without damaging it. Over-fishing lobster can have a detrimental impact on the lobster population, which in turn, can have a domino effect on the entire ecosystem. Using the difference equation,  $N_{t+1} = N_t e^{r(1-N_t/P)}$ , developed by W. E. Ricker, we describe the dynamics of the lobster population in Maine. The life cycle of the American lobster, *Homarus americanus*, dictates the model. The number of eggs laid is proportional to the number of adult lobsters. In the early stages of life, lobsters are subject to predation. We will assume that lobsters are eaten at a rate proportional to their number. Letting  $H$  be the new generation of hatched lobsters, we know that the rate of hatched lobsters equals  $\frac{dH}{dt} = -cH \Rightarrow H = H_0 e^{-ct}$  where  $H_0$  is the initial population and  $c$  is the constant of proportionality. After a time,  $T = KN_t$ , the hatched generation is no longer preyed on so the population stops decreasing. Through further exploration we arrive at the difference equation,  $N_{t+1} = N_t e^{r(1-N_t/P)}$ . The purpose of this model is to help determine a lobstering policy that maximizes lobster fishing each season without jeopardizing the lobster population for future seasons.

**Jenna Burke '13**

T. Glen Lawson, Chemistry

***Purification Optimization of the UbcH5 and UbcH7-Dependent E3 Ubiquitin Protein-ligase that Targets the EMCV 3C Protease for Ubiquitylation and Degradation***

The encephalomyocarditis virus (EMCV) 3C protease is rapidly degraded by the cellular ubiquitin-26S protease system (UPS), which limits the 3C protease concentration that develops in infected cells. At least three pathways participate in EMCV 3C protease polyubiquitylation, a prerequisite to degradation by the 26S proteasome. Because a complete understanding of 3C protease concentration regulation in EMCV-infected cells requires the identification and characterization of the ubiquitin system enzymes involved in 3C protease ubiquitylation, we have developed methods to optimize purification of the UbcH5 and UbcH7-dependent ubiquitin-protein ligases (E3) that target the EMCV 3C protease. Here we report steps of the E3 ligase purification optimization that includes methods of ammonium sulfate fractionation, S300 size exclusion chromatography, anion exchange chromatography, and UbcH5 and UbcH7-dependent affinity chromatography. The specific focus of this study evaluates the potential benefit of including S300 size exclusion chromatography within the E3 purification scheme. NIH3T3 cell lysate proteins precipitated via ammonium sulfate fractionation were applied to an S300 size exclusion chromatography, which resulted in the separation of two E3 proteins: one that functions with ubiquitin-charged UbcH7 and UbcH5, and one with a specificity for ubiquitin-charged UbcH5. E3 protein detection using SDS-PAGE electrophoresis and Western Blotting of size-excluded fractions determined presence of 3C protease-specific E3 ligase activity interacting with UbcH5 and UbcH7 E2s and the presence of a larger E3 ligase that specifically functions with UbcH5. Our results indicate that size exclusion chromatography step will be a valuable contribution to the complicated E3 purification scheme. This work was supported by NIH grant award 1R15AI099134-01.

**Michael Burton '13**

Lee Abrahamsen, Biology

***Analytical Methods for the Determination of the Presence of Nuisance Compounds and the Structural Elucidation of Novel Natural Product Antimicrobials***

Growing numbers of antibiotic-resistant infections combined with reduced development of novel antibiotic forms are causing one of our biggest public health problems: we no longer have antimicrobial drugs that we can count on to remain effective over the long term. Recently, pharmaceutical companies have reverted to examining natural products for novel compounds, as these have historically higher discovery rates. While natural products are good targets for drug development, the rate of screening has been slower and more expensive compared to other methods. To reduce both the time and cost of drug discovery, it is most effective to combine numerous analysis techniques into a single "hyphenated" sequence, which provides data that can be compared to database libraries to determine whether a compound is novel or known and has potential for further testing and development. The most effective examined technique combined both mass spectrometry (MS) and nuclear magnetic resonance (NMR) spectrometry.

**Jesse Butler '16, Nathaniel Cash '15, and Grace Hamilton '15**

Bonnie Shulman, Mathematics

***Mathematics of Ichthyology: Applying Ivlev's Model to the Feeding Patterns of the Sand Smelt (Atherina boyeri)***

In the 1940s Victor Sergeevich Ivlev, a Russian fisheries biologist, developed a mathematical model of the feeding behaviors of fish based on his own experimentation. Since then his methods, especially his Index of Aggregation and Electivity Index, have defined the field of trophic ecology and had tremendous influence on the practices of modern fisheries worldwide. This study seeks to apply a simplified version of his model (one based solely on prey availability and predatory electivity) to the feeding habits of the well-characterized sand smelt population of Trichonis Lake in Western Greece. Data published by Doulka et al. (2013) and Chrisafi et al. (2007) will be used, along with the least squares method, to model the complex behavior of feeding.

**Kate Carlucci '13**

Stephanie Richards, Biology

***Identifying the Nuclear Localization Sequence of Ribosomal S6 Kinase 2 (RSK2)***

The Ras/MAP Kinase pathway is a key signaling pathway involved in regulation of normal cell proliferation, survival, growth and differentiation. Overexpression and mutations in many of the pathway's signaling components have been observed in many cancers and diseases. This study focuses on RSK2 (ribosomal s6 kinase), a widely expressed serine/threonine kinase and downstream target of the MAPK pathway. Once activated, RSK2 translocates to the nucleus where it phosphorylates its various nuclear proteins and transcription factors. Upregulation of RSK2 transcription factors has been found in breast cancer, head and neck squamous carcinoma, and multiple myeloma cells. Currently, the mechanism for RSK2 localization to the nucleus remains unclear. In this study, potential nuclear localization signal sequences for RSK2 were mutated and amplified using site-directed mutagenesis and active and inactive RSK2 mutants were used in order to track its movement into the nucleus. By confirming nuclear localization sequences, we hope elucidate the RSK2 transport mechanism so that future research can look

to block the protein's nuclear localization appropriately in specific cancers.

**Andrew Carranco '14**

Dolores O'Higgins, Classical and Medieval Studies  
*Plautus's Captivi* -- see Michaela Brady '14 for abstract

**Bryan Carrillo '13, Kathy Guo '14, and So Hyun Kwon '13**

Bonnie Shulman, Mathematics  
*Using Derivations of the "Generalized Two-Parameter Model" in Efficiently Predicting the Rate of Tumor Growth*  
As death resulting from cancer continues to rise around the world, an efficient means of predicting and modeling the rate at which tumors grow is needed. Current computer models are not case specific. Thus, there is a need to create a model that can predict the path in which tumors grow even before growth is observed on an individualized basis. This will not only decrease the amount of unnecessary harmful side effects that can result from treatments such as radiation therapy, but will also increase the efficiency in treatment of cancer. The three models, Gompertz, logistic, and Bertalanffy growth equations, derived from the "generalized two-parameter model," are created under the assumption that tumor growth and decay is proportional to the volume of the tumor itself. The Gompertz, logistic, and Bertalanffy models were derived to evaluate the most efficient and best fit model to the biological assumption of tumor growth.

**Nathaniel Cash '15**

Bonnie Shulman, Mathematics  
*Mathematics of Ichthyology: Applying Ivlev's Model to the Feeding Patterns of the Sand Smelt (Atherina boyeri)* -- see Jesse Butler '16 for abstract

**Lila Chalabi '15**

Bonnie Shulman, Mathematics  
*West Nile Virus Epidemic* -- see Jenna Armstrong '15 for abstract

**Greer Chapman '13**

Sonya Kahlenberg, Biology  
*Understanding the Nature and Spatial Distribution of Human-Chimpanzee Encounters around Kibale National Park, Uganda*  
Though chimpanzees (*Pan troglodytes*) are endangered, conservation efforts are challenged by the rapid increase in habitat destruction fueled by exploding human population growth across Africa. Humans are living closer to chimpanzee habitat, resulting in more interspecific contact. Many of these interactions are benign, but some result in human or chimpanzee injury or death, property damage, and/or negative local attitudes toward chimpanzees. We analyzed data (2004-2012) on chimpanzees occurring in and around human settlements near Kibale National Park, Uganda, which primarily come from eyewitness accounts. Results show that these events occurred outside the home range of the Kanyawara study community, suggesting chimpanzees other than those habituated for research were involved. Chimpanzees were usually sighted in crops, confirming that crop-raiding is a major context in which human-chimpanzee interactions occur. We compare human-chimpanzee interactions at Kibale to those in other areas where these species co-occur to assess the severity of the problem at Kibale. We also suggest ways in which data collection could be improved in future studies of human-chimpanzee interactions.

**Mark Charest '15 and Ursula Sandstrom '13**

Bonnie Shulman, Mathematics  
*Mathematical Modeling of the 1918 Spanish Flu Epidemic*  
In many ways more lethal than World War I, the Spanish Flu was an extremely virulent strain of influenza that infected up to one half of the world's population between 1918 and 1919. The outcomes of this epidemic are still of interest today since they can be used in modeling and explaining the spread of a variety of diseases, including, but not limited to, H1N1 and the future recurrence of a flu strain on par with the 1918 strain. A simple model of the interacting populations has as much to offer us as a history lesson and warning for the future.

**Winnie Chelangat '13**

Rachel Austin, Chemistry  
*Purification of Alkane Hydroxylase(AlkB) with Various Detergents*  
 $\omega$ -Alkane Hydroxylase (AlkB) is an integral membrane diiron protein involved in global cycling of alkanes. Organisms containing this enzyme utilize it to metabolize alkanes for energy and carbon. This research work aimed at purifying AlkB derived from a hydrocarbonoclastic marine organism *Alcanivorax borkumensis* by solubilizing membrane with different detergents. The protein purity levels were quantified by determining the ratio of protein to heme concentration in each solubilized sample. The following detergents were used: dodecyl-  $\beta$ -D-maltopyranoside (DDM), lauryl maltose neopentyl glycol (LMNG), decyl maltose neopentyl glycol (DMNG), and lauryl dimethylamine-N-oxide (LDAO). The trends in protein activity and ratio of protein to heme concentration levels were examined.

**Chester Chiao '13**

Beverly Johnson, Geology  
*The Effects of the 2012 Alewife Migration on Nutrient Dynamics in Nequasset Lake, Woolwich, ME*  
Anadromous fish such as alewives (*Alosa pseudoharengus*) provide an important link between coastal watersheds and the Atlantic Ocean along the Gulf of Maine. Alewives contribute marine-derived nutrients (MDN) in the form of nitrogen to freshwater lakes via excretion and mortality as they migrate upstream during spawning season. The focus of this project is to determine the degree to which MDN were imported into Nequasset Lake, Woolwich, ME. Water samples were collected from the top of the fish ladder, and from the four major stream inlets, and analyzed for nutrient concentrations (TDN,  $\text{NO}_3^-$ ,  $\text{NH}_4^+$ ) to construct a nitrogen budget. Additional samples were collected for  $\delta^{15}\text{N}_{\text{NO}_3}$  analysis from April to August to trace marine-derived nitrogen from the alewives in the lake. Increases in MDN have the potential to affect lake productivity as it is immediately available for uptake by primary producers. Thus, MDN observed in Nequasset Lake may have a profound effect on the lake's ecosystem.

**Emily Clark '15**

Dolores O'Higgins, Classical and Medieval Studies  
*Plautus's Captivi* -- see Michaela Brady '14 for abstract

**Nicholas Clark '13**

Jill Reich, Psychology  
*Attitudes about Homosexuality among Male Student Athletes: Do Explicit Differ from Implicit?*  
Despite the prevalence of increasingly accepting views regarding homosexuality in society today, the media reports that

the male athletic world remains homophobic. The current study examines athletes' implicit and explicit attitudes about homosexuality. An explicit decision is one that is made consciously; an implicit decision is one that is made unconsciously. Participants were recruited from the 14 male varsity athletic teams at Bates College. To examine explicit attitudes, participants completed the Lesbian, Gay, Bisexual Knowledge and Attitudes Scale (Northington, Dillon & Becker-Schutte, 2005). To examine implicit attitudes, participants will complete a categorization task known as the Implicit Association Task (Nosek et al, 2007). The study will provide baseline data to inform the Bates Allies program, and the Bates Athletic Department about male athletes' current attitudes toward homosexuality. The study will also compare findings to previous studies and explore consistency between explicit and implicit attitudes.

#### **Kaira Cody '13**

Karen Palin, Biology

##### ***Using Photovoice to Gain Insight and Perspective on the Navajo Tribal Community about Public Health Concerns***

This study uses photovoice to provide insight and perspective on health concerns among the Navajo people living in various chapters on the Navajo reservation in Arizona and New Mexico. The photovoice method allows community participants to take and document pictures relevant to specific questions posed by the researcher. These questions are developed by the researcher in discussions with community members. The results of this photovoice project showed two overarching public health concerns among members of this Navajo community: possible uranium contamination of the reservation's water and soil; and chronic health conditions associated with change from the traditional diet and lifestyle.

#### **Lianna Cohen '13**

T. Glen Lawson, Chemistry

##### ***Delivery of EMCV 3C Protease into Cultured Mouse Cells by Direct Protein Transfection***

The encephalomyocarditis virus (EMCV) 3C protease is rapidly degraded by the ubiquitin-26S protease system (UPS). A logical approach to study how EMCV replication success is linked with 3C protease degradation is to lower the rate at which the 3C protease concentration is reduced. This can be accomplished using proteasome inhibitors, but proteasome inhibition also prevents the establishment of EMCV infections in cells. To circumvent this problem, we have explored the feasibility of using direct protein transfection to study EMCV 3C protease stability and function in vivo. Catalytically active EMCV 3C protease was expressed in *E. coli*, refolded and purified. The purified protein was delivered into cultured mouse fibroblasts using a cell-penetrating, peptide-based transfection reagent, and successful deliveries were confirmed by Western blot analysis of the transfected cell lysates. The intracellular concentration of the 3C protease rapidly decreased as a function of post-transfection time, and the rate at which the protein disappeared was reduced by proteasome inhibition. This demonstrates that, as expected, the UPS mediates the degradation of the transfected protein. As will be discussed, the availability of the direct 3C protease transfection methodology will allow for new experimental approaches to investigate how intracellular 3C protease concentration affects virus replication and will facilitate in vivo studies of how specific UPS components participate in the polyubiquitylation and proteolysis of EMCV and other picornaviral 3C proteases.

#### **Olivia Coleman '13**

Katherine Mathis, Psychology

##### ***Stress and Decision-Making Ability: Does the Type of Stressor Impact Outcome?***

Every day humans find themselves faced with a number of stressors, which vary in both type and severity. Along with stress, humans are also faced with a constant demand to make decisions. The present experiment examined the manner in which stressors, either physical or cognitive, had an impact on decision-making abilities, as well as if there were gender differences. The Cold Pressor Test (CPT) was used as a physical stressor, an impossible anagram task was used as a cognitive stressor, and the Iowa Gambling Task (IGT) was used to assess decision making. Finally, cortisol levels were assessed through the collection of free cortisol found in saliva. It was predicted that following both stressor types, cortisol levels would increase for both genders. I predicted that males may exhibit higher cortisol following the cognitive stressor than women, while the opposite trend would be found following a physical stressor.

#### **Spencer Collet '13, Olivia Krishnaswami '15, Daniel Peach '13, Cameron Sheldon '13, and Destinee Warner '13**

Robert Strong, English

##### ***The Research and Writing of Strong Graduate Fellowship Proposals***

Bates has been named a "Top Fulbright Producer" in recent years, and Bates students have been awarded prestigious fellowships, including the Beinecke, Goldwater, and Watson. Participants on this panel will discuss the research, work, and writing that lead to their strong fellowship proposals; all have advanced as finalists or have been awarded fellowships. They will also address such questions such as: How does one's current research and work prepare one for future applications? What are the key ingredients of a research proposal? How can specific writing strategies help best communicate research work to a fellowship screening committee?

#### **Kathryn Collier '13, Emily Depew '14, Matthew Leary '16, and Desmond McGrath '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

##### ***Emerging Identities: The Recent Appearance of LGBTI Support in Kenya***

Kenyan law proclaims that homosexuality is illegal and punishable by up to 14 years in prison. British colonial law had established an exclusionary attitude toward people with different sexual orientations. However, the new Constitution challenges these old penal codes through its protection of free expression, association, and privacy. By building social and political movements, community-based LGBTI organizations such as the Gay and Lesbian Coalition of Kenya (GALCK) are trying to change homophobic viewpoints. Currently, many Kenyans have begun to support and demand LGBTI inclusion. Groups such as GALCK are challenging Western views that consider Kenyans' practices to be unaccepting of LGBTI rights.

#### **Larisa Collins '13**

Nancy Koven, Psychology

##### ***Brain-Derived Neurotrophic Factor as a Potential Mediator in the Relationship between Aerobic Exercise and Aspects of Executive Functioning***

Neurotrophins such as brain-derived neurotrophic factor (BDNF) are vital for nerve cell survival and adaptive plasticity. Evidence has shown that there are high BDNF levels in the prefrontal cortex (PFC), a key brain region for aspects of higher-

order cognition. More recently, aerobic exercise has been shown to lead to greater executive functioning skills. It is unknown, however, whether BDNF mediates this relationship between exercise and cognition. In this study, 60 young adults completed a battery of executive function tests and performed a Step Test to assess aerobic fitness level. BDNF levels were quantified with ELISA (enzyme-linked immunosorbent assay) from urine samples taken at the time of testing. A mediation analysis was performed using the statistical approach described by Baron and Kenny. This project is an important step in determining which neurotrophin is responsible for the increase in executive functioning seen after aerobic exercise.

#### **Cherelle Connor '13**

Nancy Koven, Psychology

##### ***The Effects of Emotional Intelligence on the Uncanny Valley***

Emotional intelligence describes an individual's ability to identify, facilitate, understand, and manage emotions. It has been found to be an important factor in mental and social functioning in everyday life. To better understand the extent of its effects, this study looked at this type of intelligence in conjunction with Masahiro Mori's Uncanny Valley. The UV is experienced when nonhuman figures approach almost perfect human likeness. Twenty-two Bates College undergraduates were asked to complete a series of EI questionnaires. They were then asked to rate eight computer-generated face morphs. The results found no correlation between the EI and the UV, but did show a correlation between female ratings of female face morphs. The results imply that 1) the face morphs were not sufficiently eerie, 2) female participants are more sensitive to the UV than male participants, and 3) the UV is dependent on something other than emotion.

#### **Anne Cravero '13**

Laura Balladur, French and Francophone Studies

##### ***French Translations of the Poetry of W. B. Yeats: A Bilingual Recitation***

Translating poetry from one language to another is a confounding task as it requires a translator to transmit the imagery, rhythm and nuanced meaning of a poem by the use of a different linguistic code than that with which the poem was created. The poetry of W. B. Yeats is a prominent piece of the cannon of Irish literature and translators have struggled to accurately recreate the symbolism and mythological imagery of Yeats' poems. The French have strained to translate the essence of the Irish identity and the struggle for a sovereign Irish state that is an important focus of Yeats' poetry. This presentation is a guided examination of the differences between several translations of Yeats' "Isle of Innisfree" and "White Swans at Coole" into French. The choices and interpretations of the different translators will be presented and supplemented by the recitation of both the English and French versions of the selected poems. Basic comprehension of French is recommended, but not absolutely necessary in understanding the presentation.

#### **Michael Creedon '15**

Dolores O'Higgins, Classical and Medieval Studies

##### ***Plautus's Captivi*** -- see Michaela Brady '14 for abstract

#### **Kevin Crotty '13, Elizabeth Hallett '13, Deana Lorenzo '13, Andrea Newman '13, and Catherine Tuttle '13**

Francisca López, Spanish

##### ***Language, Linguistics, Literature, and Film: Spanish Thesis Research***

The Spanish department advises students engaged in diverse research topics. Five students are exploring topics in linguistics, documentary film, translation, and literature. In order to convey the variety of theses, we will present in the form of a panel, sharing our experiences and findings. Each individual will present briefly for about ten minutes, followed by a group discussion and questions and answers. The unique assortment of Spanish theses should provoke discussion as we examine the common trends and topics found in our work.

#### **Natacha Danon '15**

Loring Danforth, Anthropology

##### ***Bates to Saudi*** -- see Gintare Balseviciute '15 for abstract

#### **Jamilia Davis '15, Bridget Feldmann '16, and Jazmine Woodruff '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

##### ***Tending Orphans – African Strategies***

Our presentation centers on African techniques of placing orphaned children. We highlight select African nations' adoption and foster-care policies related to the settlement of children who need homes. We discuss celebrity adoptions, specifically the adoption of African babies by wealthy white Americans as well as by African celebrities. Africans' critiques of these phenomena remain at the center of our work. We utilize a wide array of sources from African nonprofit agencies as well as governmental units, focusing especially on those reflecting on-the-ground opinions.

#### **Kathryn DeAngelis '13, Terry Horowitz '13, Ryan March '13, and Lisa Reedich '13**

Ryan Bavis, Biology

##### ***The Effects of Chronic Hyperoxia on the Neurochemical Development of the Caudal NTS***

The specific aim of this study was to determine whether chronic hyperoxia exposure affected the development of pathways involved in the transition from an immature hypoxic ventilatory response (HVR) to a mature HVR in neonatal rats. We injected four-day-old immature rats with antagonists of the PDGF-B, NO, NDMA, and GABA-B pathways and measured their ventilatory response to hypoxia. Control rats injected with saline were expected to exhibit the biphasic (immature) HVR and hyperoxia rats injected with saline were expected to exhibit a sustained (mature) HVR, which is a common result seen in rats exposed to chronic hyperoxia during development. For the inhibitory PDGF-B and GABA-B pathways, we expected to see a sustained (mature) HVR in the control rats because the inhibitory pathway was blocked by the antagonist. For the excitatory NO and NDMA pathways, we expected hyperoxia rats injected with the antagonist to exhibit a biphasic (immature) HVR as the excitatory pathway was knocked down. Inhibition of the PDGF-B and NMDA pathways resulted in support of our hypotheses while the antagonist for the NO and GABA-B pathway had no effect, suggesting that hyperoxia has no effect on these two signaling pathways.

**Lauren Demers '13**

Nancy Koven, Psychology

***Meta-Affective Processing and Its Relationship to Serotonin and BDNF Systems***

The relationship between brain-derived neurotrophic factor (BDNF) and serotonin (5-HT) and depression and anxiety disorders is well studied, but the relationship between these two neurotransmitter systems and aspects of affective processing in non-depressed people calls for further exploration. In this study, BDNF and 5-HT urine levels, self-report and performance-based emotional intelligence (eIQ), and other aspects of affective processing were measured in a young adult sample. It is hypothesized that high levels of BDNF and 5-HT are associated with high eIQ and high ranking affective processing skills. The clarification of the neurochemical basis of affective processing in healthy individuals may elucidate etiological contributions, novel treatment directions, and more appropriate diagnostic classification systems for those with debilitating emotional dysregulation.

**Emily Depew '14**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

***Emerging Identities: The Recent Appearance of LGBTI Support in Kenya*** -- see Kathryn Collier '13 for abstract**Carrie Dillaway '13**

Margaret Maurer-Fazio, Economics

***Environmental Education in the Moral Curriculum Classroom in China***

This thesis explores the role of environmental education within the moral education curriculum in China's compulsory education system. The moral curriculum imparts to students fundamental values and behavioral and ideological guidelines to follow in life and duties and responsibilities to uphold, at times using the environment as its context. Environmental education is universally known for its contribution to quality education, but within the moral curriculum, it is a means to promote collectivism and civic morality as dictated by the rigid expectations of the central government that serves as the primary moral agent instilled through practices of indoctrination. Today, Chinese perceive the moral curriculum as outdated and disconnected from the needs of the current population. In this thesis, I highlight the flaws within the moral curriculum that make it an ill-suited framework for environmental education, and, at the same time, the successes of environmental education that enable it to serve the purposes of a modern moral curriculum.

**Catherine Djang '13**

Claudia Aburto Guzmán, Spanish

***Translating Gender and Violence in the Poetry of Brian Turner, Daisy Zamora, and Claribel Alegría***

In my Spanish translation seminar, I encountered certain challenges that arise when translating elements of gender and violence. Three authors, Brian Turner, Daisy Zamora, and Claribel Alegría, utilize gender and violence in contrasting ways, each requiring unique interpretation on behalf of the translator. The translation of gender and violence requires careful examination, since the particular lens through which the original work is viewed can be easily lost. The authors' choice of literary form—poetry—only further compounds the challenges during the translation process. The translator thus is in a position where he or she must navigate several competing demands, and where each word subtly and often profoundly impacts the

translated meaning. I will present a selection of my translations, highlighting points of complication and including competing theories and approaches.

**Margaux Donze '14, Tara Notarianni '14, and Caroline Richards '14**

Bonnie Shulman, Mathematics

***Mathematical Modeling of Bulimia Nervosa in American Colleges***

In American culture, negative body image is a serious issue worsened by the unrealistic expectations of the perfect body set forth by social media. This is especially true for females on college campuses across the nation where these pressures are magnified, and can lead to the development of serious diseases such as bulimia nervosa. Bulimia should be treated like any other biological epidemic. It can be mathematically modeled to predict long-term behavior and outcomes of the epidemic. Such a model can reveal hidden patterns of social behavior of females. Our models incorporate three groups: those who are susceptible to developing bulimia, those who are bulimic, and those who are being treated for bulimia. We analyze the behavior of each group in a homogeneously mixed population of a college campus. Using these models, we can derive equilibrium, steady-state values that we can examine using linear stability analysis. Then we apply all of these mathematical models to the Bates College campus to explain a specific case of this phenomenon.

**Evan Dowd '13**

Jill Reich, Psychology

***Step Up and Stand Out***

Researchers have found that the bystander effect (Lantane, 1969) explains situations in which an individual does not offer help to the victim in an emergency situation when other people are present. Research has also demonstrated that individuals can learn relevant decision-making skills to intervene in an emergency situation in ways that reduce the bystander effect. In this research, an intervention will be implemented to teach student athletes the steps required to intervene in situations involving alcohol abuse including: notice the event, interpret the event, assume personal responsibility, know how to help, and implement the program. A survey will be given twice (pre- and post-intervention) to 40 student athletes, from the same sports team, to test their perception and expected behavior when placed in the kinds of situations that elicit the bystander effect. This study will look at differences in response between the pre- and post-test to investigate the effects of the intervention.

**Colin Dowe '13**

Michael Retelle, Geology

***Paleoclimate Reconstruction from a Varved Sediment Record Linnévatnet, Svalbard, Norway***

Varved sediments from proglacial lakes provide valuable paleoclimate records in regions where instrumental records are commonly short-lived and other proxy-records lack detailed temporal resolution. This study presents data from Linnévatnet, a varved proglacial lake, located in Western Spitsbergen, Svalbard, Norway. Linnévatnet is a 4.7 km long basin fed by an inwash delta 6 km from the margin of Linnébreen, a polythermal cirque glacier. Linnévatnet sediments are made of finely laminated brown and tan clay-silt couplets that contain valuable temporal and climatic information. This study reconstructs paleoclimate conditions in western Spitsbergen by analyzing paleoclimate proxies within two sediment cores at high temporal

resolution. First, the annual periodicity of the lamination couplets was confirmed through plutonium age determination. Second, measurements of grain size and varve thickness, two variables that are directly related to proglacial sediment transport and the position of Linnébreen, were used to reconstruct climatic conditions in the past.

**Emily Egan '13, Taryn O'Connell '13, and Raisa Sharmin '13**  
Darby Ray, Harvard Center for Community Partnerships  
*Research and the Public Good*

The Harvard Center for Community Partnerships supports students in pursuing academic research that meets significant public goals or needs. This semester, Community-Engaged Research Fellows are working on collaborative research projects situated at the intersection of community interests and academic work in sociology, biochemistry, environmental studies, and economics. Projects focus on diverse topic areas including teenage pregnancy, pediatric dental care, female empowerment, gestational diabetes, and mill-worker responses to river pollution. In this session, students briefly outline their research projects and lead a structured dialogue about community-engaged research as public scholarship that illuminates the rewards and challenges of such work.

**Amanda Eller '13**

William Ambrose, Biology

*Extended Chronology of Serripes groelandicus from a High-Arctic Fjord on Svalbard, Norway*

Knowledge of how marine organisms are influenced by climate may help us understand how they will respond to changes. I explored the relationship between local and regional climate and the growth of *Serripes groelandicus* (Greenland Cockle) from a high-arctic fjord, Rijpsfjord on Svalbard, Norway. Cockles deposit annual growth lines, allowing growth rates to be determined. Growth is largely dependent on temperature and food availability which are affected by climate. Comparing modeled growth based on the von-Bertalanffy equation to the actual growth, obtained from the width of the growth rings; a standard growth index for all samples was created. Samples were collected over nine years; with individual age ranging 4-28 years, a chronology of growth from 1983-2012 was created. Preliminary results indicate that the Arctic Climate Regime Index and precipitation have significant effect on growth rates; a multilinear regression of the two explained nearly 65% of the interannual variability in growth.

**Rachel Ellis '14**

Sonya Kahlenberg, Biology

*Assessing Spatial Distribution of Poachers' Snares to Direct Chimpanzee Conservation Efforts in Kibale National Park, Uganda*

Though it is illegal, hunters use snares to catch wildlife inside national parks in many parts of Africa. Endangered chimpanzees (*Pan troglodytes*) are often caught in snares, which may kill the chimpanzee or cause digits, hands, or feet to be maimed or lost. For these reasons, snare removal is a conservation priority for chimpanzees. Around the Kanyawara chimpanzee community in Kibale National Park in Uganda, 983 snare removal patrols collected a total of 909 snares between February 2009 and April 2012 (June 2009 excluded). We analyzed the spatial distributions of snares in and around the Kanyawara chimpanzee home range, to better understand the areas that pose a high risk of injury to this important population of chimpanzees. Spatial analyses show that most of these snares were found along the

boundary of Kibale National Park and in the northern parts of the chimpanzee range; we recommend that patrol efforts continue to be emphasized in these locations.

**Students in ENG 395Y, Medieval London**

Sylvia Federico, English

*Medieval Londoners*

Our class has been working to understand medieval London through the lives and experiences of the individual men and women who inhabited the city. Through our study, we have come to understand medieval London as a character, a legible phenomenon whose cohesion (or disambiguation) provides a metaphor for the medieval human condition. During the Summit, members of the class will become medieval Londoners in an experiential tableau; we intend to engage interlocutors and passersby and thus to create a learning and teaching opportunity on the topic of medieval London.

**Zoë Fahy '13 and Kirsten Pianka '13**

Rachel Boggia, Dance

*Workings of a Dance Thesis*

In this presentation slot, we will outline the artistic process of completing the written and performance components of a senior dance thesis. The discussion will focus primarily on the improvisational scores used to set choreography, set and lighting design, and our artistic collaboration with Dutch fabric artist Fransje Killaars. This is an opportunity to engage dance in a setting of academic discussion, as well as answer questions about this relatively new thesis process.

**Lauren Farnsworth '13**

Stephen Sawyer, Office of Off-Campus Study

*Antes Era Mas Lindo Vivir (Life was More Beautiful Before)*

This thirteen-minute documentary provides an opportunity to understand more closely the effects of climate change that the people of Bolivia are seeing and experiencing on a daily basis. The film focuses on the community of Sajama in the national park, at the foot of the tallest snow-capped mountain in Bolivia. The people of this community and their livelihood depend on the earth. Any one of them could explain the effects that climate change is having on their way of life. Due to the melting of the glaciers, their economic security, dependent upon livestock and tourism, is in danger. There is no longer enough water for their animals and they cannot lead glacier expeditions due to the rapid melting. As a result the people of Sajama have had to migrate to new land or to the city.

**Bridget Feldmann '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

*Tending Orphans – African Strategies* -- see Jamilia Davis '15 for abstract

**Kate Fetrow '13**

Stephen Engel, Politics

*Reclaiming Rights: Indigenous Peoples and State Sovereignty*

Indigenous peoples have long faced oppression by Western liberal democracies, which are ostentatiously committed to self-determination and human rights. Yet indigenous rights pose a fundamental challenge to the sovereignty of these states. When and why, therefore, do states cede sovereignty to indigenous peoples? There are two approaches to answering this question in the existing literature: normative and strategic. The normative approach holds that states are motivated by the rightness of a claim, while the strategic approach holds that states cede

sovereignty when pressured to do so by NGO networks and the international community. Through a case study of the United States from the 1970s onward, I evaluate these approaches, arguing that neither approach explains why states cede sovereignty to indigenous peoples. In doing so, I propose a new model for understanding indigenous sovereignty claims' successes or failures: states cede sovereignty to indigenous peoples when doing so advances broader governmental aims. It is by pursuing a strategy of alignment, therefore, that indigenous peoples are most likely to be successful in their sovereignty goals.

### **Virginia Flatow '13**

Kathryn Low, Psychology

#### ***Numeracy and Health Risk Assessment***

Literacy, especially quantitative literacy, is remarkably poor within the United States (Kutner, Greenberg, Jin, Boyle, Hsu, & Dunleavy, 2007). Poor quantitative literacy has been associated with the inability to assess risk, susceptibility to framing effects, and poor health outcomes (Schwartz & Woloshin, 1997; Dewalt, Berkman, Sheridan, Lohr, & Pignone, 2004; Ellen Peters et al., 2006). Over the last twenty years healthcare has shifted toward a more patient-centered approach, putting higher demands on the patient to comprehend and make decisions based on complex quantitative information. Without a baseline ability to understand numerical concepts, it seems unlikely that an individual would be able to make the best decisions for his or her health. The present study investigated whether collegiate courses impact numeracy scores. It also assessed the relationship between numeracy and health risk assessments. The study was also intended to determine if the affectivity of a medical scenario affects decision making. Ultimately, the goal is to better understand which courses prepare young undergraduates for making decisions about their health.

### **Jackson Fleming '15 and Charles Munn '14**

Dolores O'Higgins, Classical and Medieval Studies

#### ***Euripides' Bacchae***

The students of Professor O'Higgins' Ancient Greek 200- and 300- level classes offer their own interpretation of two scenes from the 2,400-year-old classic, Euripides' *Bacchae*. Performed in the original Greek, and captured on video, this project melds the modern and the historical. Aided by English subtitles (taken from the students' own translations), viewers may watch as Pentheus, the arrogant King of Thebes, ignorantly seals his own horrible fate through his sacrilegious and stubborn unwillingness to accept the new god Dionysus and the strange mysteries of his Bacchic cult.

### **Emily Foden '14**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

***Conserve to Preserve: How Sub-Saharan Africans Protect Their Ecosystems, Cultures, and Communities*** -- see John Albanese '16 for abstract

### **Samantha Forrest '13**

Glen Ernstrom, Biology

#### ***The Effects of Synaptic Vesicle Acidification Perturbation on Proton Pump Subunit Targeting in Caenorhabditis elegans***

Synaptic transmission is made possible through the release of packets of neurotransmitters at presynaptic terminals. Neurotransmitters are stored in specialized sacs, or synaptic vesicles, that dock at the membrane and release regulated packets, or quanta. What regulates the loading of

neurotransmitter is not fully understood. This project tests a model of quantal transmission that is based on the acidification of the proton pump found of these vesicles: only when these vesicles are fully acidified do they release neurotransmitter. This model predicts that the subunits of the proton pump,  $V_0$  and  $V_1$ , will detach in the event of full acidification and subunits that are not anchored to the membrane will diffuse throughout the synapse. I used *Caenorhabditis elegans*, a genetically tractable model organism, to analyze the spatial distribution of these evolutionarily conserved synaptic proton pumps when acidification is disturbed. I generated transgenes that encode  $V_0$ , which is membrane anchored, and  $V_1$ , which is non-membrane anchored, tagged with fluorescent proteins GFP and mCherry. We then generated transgenic animals that express a single copy of these transgenes and analyze the fluorescent intensity and volume at synapses of normal and defective proton pumps from confocal images. We predict that proton pump distribution will be more clustered at synapses when it is defective. Due to the conserved nature of the proton pump, this knowledge can be used to describe a typical regulatory mechanism of quantal neurotransmitter release.

### **Mikayla Foster '13**

John Baughman, Politics

#### ***How to Maintain One-Party Control: A Case Study of the Political Strategies Used by New Hampshire Republicans***

This thesis is a case study of the strategies used by political parties to maintain one-party control at the state level. The New Hampshire House of Representatives, an unusually large chamber with 400 members, is the focus of the study. The Republican Party was able to maintain control of the House for almost 80 years, even when two-party competition arose in the state in the 1990s and Democrats were winning seats at the top of the ticket. To explain how they were able to maintain control, this thesis examines the use of redistricting, floterial districts, and ballot design to identify the political strategies used by the party. An analysis of both the intended and unanticipated consequences of institutional design as well as the interplay and sequencing of the strategies explain how Republicans manipulated electoral institutions and translated votes into seats in order to protect a party's majority in the legislature.

### **Julia Foxworth '13, Grace Glasson '14, and Douglas Welsh '14**

Pamela Johnson, Art and Visual Culture

#### ***Zines, Yarn Bombing and the Arts House***

In this panel, students discuss their independent art projects, including publications, events, and public art installations. Doug Welsh '14 will speak about the Arts House, a themed Bates residence where he lives and brings together artists to collaborate on projects and coordinate events, inviting the Bates community to participate and experience art. Grace Glasson '14 will discuss her creation "Sweater Mouth," a pocket-sized zine she has produced to showcase her poetry and drawings. Julia Foxworth '13 will present the new street art phenomenon called yarn bombing. She will explain her process and preview some projects she plans to install on the Bates campus.

### **Alexander Francis '14**

Bonnie Shulman, Mathematics

***Three-species Lotka-Volterra Predator Prey Model*** -- see Devon Brown '14 for abstract

**Students in FRE 270: French Stylistics**

Mary Rice-DeFosse, French and Francophone Studies

**Projet Stéréotype: France and the French**

What kinds of stereotypes exist about France and the French? Are they grounded in historical relationships between countries? Are they fixed or mutable? Do they evolve and change with experience? Through a series of interviews with individuals of different ages, ethnicities, and backgrounds, students in FRE 270, French Stylistics, explored the kinds of stereotypes people hold about France and the French and whether they varied according to education, experience, travel, and contact with the French.

**Daniel Friedman '13**

William Seeley, Philosophy

**Robots and Forward Models**

One of the aims of artificial intelligence research is to give a full account of the biological basis of intelligent behavior. Previously, the study of one such intelligent behavior, locomotion, had focused largely on computation carried out by control systems. However, more recent bio-robotic studies, most notably by Pfeifer and Iida, have focused on the physical dynamics of the robot in its environment and morphological properties of the robot's body in conjunction with control systems. These studies have shown that a significant reduction in computational load can be achieved through intelligent body design, suggesting that morphology plays an integral role in producing intelligent behavior. This project attempts to reproduce Pfeifer's results by designing and constructing a quadruped robot capable of initiating, maintaining and transitioning between stereotyped gait patterns.

**Cara Garcia-Bou '13, Rosalie Philip '13, and Samantha Rothberg '13**

Rebecca Corrie, Art and Visual Culture

**Internships in Museums and Galleries**

Our presentations focus on on- and off-campus internships in the visual arts. Rosalie Philip will discuss her Ladd Internship in the development office of the Guggenheim Museum; she also has interned at the Bates College Museum of Art and the Wadsworth Atheneum. Cara Garcia-Bou has interned at the Bates College Museum of Art and in the Communication Department and Visitor Services of the Metropolitan Museum of Art. Samantha Rothberg has been a museum education intern at the Bates College Museum of Art, and an intern at the Cloisters, the Jewish Museum, and Sotheby's. They will discuss this pre-professional training in the context of their academic work.

**Taylor Gartley '13**

Francesco Duina, Sociology

**Trade Unions and Deregulation**

This study looks at the role of trade unions and how they deal with deregulation in the labor market. The existing literature suggests a number of variables that increase the vulnerability of trade unions to government deregulation. I synthesize evidence from French and North American trade unions of varying industries regarding how they have operated in an increasingly less-regulated environment. Previous work in this field covers a broader scope of deregulation ranging from the airline industry to telecommunications and railways. In exploring these industries and in observing trade unions in two different countries, I compare the reactions and outcomes of the effects of deregulation policies on trade unions.

**Colleen Garvey '13**

Stephanie Richards, Biology

**Identifying the Nuclear Localization Signal of p90 Ribosomal S6 Kinase 3 (RSK3) through Fragment and Mutant Protein Subcellular Localization**

p90 ribosomal S6 kinase (RSK) has been shown to regulate a variety of cellular functions, such as apoptosis and metabolism. Changes in its activity have been linked to detrimental physiological consequences, such as cancer and mental retardation. Many of RSK's substrates are located in the nucleus, and thus RSK translocation into the nucleus is essential for its function. The purpose of this study was to experimentally analyze the human RSK3 sequence for a functional nuclear localization signal (NLS), or the amino acid sequence necessary for RSK3 localization into the nucleus. There have been two suggested, but never experimentally tested, NLSs in RSK3, and it was these two regions this research was focused on. Site-directed mutagenesis was employed on four amino acids located within the putative NLSs on full length RSK3-GFP fusion protein. Mouse fibroblast cells were transfected with mutated and fragmented RSK3 and visualized with a fluorescent microscope to identify where the protein localized.

**Henry Geng '13**

Lynne Lewis, Economics

**Economic Valuation of Alewives on the Androscoggin and Kennebec River Watersheds Using Split Sample Surveying**

Environmental degradation and the depletion of finite resources have a significant impact on society. As such, policy makers and governing bodies must carefully consider how to shape their policies to address these problems. In order to do so, policy makers typically initiate a benefit-cost analysis to determine the best policy for a particular scenario. This analysis of environmental issues usually involves the valuation of "public goods," which are goods that are not valued in a market structure. This paper presents a case study in which the contingent valuation method is used to determine how much people value a public good. The study examines the willingness-to-pay (WTP) of Maine residents regarding various watershed restoration projects on the Kennebec and Androscoggin Rivers. The watershed restoration scenarios are based around the alewife populations on the two rivers, and the services that the alewives provide to the surrounding communities. The WTP information on Maine residents is collected through a joint mail and internet survey. The data collected from the survey will help policy makers determine an optimal investment in the relevant watershed restoration projects. This study is a continuation of a thesis project from Spring 2012 by Lindsay Thompson '12 and Professor Lynne Lewis.

**Joshua Giesler '16, Alexandra LeFevre '16, Nicholas Luther '16, and Megumi Milla '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

**Gender Parity: Necessity or Imposition?**

Influenced by Western institutions, policy makers in Madagascar promulgate a particular idea about gender parity that may not reflect Malagasy norms. Both international and domestic policies pertaining to education seek to provide equal opportunity regardless of gender. Qualitative and quantitative data from the past few decades demonstrate that balanced enrollments of girls and boys have dramatically increased in Malagasy classrooms. But to what extent does such gender balance represent community values? We explore the perspectives of students, teachers, and parents to cultivate a

better understanding of the dynamic between gender equality in Malagasy society and the policy emphasis on gender parity in the classroom.

#### **Eryn Gilchrist '13**

Robert Farnsworth, English

*Literary Reading by Creative Thesis Writers* -- see Ashley Brunk '13 for abstract

#### **Grace Glasson '14**

Pamela Johnson, Art and Visual Culture

*Zines, Yarn Bombing, and the Arts House* -- see Julia Foxworth '13 for abstract

#### **Astrid Gleaton '13**

Rachel Austin, Chemistry

*Purification of Metallothionein-3 and its Role in Lead Metabolism*

Metallothioneins are a family of proteins characterized by their small size and cysteine rich amino acid that allows them to play a significant role in the metabolism of metals such as zinc and copper in a variety of tissues. Metallothionein-3 (MT-3) is a protein within this family almost exclusively found in nervous tissue. Because childhood lead poisoning results in permanent neurological deficits, we aim to understand metallothionein-3's role in lead metabolism by first purifying and performing thermodynamic and kinetic binding studies in vitro. Glutathione S-transferase (GST) and MT-3 containing plasmid was transformed in *E. coli*, which were then batch grown and harvested. Cells were lysed and GST MT-3 extracted using sepharose beads as GST binding medium. GST was cleaved from MT-3 by thrombin protease, and then purified by size exclusion chromatography. LC-MS was used to characterize the purity and effectiveness of the MT-3 extract. ICP-MS was used to determine the metal binding stoichiometry of the purified MT-3 to both zinc and lead. From our LC-MS data, it is evident that we are successfully purifying MT-3, but ICP-MS data has yet revealed any stoichiometric data. From this, we cannot yet begin making conclusion pertaining to the lead binding affinities of MT-3.

#### **Andre Gobbo '13**

Senem Aslan, Politics

*How South Sudan Became the Newest Country in the World*  
On 9 July 2011, South Sudan declared its independence from the nation of Sudan, making South Sudan only the second nation to be created since the collapse of the Soviet Union. During this time, there was an international norm against the creation of new states, a convention that persists today. How did South Sudan manage to successfully secede and create a new state? Among the elements of South Sudan success were a military strong enough to effectively challenge the state from which it separated, sustained mobilization over a long period of time, support from the international community in its declaration of independence, and a weak state from which it was seceding. The creation of a new state has serious implications for the greater regions of North Africa and sub-Saharan Africa as well as the international community as a whole.

#### **Maxwell Goldberg '13**

Thomas Wenzel, Chemistry

*New Calix[4]resorcinarenes for Chiral NMR Analysis*

In the past, calix[4]resorcinarenes have proven to work well as chiral solvating agents for enantiomeric discrimination in NMR

analysis. Methylene-bridged calix[4]resorcinarenes are able to associate with and discriminate between pair of enantiomers due to the noncovalent and hydrophobic interactions between the cavitand and the enantiomeric substrates. I am currently exploring how new tertiary amine substituents on the rim of the cavitand ring effect substrate interaction and subsequently enantiomeric discrimination. The cavitands of interest are constructed using a condensation reaction between 2-methylresorcinol and acetaldehyde. The cavitand then undergoes a bromination reaction to allow the addition of a tertiary amine to the upper rim of the ring. In order to prevent ring inversion, the cavitand underwent a second bridging reaction to connect the resorcinol hydroxy groups. Once fully bridged, a tertiary amine is added to the bromomethylcavitand to facilitate additional steric hinderance. My goal is to determine whether or not these new calix[4]resorcinarenes serve as proficient chiral NMR solvating agents for enantiomeric discrimination in NMR analysis.

#### **Alyson Goldstein '13**

Amy Douglass, Psychology

*Does the Timing of Corroborating Evidence Affect Investigative Interviewers Behavior?*

Expectations can arise in interviewers when they learn case facts such as their witness received positive post-identification feedback or that there is a corroborating witness. However, it is not known if expectations can be created in the middle of an interview, and if that would have the same effect. Student participants were randomized into roles of eyewitness or interviewer. Interviewers received no corroborating information, either before or during the interview. Total involvement is analyzed using a univariate ANOVA. Higher involvement is defined as more negative feedback, more words spoken, and more interruptions by the interviewer. It is expected that interviewers who start out with the information will have the lowest overall involvement in the interview. Interviewers who gain the knowledge in the middle of the interview will have slightly higher rates of feedback, words spoken, and interruptions than the interviewers who start out with the information, but their rates will be lower than interviewers with no corroborating knowledge.

#### **Amanda Goss '13**

Mitchell Scharman, Geology

*Analysis of Brittle Paleogene Structures in the Svea Region, Eastern Spitsbergen, Svalbard*

The Svalbard archipelago has been deformed by several tectonic events throughout its geologic history, most recently by rifting from Greenland during the Paleogene. Svalbard's largest island, Spitsbergen, features two large-scale tectonic structures that formed during this Paleogene event: a fold-and-thrust belt along the west coast, and an associated foreland basin in the central part of the island. The largest coal mine on Spitsbergen, the Svea Nord mine, is located on the eastern edge of this foreland basin, in a region of subhorizontal sedimentary strata where small-scale brittle structures are observed. This study aims to determine whether these brittle structures are related to either 1) extension due to collapse of the over-thickened fold-and-thrust belt or 2) extensional forces resulting from the rifting of Svalbard and Greenland. Orientation data from faults, joints, and slickenlines were collected within the Svea Nord mine and the surrounding area in order to resolve the paleostress regime during deformation. Two groups of normal faults, S to SW dipping and NW dipping, were observed in the mine and the

surrounding region. Joint orientation measurements show two dominant sub-vertical joint set orientations: ENE-WSW and NNW-SSE. Preliminary results from stress analysis of the joint sets show two distinct stress regimes with NW-SE and ENE-WSW  $\sigma_1$  directions respectively. An analysis of lineaments from aerial imagery will help to solidify these initial findings.

### **Jayne Gough '13**

Rachel Austin, Chemistry

#### ***Synthesis and Activity of Supported Ruthenium Catalysts for the Deoxygenation of Phenol as a Model Compound for Fast Pyrolysis Oil***

A series of third-generation ruthenium-base supported catalysts were synthesized, characterized by ICP, and tested for their ability to catalyze the hydrodeoxygenation of fast pyrolysis oil and a model compound for key functional groups in fast pyrolysis oil. These catalysts were termed "third-generation" catalysts because they build on two prior generations of catalysts that were tested for catalytic activity. In this generation of catalysts, a synthetic method was used to in theory generate and reduce uniform nanoparticles of ruthenium while on the surface of silica and titania supports. Utilization of the Parr reactor was necessary to test the catalytic reactivity of the catalysts. Post catalytic reaction analysis was done by gas chromatography mass spectrometry. A fourth generation of catalysts on the most promising support, titania, will be synthesized by first forming the nanoparticles and impregnating them onto the support in a second step to determine if catalytic activity increases.

### **Munroe Graham '13**

Mollie Godfrey, English

#### ***Exploring the Maine NAACP Archives***

Despite Maine's relatively small African American population, the Portland and Bangor chapters of the National Association for the Advancement of Colored People (NAACP) have collected thousands of letters, photographs and posters documenting their strength and importance in Maine communities. The collection was donated by NAACP members to the Sampson Center for Diversity at University of Southern Maine. In Short Term 2012, members of INDS s36 (Making African American History: Preserving the Archives of the Portland NAACP) worked with administrative papers, photographs, newspaper articles, and event programs to understand the importance of the NAACP in Maine and the value of adding this collection to the historical record. This presentation focuses on our experience with archival material and learning about history through primary sources.

### **Logan Greenblatt '14**

Elke Morris, Art and Visual Culture

#### ***The Photographic Process: Creating "That" Image***

Photography is an art that is accessible to a broad range of people. Why are some photographs so moving and striking, and why are some "masters" of the medium so well-recognized and studied today? In my photographs, I work toward creating thought-provoking images. In order to create an image that is striking and moving, the neurons in the right hemisphere of the photographer's brain need to be firing. The world must look completely different, clearer, in greater detail and understanding. The artist's mind races in a thousand directions pondering what the image would look like if the aperture was changed, lenses switched, or the image altered in Photoshop. Creating "that" image is not as simple as pushing the shutter button. I will present several of my images and discuss my progress in the

medium. Exhibited in Pettengill Hall are four images I consider to be among my most successful work.

### **Kathy Guo '14**

Bonnie Shulman, Mathematics

#### ***Using Derivations of the "Generalized Two-Parameter Model" in Efficiently Predicting the Rate of Tumor Growth*** -- see

Bryan Carrillo '13 for abstract

### **Lindsey Gwynne '13**

Nancy Koven, Psychology

#### ***Attentional Bias in Orthorexia Nervosa***

Orthorexia nervosa (ON) refers to an eating disorder characterized by a fixation with eating healthy or proper foods. Eventually, this disorder can result in serious dietary restriction, nutritional deficiencies, and social isolation. There is a lack of agreement about whether ON can be labeled as a subcategory of anorexia nervosa (AN) or obsessive-compulsive disorder (OCD). Given the known similarities between AN and ON and OCD and ON, the purpose of this study is to determine whether attentional biases in individuals with ON symptomology are similar to those of subjects with AN symptomology or OCD symptomology.

### **Lauren Hاديaris '13**

Senem Aslan, Politics

#### ***The Egyptian Military***

Why did the Egyptian military side with the protestors during the demonstrations in 2011? The military's decision to allow the fall of a three-decade rule by a monarchical president and a half-century legacy of authoritarian regimes shocked the scholarly community. What caused this sudden change of support especially when other Arab presidential regimes responded with violence and repression? This thesis is an investigation into what factors may have influenced or have made this refusal possible. What allowed this strategy for the military to remain a leading institution in the nation at a time of change?

### **Elizabeth Hallett '13**

Francisca López, Spanish

#### ***Language, Linguistics, Literature, and Film: Spanish Thesis Research*** -- see Kevin Crotty '13 for abstract

### **Grace Hamilton '15**

Bonnie Shulman, Mathematics

#### ***Mathematics of Ichthyology: Applying Ivlev's Model to the Feeding Patterns of the Sand Smelt (Atherina boyeri)*** -- see

Jesse Butler '16 for abstract

### **Nora Hanagan '13**

Senem Aslan, Politics

#### ***Turkey's Gender Equality Puzzle: Navigating the Difference between Action and Intent***

Given extensive reforms targeted at improving gender equality in Turkey since the 1920s, one would assume that women and men enjoy a comparable social status, but this is far from the case. This study focuses on two factors affecting the measure of gender equality: economic participation and educational attainment. Since the establishment of the New Turkish Republic in 1923, both topics have been the primary subject of extensive legal reforms and modernization policies. To address the research puzzle, this study utilizes a state-society approach to explore the interaction between gender-targeted reforms and their implications on Turkish women. In each case, the official

state policy has failed to make lasting differences on many women's educational and economic opportunities. To explain the disconnect between official national policy and realities on the ground, this paper argues that the process of simplifying "women's interests" to a singular vision of the ideal Turkish female citizen, has limited the state's capacity to effectively implement policy. In contrast to the dominant analytical discourse which questions the state's commitment to gender equality and criticizes its contradictory nature, this thesis does not assume absolute state strength or the universality of power dynamics between male oppressors (the state) and female victims (society). Instead, it acknowledges the limits to state power and the variety of interactions between state and society.

#### **David Harning '13**

Beverly Johnson, Geology

##### ***A Geochemical Investigation of Late Holocene Sediment Cores from Pyramid Lake, Fiordland, New Zealand***

Pyramid Lake is a small (c. 500 meters in diameter), semi-closed lake thought to have formed 12,000 to 13,000 years ago, following the Green Lake Landslide at the end of the last ice age. Recent records of watershed change indicate regional climate variability from natural and anthropogenic sources. Biogenic silica, stable isotopes ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ) and carbon and nitrogen elemental ratios of bulk sediment were examined in two sediment cores, 28 and 34 cm respectively, collected from Pyramid Lake to shed light on nutrient dynamics and primary production within the watershed. Carbon isotopes ranged from -27.7% to -29.0%, showing an overall depletion from the bottom to top of core while nitrogen isotopes ranged from 0.9% to 1.9%, showing a slight enrichment up core. Biogenic silica ranged from 0.97% to 23.8% and increased towards the top of the cores. These results suggest an increase in primary productivity near the surface of the cores.  $^{240}\text{Pu}$  dates are pending as is compound-specific lipid biomarker analysis. By learning how the lake's primary productivity has changed in response to its environment, we can gain an understanding of the extent of human impact and predict how it could change in the future in the face of human-induced climate change.

#### **Joanna Harran '13**

Robert Farnsworth, English

***Literary Reading by Creative Thesis Writers*** -- see Ashley Brunk '13 for abstract

#### **Corey Hill '13**

Ryan Bavis, Biology

##### ***Plasticity in the Central Control Mechanism of the Biphasic Ventilatory Response Following Developmental Hyperoxia: Effects of the P2X Receptor Antagonist PPADS***

The biphasic ventilatory response to acute hypoxia (HVR) has been shown to be a plastic system, responding significantly to developmental oxygen conditions. Neonatal rats developed in relative hyperoxia express HVRs similar to more mature individuals, suggesting an accelerated development of the system. Through a comparative analysis of HVR seen in P4 neonates raised in hyperoxia and P14 rats grown in normoxia, this research aims to elucidate the exact physiological changes induced by developmental hyperoxia. Additionally, it is hoped that a pharmacokinetic examination of the P2X inhibitor PPADS will solidify its role as a robust method for isolating CNS respiratory control by inhibition of carotid body activity. These data will add to the growing understanding of developmental

respiratory plasticity that has far reaching implications, especially in the realms of neonatal care for humans.

#### **Hyo Sun Hong '16**

Bonnie Shulman, Mathematics

##### ***Using Derivations of the "Generalized Two-Parameter Model" in Efficiently Predicting the Rate of Tumor Growth*** -- see

Bryan Carrillo '13 for abstract

#### **Terry Horowitz '13**

Ryan Bavis, Biology

##### ***The Effects of Chronic Hyperoxia on the Neurochemical Development of the Caudal NTS*** -- see Kathryn DeAngelis '13

for abstract

#### **Leah Humes '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

##### ***Blood, Exploitation, and Murder, All for a Cell Phone?*** -- see

Sarah Brooks '16 for abstract

#### **Amna Ilyas '13**

Pallavi Jayawant, Mathematics

##### ***Graph Theoretic Model for Music Information Retrieval***

Did you know that you could input a song as an audio or score fragment into the computer and it can identify the song for you? There are a number of models for music information retrieval through which this is possible. This thesis project focuses on a music information retrieval method that uses graph theory. A musical theme in a song input is converted into a representative graph. This graph is then compared with existing graphs in a database. Through a similarity function the system is able to find relevant matches and give you the result. How is musical information converted into graphs? What information from these graphs helps us compare musical themes? What is the similarity function and how does it work? Find out the answers at the presentation.

#### **Valerie Jarvis '13**

Karen Palin, Biology

##### ***An Investigational Study of Gestational Diabetes Mellitus in Somali Women in Lewiston***

Gestational diabetes mellitus (GDM) is an impaired glucose tolerance that is detected during pregnancy that results in various levels of hyperglycemia. GDM is becoming a global health concern due to the epidemiological transition towards a decrease in physical activity and increase in caloric intake. Diet and exercise modifications during pregnancy can reduce the risk of GDM. This project focuses on addressing the increasing prevalence of GDM in the Somali population in Lewiston, ME, and preventing the adverse maternal and fetal outcomes associated with GDM. Data on prenatal care knowledge, diabetes, nutrition, and exercise was collected through home visit questionnaires that were designed as a collaborative effort with community practitioners. Educational workshops and a sustainable exercise regime are potential community outreach outcomes.

#### **Patrick Jeffries '14**

Stephen Sawyer, Office of Off-Campus Study

##### ***Warriors of Shangri-La: Oral Histories of Tibetan Resistance to Chinese Occupation and the Lives of Rebels after Defeat***

Chinese PLA forces invaded Eastern Tibet in 1949 and 1950. In the Kham and Amdo provinces of Tibet, people rose in violent resistance against Chinese occupation. Eventually moving to

Lhasa, India, and Mustang, an organized Tibetan resistance movement existed until 1974. Accounts of this rebellion are less known and less heralded by those who would like to believe that Tibet was a ubiquitously nonviolent, peaceful land prior to 1949. This talk recounts a collection of oral histories conducted among Tibetans who actively took part in this resistance. Their stories tell of lives defined by rebellion, violence, and defeat. These histories also illustrate that these rebels did not cease to exist after surrender; they still live in refugee camps across Nepal, some continuing to resist foreign occupation of their homeland.

**Justin Johal '14**

Glen Ernstrom, Biology

***Hypothetical Acidification Restoration through Archaerhodopsin Optogenetics in Caenorhabditis Elegans***

Clinical neuroscience, over time, has tried to understand how neurons in the brain work together to implement feelings, senses, thoughts, and physical activity, and how mutations in specific neuronal pathways or neurons potentially cause brain disease, including Alzheimer's disease. Recently, optogenetics have been used as genetically encoded molecules that, when attached to specific neurons, increase or suppress activity. Opsin, specifically archaerhodopsin, proteins have been used as light-driven proteins to assist in the restorations of synapses. Archaerhodopsin are light-driven outward proton pumps that have been mainly found in algae and other prokaryotes. In *C. elegans* organisms that have shown to express unc-119 (incoordination), their synaptic vesicles haven't reached the appropriate acidic levels (pH=5.5) to endocytose and release their neurotransmitters. Therefore, if archaerhodopsin, attached to synaptogyrin, were to be translocated into the membrane of synaptic vesicles, then through optogenetics, lumen acidification could potentially be restored.

**Hansen Johnson '13**

William Ambrose, Biology

***Characterizing Songs in the Bering-Chukchi-Beaufort Population of Bowhead Whales (Balaena mysticetus) during Their Annual Spring Migration***

Bowhead whales (*Balaena mysticetus*) are uniquely suited to spend their entire lives in the Arctic Ocean. The Bering-Chukchi-Beaufort (BCB) population of bowhead whales is defined by their residence in and migrations between wintering grounds in the Bering Sea and summering grounds in the Beaufort Sea. The regular passage of the entire population along the coastline of northern Alaska invites the possibility of answering several questions regarding bowhead song. Marine autonomous recording units were deployed in the Chukchi Sea off of Point Barrow, AK, during the spring migration of 2011. Continuous audio data recorded from 12 April to 27 May contain a range of bowhead vocalizations from short calls to complex song. I identified 19 unique song types and characterized them quantitatively based on unit order, frequency and duration. The number of observed song types suggests that bowheads have a more diverse song repertoire than that of other cetaceans. Of these 19 songs, nine were recorded on multiple occasions throughout the season, which indicates an overlap in song repertoire between individuals.

**Travis Jones '13**

Martin Andrucki, Theater and Dance

***Exploring Circus Arts***

From its beginnings, inspired by the circus of England, the American circus has developed a unique legacy over the last

three centuries. From equestrian acts and elephants to acrobats and canvas tents, the American circus grew as the country expanded. I examine the factors that contribute to the circus legacy, and consider how the contemporary circus either embraces or distances itself from what was once known as "The Greatest Show on Earth." In addition to my research on circus, I conducted an independent study on circus arts in winter 2013. I studied aerial straps with learning associate Andrew Adams '09; Alison Haymes '16 studied aerial hoops with learning associate Helena Reynolds. Alison and I will offer performances on aerial hoops and aerial straps, respectively, during the Bates Modern Dance Company Winter Concert on Summit Weekend.

**Eliza Kaplan '15**

Loring Danforth, Anthropology

***Bates to Saudi*** -- see Gintare Balseviciute '15 for abstract

**Nicholas Karlson '13**

Thomas Wenzel, Chemistry

***Diamagnetic Lanthanide Complexes as Chiral NMR Shift Reagents***

Diamagnetic lanthanide complexes with aryl containing 3-(3,5-dinitrobenzoyl)-(+)-camphor were synthesized and their enantiomeric discrimination properties were analyzed. The shielding of the hydrogen atoms by the aryl rings in the lanthanide complexes most likely increases the enantiomeric discrimination in <sup>1</sup>H NMR.

**Kathilee Kenlock '14**

Michael Durst, Physics

***Photothermal Imaging***

I developed a custom confocal microscope for detecting the photothermal effect, which can image any object that absorbs light and heats up, including gold nanoparticles and cellular mitochondria. In a biological sample, these absorbing structures can be heated deep beneath the surface, allowing for the detection and treatment of cancer and other abnormalities without making an incision.

**Mollie Kervick '13**

Robert Farnsworth, English

***Literary Reading by Creative Thesis Writers*** -- see Ashley Brunk '13 for abstract

**Eric Kimball '13**

Catherine Buell, Mathematics

***Frobenius Pseudoprimes and a Cubic Primality Test***

An integer,  $n$ , is called a Frobenius probable prime with respect to a polynomial when it passes the Frobenius probable prime test. Composite integers that are Frobenius probable primes are called Frobenius pseudoprimes. Jon Grantham developed and analyzed a Frobenius probable prime test with quadratic polynomials. Using the Chinese Remainder Theorem and Frobenius automorphisms, we were able to extend Grantham's results to some cubic polynomials. This case is computationally similar but more efficient than the quadratic case.

**Andrea King '13**

Krista Aronson, Psychology

***Social Skills Intervention: Serving Local Adolescent Boys***

Incorporating social skills games and mindfulness activities, the current project represents an intervention designed to improve social and academic competence among youth diagnosed with DSM IV Axis I disorders. Carried out in an educationally

focused day program for youth struggling with executive functioning deficits (EFDs), which are characterized by difficulties regulating attention, cognitions, emotions, and behaviors, this work introduced an alternative method to practicing social skills. Seven adolescent boys participated in this program, which focused on attention; awareness of self, others, sounds, and directions; understanding transient nature of thoughts; reflecting on behavior; mindfulness; self-control; memory; observation and listening (Plummer, 2008). Observational qualitative data were collected during the activities, "reflection conversations," and morning class time. Results from the observational data collected demonstrated that students enjoyed these activities and were interested in continuing. Although participants had room to grow with respect to attention and abstract thinking, findings provide important information that will be used to inform future programming within the community.

#### **Nikhil Krishna '13**

Thomas Wenzel, Chemistry

##### ***Cationic Cyclodextrins as Chiral NMR Solvating Agents***

Chiral solvating agents are involved in enantiomeric discrimination through nuclear magnetic resonance (NMR). A chiral discriminator can form a complex with a substrate and distinguish enantiomers within the substrate through peak splitting and peak shifts, in comparison to the non-complexed substrate. Cyclodextrins are notable discriminating agents because of both their water solubility and large, hydrophobic cavity, allowing for complex formation. A cationic cyclodextrin, using an ammonium based salt substituent, has historically been better discriminator than a native cyclodextrin since its positive charge complements the potentially negative charge from the substrate. The effects of both substituent size and substituent stereochemical purity on discrimination efficiency were examined in this study. Currently, beta-cyclodextrins containing both enantiomerically pure and racemic substituent groups of glycidyl triethylammonium chloride have been synthesized. Eventually, cationic cyclodextrin-substrate complexes will be formed to examine discrimination.

#### **Olivia Krishnaswami '15**

Robert Strong, English

##### ***The Research and Writing of Strong Graduate Fellowship Proposals*** -- see Spencer Collet '13 for abstract

#### **So Hyun Kwon '13**

Bonnie Shulman, Mathematics

##### ***Using Derivations of the "Generalized Two-Parameter Model" in Efficiently Predicting the Rate of Tumor Growth*** -- see Bryan Carrillo '13 for abstract

#### **Samantha Landino '13**

Jason Castro, Psychology

##### ***Intrinsic and Synaptic Properties of Accessory Olfactory Bulb Mitral Cells in Female Mice Following Exposure to Dominant versus Subordinate Male Odors***

The accessory olfactory bulb (AOB) is a sensory brain region critical for processing socially relevant chemical signals from conspecifics; for example, dominant and subordinate derived odors differentially activate this structure. In addition, the AOB is a well-established locus of social memory, with long-lasting, well-localized, and stimulus-specific physiological changes that decrease AOB output upon reactivation by a specific odor. I tested the hypothesis that such plastic changes in the AOB are

selectively induced by the odors of dominant, but not subordinate individuals. I sought to characterize a hypothesized, but unidentified memory for signals conveying social rank. To do this, I established social hierarchies in male mice, using the tube test to identify dominant and subordinate individuals. Female mice were reared for nine days on bedding from the cages of dominant or subordinate males. In vitro whole-cell recordings from female AOB slices were used to determine how dominant vs. subordinate male odors alter intrinsic and synaptic properties of AOB principal neurons (mitral cells). It was expected that mitral cells exposed to dominant odors would exhibit lower firing rates, less sensitivity to current input, and larger amplitudes of recurrent inhibition than subordinate exposed cells, indicating a decrease in output similar to that seen with documented olfactory memories. These results would demonstrate a novel type of olfactory memory in which signals of social standing lead to long-term changes in brain organization.

#### **Christopher Lane '13**

Sonja Pieck, Environmental Studies

##### ***Rescaling of Environmental Governance in the Wadden Sea***

The Wadden Sea protected area, shared between Denmark, Germany, and the Netherlands, is unique in its ecology and biodiversity. In the last thirty years, it has been afforded more and more protection on a higher and higher level. While responsibility initially fell to the three controlling nations, the area was added to the UNESCO World Heritage site list in 2009. While the designation might seem beneficial, it was heavily opposed by the region's residents, who viewed it as a threat to their already endangered autonomy, particularly in light of a constantly increasing body of exterior stakeholders. This presentation examines how this conflict has evolved and how this rescaling of power is reminiscent of similar instances in other transboundary conservation areas around the world.

#### **Stephanie LaRosa '13**

William Ambrose, Biology

##### ***Growth Variability and Heavy Metal Concentrations in Margaritifera margaritifera from Karpelva Fjord, Norway***

Growth lines annually deposited in the shells of bivalves can serve to estimate growth rate and reflect environmental conditions, including anthropogenic disturbance. The freshwater pearl mussel *Margaritifera margaritifera* reaches ages of 150-200 years, making it an excellent long-term proxy of climate. Samples of *M. margaritifera* were obtained from Karpelva fjord in Finnmark, Norway, in the proximity of a nickel smelter on the Kola Peninsula in Russia. The banding patterns of annuli of *M. margaritifera* were analyzed to develop a long-term growth chronology from the late nineteenth century to 2011. Growth variability of *M. margaritifera* indicates years of favorable or unfavorable growth conditions. The shells were also tested for heavy metals before and after 1946 when the nickel smelter was established on the Kola Peninsula. The concentrations of metals in different increments of the shell, which corresponded to different time periods, should reflect pollution in Karpelva fjord from increased industrial activity.

#### **Jeffrey Lathrop '13**

Todd Kahan, Psychology

##### ***The Influences of Asymmetrical Brain Hemisphere Activation on Aspects of Visual Processing***

This study examines how certain aspects of visual processing differ depending on which hemisphere of the brain is activated.

Previous research supports the conclusion that the left hemisphere of the brain is more proficient at depicting the parts of an image while the right hemisphere is more proficient at perceiving the larger holistic image. The current experiments presented individuals with tasks designed to elicit asymmetrical brain hemisphere activation by presenting images to either side of a person's visual field. When images are presented to the left visual field, they are first processed by the right hemisphere of the brain; when images are presented to the right visual field, they are first processed by the left hemisphere of the brain. Participants were asked to respond to the images that were shown as quickly and accurately as possible. Reaction times and error rates for making these responses were analyzed in order to better ascertain the roles that the right and left hemispheres play in helping us to perceive visually presented stimuli.

#### **Michael Lavallee '13**

Pamela Baker, Biology

#### ***Chemotherapeutic Efficacies of Monoclonal Antibody Treatments in Breast Cancer Patients with Over-expression of HER2***

In the field of oncology, there have been significant advancements in both the number of treatment options available to cancer patients and the efficacy of these new alternatives. Cancer, characterized by uncontrolled growth and spread of abnormal cells, is a disease that occurs in people of all ages, with one out of every two men and one out of every three women developing it during their lifetime. The use of antibodies has been at the forefront of cancer research recently, allowing chemotherapeutic agents to achieve a greater specificity in the termination of cells within the body. A motif has been observed within breast cancer patients where a particular gene, HER2-NEU, is being over-expressed by highly differentiated, cancerous cells. This work will be a critical analysis of clinical research articles publishing information on the use of trastuzumab, and an illustration of the improved efficacies observed with the incorporation of this HER2-NEU targeting antibody.

#### **Elizabeth Lawson '13**

William Ambrose, Biology

#### ***Determination of Mytilus edulis Growth from Kongsfjord in Svalbard, Norway***

*Mytilus edulis*, the blue mussel, has a wide range that extends in Europe to the Svalbard archipelago, located at ~780 N. My study 1) determines if growth lines are annual using calcein marked shells from moorings, 2) estimates a growth rate in *M. edulis* shell cross section at the end of its range, and 3) generates a Standard Growth Index to see if growth is a good proxy for environmental conditions. The right valve of each mussel was embedded in epoxy, cut using a low-speed saw with a diamond waifering blade, polished, imaged (with fluorescence in the case of the moored mussels), and the distance between the annual lines were measured in order to estimate the amount of growth per year. Growth was modeled using the von Bertalanffy equation.

#### **Matthew Leary '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics  
***Emerging Identities: The Recent Appearance of LGBTI Support in Kenya*** -- see Kathryn Collier '13 for abstract

#### **Louisa Lee '13**

William Ambrose, Biology

***Spisula solidissima from Maine as Environmental Proxies***  
Surf-clams, *Spisula solidissima*, are abundant and commercially important in North America. Studying their growth can aid in managing fisheries and reconstructing paleoclimates. The chemical composition, density, and width of newly secreted shell depend on changes in the surrounding environment, giving rise to visible growth bands on the shell and cross section. Thus, growth patterns can serve as proxies for environmental variables such as sea surface temperature, salinity, precipitation, and large scale climate oscillations. My goal was to determine which environmental factors affect growth, and by comparing two populations of *Spisula* establish whether growth follows regional or local variations. A 20+-year chronology of average growth was constructed using live and dead *Spisula* from Casco Bay and Seawall Beach, ME. Mean annual growth was correlated with the different environmental parameters and compared between the two populations. Preliminary results show that growth of Land's End clams are negatively correlated with mean annual precipitation.

#### **Alexandra LeFevre '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics  
***Gender Parity: Necessity or Imposition?*** -- see Joshua Giesler '16 for abstract

#### **Courtney Lemenze '13**

Michael Murray, Economics

#### ***The Behavioral Economic and Neuroeconomic Analysis of Alcohol Consumption and Hyperbolic Discounting***

Economists frequently assume that people make rational choices. However, behavioral economists have recently challenged this assumption and have begun exploring the rationality of intertemporal choice, decision-involving tradeoffs that occur at different times. One such challenge has focused on the exponential discounting model of rational choice. Discounting can be easily defined as our desire for rewards sooner rather than later. Standard economists believe that an individual's discounting only depends on the length of time between the sooner and later reward. Conversely, behavioral economists have observed that when the sooner delivery of a reward is in the present the later reward is discounted more heavily; this is called present bias. A new model called hyperbolic discounting has been proposed to account for present bias. Neuroscientific data suggests that an increase of dopaminergic activity within the nucleus accumbens and ventral tegmental area (VTA) brain regions. This may be the factor why individuals, who consume large amounts of alcohol, tend to hyperbolically discount. This study tests whether alcohol consumption is better correlated with the hyperbolic discounting model or exponential discounting model.

#### **Ashley Lepre '13**

Robert Farnsworth, English

***Literary Reading by Creative Thesis Writers*** -- see Ashley Brunk '13 for abstract

#### **Elise Levesque '13**

Amy Douglass, Psychology

#### ***The Effect of Reward on Asymmetry in Eyewitness and Interviewer Goals***

This study seeks to examine how the differing perspectives and goals brought to eyewitness testimony interviews by the

eyewitnesses and the interviewers interact to influence the quality of information brought to trial. My experiment attempts to replicate and expand upon Douglass, Brewer, Semmler, Bustamante, & Hiley's 2012 experiment on matching versus mismatching goals. Reporting goals is manipulated in a factorial design with participants being asked either to collect/provide as much information as possible or merely as much accurate information as possible. Participants in the current study were also assigned to either a reward or a no reward condition, meaning that those who successfully achieved the goals laid out for them by the facilitator received a monetary reward. They were also asked to complete a questionnaire evaluating how well they understood their role in the interview. I predicted that participants in the reward condition who also score highly on their questionnaires (indicating high role clarity) will show an amplified effect of the matching conditions producing better interview results.

### **Mary Lewis '13**

Rachel Austin, Chemistry

#### ***Synthesis and Activity of Supported Ruthenium Catalysts for the Deoxygenation of Phenol as a Model Compound for Fast Pyrolysis Oil***

A series of third-generation ruthenium-base supported catalysts were synthesized, characterized by ICP, and tested for their ability to catalyze the hydrodeoxygenation of fast pyrolysis oil and a model compound for key functional groups in fast pyrolysis oil. These catalysts were termed "third-generation" catalysts because they build on two prior generations of catalysts that were tested for catalytic activity. In this generation of catalysts, a synthetic method was used to in theory generate and reduce uniform nanoparticles of ruthenium while on the surface of silica and titania supports. Utilization of the Parr reactor was necessary to test the catalytic reactivity of the catalysts. Post catalytic reaction analysis was done by gas chromatography mass spectrometry. A fourth generation of catalysts on the most promising support, titania, will be synthesized by first forming the nanoparticles and impregnating them onto the support in a second step to determine if catalytic activity increases.

### **Zoe Livingston '13**

Rebecca Fraser-Thill, Psychology

#### ***The Relationship between Self-Efficacy, Labor Method, and Birth Satisfaction***

This study investigated whether a woman's general sense of self-efficacy and labor method were associated with birth satisfaction. Mothers who were no more than twelve months postpartum were chosen from online mothering groups and prenatal care groups. Participants were asked to complete a General Self-Efficacy Scale, Satisfaction with Delivery and Conduct During Labor/Delivery Questionnaire, and a General Information Questionnaire designed for this study. A 2 (self-efficacy: high or low) x 3 (actual labor method: natural vaginal or medicated vaginal or planned c-section/medicated c-section) ANOVA on birth satisfaction indicated a significant main effect of self-efficacy,  $p = .014$ , as well as a significant main effect of labor method,  $p = 0.002$ . A strong trend toward an interaction was found between self-efficacy and labor method on birth satisfaction. Women with low levels of birth satisfaction who had a c-section as their actual labor method are less satisfied with birth than women in any other group.

### **Deana Lorenzo '13**

Francisca López, Spanish

#### ***Language, Linguistics, Literature, and Film: Spanish Thesis Research*** -- see Kevin Crotty '13 for abstract

### **Nicholas Luther '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics  
***Gender Parity: Necessity or Imposition?*** -- see Joshua Giesler '16 for abstract

### **Ryan MacDonald '13**

William Ambrose, Biology

#### ***Geographic Variation of Growth Rates in Adult Soft-shelled Clams, *Mya arenaria*, along the Maine Coast***

Biological criteria informing the management of bivalve fisheries is poorly understood despite their commercial importance to coastal economies in the United States. To better understand and predict bivalve growth relationships I measured growth rates of wild, adult soft-shell, *Mya arenaria*, at ten different sites along the Maine coastline and tested the relationship of growth rates to temperature, salinity, porosity, benthic chlorophyll, and water column chlorophyll. I expect to see increasing growth rates with increases in temperature and both benthic and water column chlorophyll measurements. This leads me to anticipate increasing growth in the southern sites and corresponding correlations with increased temperature and chlorophyll at these sites. The goal of the study is to provide information to help better manage bivalve fisheries and determine optimal harvest intervals for soft-shell clams throughout Maine.

### **Conor Maginn '13**

Beverly Johnson, Geology

#### ***Variations in Hypoxia and Productivity along the Oregon Margin during the Younger Dryas and Early Holocene***

While the climactically cold time interval known as the Younger Dryas (YD; 12.9-11.6 kyr BP), has been well observed in the North Atlantic, little is known about its history in the Northeast Pacific. In an effort to better understand variations in hypoxia and productivity in this region during the YD and early Holocene, this paleoceanographic study examined a sediment core collected off the Oregon Margin. Methods included geochemical analyses of trace metals (Re, Mo), minor elements (Mn, Al), as well as carbon and nitrogen contents and stable isotopes. The proxy data suggest that the YD was a cold and oxic period, while the Holocene grew gradually hypoxic with time. In effect, these proxies provide a high-resolution record of the transition from the YD to the Holocene, allowing us to better understand shifts in hypoxia and productivity through this time period in the Northeast Pacific.

### **Sheena Malik '13**

Amy Douglass, Psychology

#### ***Observer Perspectives on Eyewitness-Investigator Interactions: Are Interactions with Matching Goals Rated More Positively?***

In the field of psychology and law, research has been conducted looking at the interaction between eyewitnesses and investigators preceding a crime, with manipulations of certain factors on both parts that could alter the accuracy of the eyewitness's testimony. Pre-existing evidence suggests that an eyewitness's testimony is a crucial part of an investigation, and hence, an inaccurate or false testimony can have serious repercussions. This experiment is focused on third-person judgments of eyewitness-investigator interactions. The aim of

the study is to see whether third-person evaluators who are not present during the interaction, such as jurors, are able to make a distinction between an accurate and inaccurate eyewitness testimony. Participants were asked to listen to a conversation between an eyewitness and investigator and then fill out a questionnaire rating the two and the interaction in general. Audio recordings, used from a previous experiment, consisted of four conditions wherein the eyewitnesses and investigators were given matched or mismatched instructions for accuracy or quantity of information. The present participants were randomly assigned to one of the four conditions and were unaware of this manipulation.

#### **Maura Maloney '13**

Xing Fan, Chinese

##### ***Dating Programs in the People's Republic of China***

My thesis focuses on two dating television programs currently airing in China, *If You Are the One* and *Let's Go on a Date*. These two programs air on competing networks and have been successful in providing local networks with a cost-effective means of competing with national stations. The programs serve as a platform for gender performativity. These "performances," which vary greatly and include everything from counter-hegemonic to stereotype-enforcing scripts, are symptomatic of women's changing and contradictory roles in the modern Chinese workplace and family.

#### **Mariya Manahova '14**

William Seeley, Philosophy

***Consciousness Studies*** -- see Evan Beinecke '14 for abstract

#### **Ryan March '13**

Ryan Bavis, Biology

***The Effects of Chronic Hyperoxia on the Neurochemical Development of the Caudal NTS*** -- see Kathryn DeAngelis '13 for abstract

#### **Talia Mason '15**

Rachel Boggia, Dance

##### ***Understanding Spirituality through Movement***

In exploring modern dance through the lens of religion and spirituality, I hope to elucidate connections that major modern dancers have found both in their personal lives and in their dance practices. Within Martha Graham's and Doris Humphrey's repertoires, there are links to America's spiritual founding. These primal dancers, in turn, had a dramatic effect on Paula Mason's development as a dancer, choreographer, and spiritual individual. As a practitioner of dance and Subud, Mason explains that Subud is about living an inner life within the material world. Through video clips of Mason as well as snippets of Graham's and Humphrey's repertory, I hope to establish how Mason has been affected by their works as well as their spirituality, in her own life.

#### **Henry Mauck '13**

William Ambrose, Biology

##### ***Soft-Shell Clam Growth***

The goal of my study was to examine changes in soft-shelled clam (*Mya arenaria*) growth rate since 1981 and 2003 at six coastal New England sites, and to determine if variations have been caused by long-term changes in environmental parameters. A 2003 study found that the growth rates had increased by an average of 92% since 1981 at the same sites. The clams collected in 2012 were aged externally as well as internally by

sectioning the chondrophore of each individual, and counting the alternating light and dark annual lines. Data suggest that the increased sea surface temperatures associated with lower latitudes as well as the trend toward warming sea surface temperatures since 1981 have contributed to increased *M. arenaria* annual growth rates. This relationship can be quantified because of the long-term data set, the clam's consistent shell secretion, and may be a model of growth for other marine organisms.

#### **Laura Max '13**

Nancy Koven, Psychology

##### ***Peripheral Levels of Oxytocin, Affective Processing, and Attention in Relation to Schizotypy***

Often considered a prodromal indicator of schizophrenia, schizotypal personality involves cognitive-emotional disturbances and impaired social cognition that are normally distributed in the general population. The neuropeptide oxytocin, which facilitates emotion recognition, bonding, trust, and attachment, is thought to play a role in the etiology of schizophrenia and is therefore being targeted as a therapeutic agent for psychosis. However, no study to date has examined whether oxytocin abnormalities are detectable in schizotypy. Using a sample of young adults, this study 1) assesses the degree of correlation between peripheral levels of oxytocin and self-report indices of schizotypy and 2) examines whether oxytocin mediates the relationships between the diminished attention and social cognition observed with schizotypy. Neuropsychological measures of selective and sustained attention include the Color-Word Interference Test and the Continuous Performance Test, respectively, and tests of social cognition include the Mayer-Salovey-Caruso Emotional Intelligence Test as well as a novel task assessing emotion recognition derived from the Penn Emotion Recognition Task. Peripheral oxytocin levels were examined with enzyme-linked immunosorbent assay from saliva samples obtained per participant. Correlation and regression approaches will be used to examine the co-variance among variables across the full sample, and multivariate analysis of variance will be used to determine whether high- and low-schizotypy groups systematically differ on biological and behavioral measures of interest. Identifying whether irregular oxytocin levels are apparent in schizotypy is a practical and critical step in the effort to elucidate the neurophysiological mechanisms involved in schizophrenia spectrum disorders.

#### **Desmond McGrath '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

##### ***Emerging Identities: The Recent Appearance of LGBTI Support in Kenya*** -- see Kathryn Collier '13 for abstract

#### **Holly McLaughlin '13**

Jan Hovden, Rhetoric

##### ***Protecting Life: A Metaphorical Analysis of the Pro-Life Anti-Abortion Movement and the Conservation Movement***

The 2012 election cycle in the United States was not only saturated with talk of the abortion issue but marked by extreme weather events such as "Superstorm Sandy" and the costliest drought in U.S. history. This investigation attempts to understand how the discourse concerning life, both human and ecological, is negotiated in the political sphere. In consulting the theory of logology by Kenneth Burke and the discussion of metaphor by George Lakoff and Mark Johnson, a cluster analysis is applied to identify the metaphors that emerge around the word "life." These metaphors are then compared to further

understand how the protection of life is negotiated rhetorically. This analysis is limited to two spheres. Concerning abortion rhetoric, the organization, The Susan B. Anthony List, is used to identify and collect texts from politicians who actively speak out against abortion. Contrastingly, the ongoing case of saving the symbolic Hetch Hetchy Valley in Yosemite National Park is used to identify conservation discourse. Ultimately, a comparative cluster analysis of the word "life" is conducted to distinguish how each respective faction, the anti-abortion movement and the conservation movement, uses the term "life" in order to draw conclusions in how a politician may be pro-life and anti-abortion, but not pro-conservation, or vice versa.

#### **Lydia Merizon '16**

Bonnie Shulman, Mathematics

*West Nile Virus Epidemic* -- see Jenna Armstrong '15 for abstract

#### **James Meyo '14**

Bonnie Shulman, Mathematics

##### ***Modeling of Interspecific Competition between Pseudomonas aeruginosa and Staphylococcus aureus***

Many bacterial infections are not simply the result of colonization by one microorganism, but the pathogenic contribution of several organisms. This is the case with the infections cystic fibrosis, untreatable biofilms, and lung infections. Two main bacteria, *Pseudomonas aeruginosa* and *Staphylococcus aureus* are associated with these infections. Although these bacteria may reside in the same pathogenic environment, essentially no mathematical model has been proposed to predict how they interact in vitro. To provide a more comprehensive analysis of *P. aeruginosa* and *S. aureus*, each bacterium will be monocultured on Luria Broth (LB) and then cocultured on a LB plate and broth. Our mathematical model of this experiment will potentially give pharmaceuticals a better idea of how to develop therapeutic targets for the treatment of biofilm or lung infections.

#### **Megumi Milla '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics  
*Gender Parity: Necessity or Imposition?* -- see Joshua Giesler '16 for abstract

#### **Hannah Miller '14**

Claudia Aburto Guzmán, Spanish

##### ***Patterns of Inclusion/Exclusion in State-Funded Argentinean Theater***

This presentation is based on a case study analysis of the Teatro del Libertador San Martín, a government-financed theater in Córdoba, Argentina, where I interned while studying abroad last fall. My observations during this period led me develop the following working thesis: state-funded theater imposes patterns of inclusion and exclusion of participants based on a variety of factors, including ideological, economic, and material issues, all related to the distribution of power within the theater itself. In order to address the problematics of the organization of state-funded theater, I am analyzing state-generated original documents, including those related to the distribution of funding and the relationship between the agency and the internal organization of the theater.

#### **Marisa Mohrer '13**

Kathryn Low, Psychology

##### ***Mainstreaming and Specialty Programs for Children and Adolescents with Autism Spectrum Disorders in Lewiston, ME: A Community-Based Thesis***

The increasing prevalence rate of autism spectrum disorders (ASD) has initiated worldwide public health concerns and highlights the necessity of educational programs in which the needs of every individual with ASD are being effectively met. Observational research for this community-based thesis will be used to produce an extensive guide for parents and educators on the available educational services in the Lewiston area. Observations made at specialty and mainstreaming programs provide information on classroom resources, educational and inclusion techniques, social skills training, and the use of Applied Behavioral Analysis. My research discusses best-practice methods for teaching individuals with ASD and will highlight what schools can do to ensure that every student with ASD is thriving to their potential.

#### **Joanna Moody '14**

Nathan Lundblad, Physics

##### ***Cooling Gaseous Atoms toward Absolute Zero***

This poster outlines the process of cooling atomic gases to temperatures close to absolute zero, in order to study quantum-mechanical phenomenon such as Bose-Einstein Condensation (BEC) obscured in high-temperature gaseous states. To get a source of atoms cold and dense enough to see BEC, a beam of laser cooled atoms are loaded into a magneto-optical trap (MOT). After collecting a large number of atoms in the MOT, the lasers are turned off and, after a short period of free fall molasses phase, the atoms are loaded into a magnetic quadrupole trap. In this trap we cool the atoms further using rf-induced evaporation. This method uses radio waves to flip the spins of the most energetic atoms, causing them to fly off. Then when the rest of the trapped atoms re-thermalize, the net energy per atom has dropped, and the atoms are cooler, approaching temperatures below 10 microKelvin above absolute zero.

#### **Rose Moran '13**

Todd Kahan, Psychology

##### ***Alexithymia and the Rapid Serial Visual Presentation (RSVP) Task: Does Difficulty Identifying Affective Stimuli Eliminate the Attentional Blink?***

Alexithymia is a personality construct characterized by diminished capacity to identify one's own emotions and the emotions of others. Similarly, individuals who are considered alexithymic have difficulty describing, regulating, and interpreting emotions. This affective detriment can lead to trouble with social interactions and is linked to numerous co-occurring psychiatric diagnoses. In this study, the rapid serial visual presentation (RSVP) task was used to compare the participants' attentional blink when presented with schematic face stimuli. The participants were also administered the Toronto Alexithymia Scale (TAS) questionnaire in order to determine their propensity for alexithymic traits.

#### **Danielle Morris '13**

Michael Sargent, Psychology

##### ***Construal Level Theory and Psychological Distance: Israeli Policy Decisions and Sacred Values***

Anything outside of our immediate present must be mentally represented, or construed. Construal level theory posits that psychological distance affects how abstractly or concretely

people perceive a given situation (Trope & Liberman 1998). Previous research has shown that people perceive situations more abstractly at a larger psychological distance (Trope & Liberman 1998). When negotiators have more psychological distance from an interpersonal negotiation, outcomes are more satisfactory. Furthermore, at a greater distance negotiators are more likely to make concessions on secondary issues to maintain a primary goal ("logrolling") (Henderson, Trope & Carnevale 2006). My research examines individual decision making about high-stakes policy that would sacrifice territory for peace in Israel: Does the same logrolling that occurs in interpersonal negotiation affect individual decision making that implies sacred values? It is predicted that at a greater temporal distance participants will be more likely to sacrifice territory, a secondary goal, for peace, a primary goal.

### **Rachel Morrison '13**

Beverly Johnson, Geology

#### ***Isotopic Reconstructions of Swordfish Diets in the Gulf of Maine***

Stable isotope tracers can be valuable tools for interpreting the way an ecosystem has functioned over time. Both modern and archaeological swordfish rostra spanning 4,200 years were collected from the Gulf of Maine, North Carolina, and off the coast of California for  $^{15}\text{N}$  and  $^{13}\text{C}$  analysis to understand shifts in swordfish populations and reconstruct their diets through time. In addition, several selected whole rostra were subsectioned and analyzed for bulk carbon and nitrogen isotope analysis in order to evaluate the isotopic variability that can occur along the length of a rostrum. Preliminary results show slight variability in  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  along and within individual rostra. This variability may reflect natural changes in the diet of the swordfish throughout its life, movement patterns with growth, or the increased presence of isotopically depleted lipids in collagen farthest from the rostrum tip. The  $\delta^{15}\text{N}$  of the archaeological rostrum collagen is relatively constant between 4.2 ka BP and 1.2 ka BP, and then becomes depleted in  $^{15}\text{N}$  in modern samples. These data may reflect 1) a decrease in trophic level of the swordfish, 2) a change in nutrients at the base of the food web, or 3) a fundamental shift in swordfish populations in the last 1.2 ka. Swordfish used to be an important resource to human cultures in the nearshore region of the Gulf of Maine; thus, the study of the dietary habits provides useful information on changes in their ecology as well as human exploitation.

### **Fergus Moynihan '13, and Jonathan Woelfel '13**

Bonnie Shulman, Mathematics

#### ***Modeling the Zombie Infection***

Recently, Hollywood productions have revolved around the idea of a zombie infection spreading across the globe. Using an adjusted Susceptible-Exposed-Infected-Recovered (S-E-I-R) model, we project what would occur should such an event ever happen. The progression of the infection depends on various parameters, including: the rate of infection of susceptibles, the rate at which exposed individuals become infected, and the rate of recovery among the infected population. Finally, we answer the question of whether a zombie infection would run its course, infecting all human beings, or whether we could eradicate the infection before the latter occurs. There are approximately seven billion people on earth; what are your chances of survival?

### **Charles Munn '14**

Dolores O'Higgins, Classical and Medieval Studies

***Euripides' Bacchae*** -- see Jackson Fleming '15 for abstract

***Plautus's Captivi*** -- see Michaela Brady '14 for abstract

### **Desmond Mushi '13**

Elizabeth Eames, Anthropology

#### ***Microfinance as Ambivalence: Kilimanjaro Women's Experiences of Capitalist Development***

Worldwide, microfinance has gained popularity as a way of fighting poverty and enhancing gender equality. By providing women with access to small loans, microfinance is expected to enable women to generate an income and to initiate their own economic and socio-political empowerment. This paper questions the received wisdom that the benefits of microfinance start with poverty reduction and are subsequently followed by social emancipation. I explore the economic as well as the social impacts of microfinance through an ethnographic study of three women from a town called Bomang'ombe in Kilimanjaro, Tanzania, as they undertake a range of microfinance sponsored income-generating settings, and negotiate the consequences of the new subjectivities on which the independent, entrepreneurial citizen is based. The focus in such interventions on the independent, entrepreneurial citizen suggests not only new ways to generate economic growth and sustainable development, but an important recalibration of the repressive social relations thought to be at the root of women's persistent "underdevelopment." I find that economic success and social emancipation has come at a cost for the three women included in this study. The cost of the material gain and social emancipation include family challenges that wives endure with their in laws, as well as been ostracized by their communities for pursuing male-dominated businesses.

### **Julie Naidu '13**

Michael Sargent, Psychology

#### ***How Memory for Features of a Business Differs as a Function of Regulatory Focus and Valence***

Regulatory focus theory proposes that individuals can be motivated by two different systems. Those who are promotion focused seek aspirations and achievements in their goal pursuit, while prevention focused individuals desire security and safety. Research indicated that individuals who are promotion focused demonstrate a "risky" response bias in a signal detection task by showing a tendency to say "yes," they did see the item, while prevention focused individuals demonstrate a conservative bias by showing a tendency to say "no," they did not see the item. Additional research, however, indicated that negative stimuli influences prevention focused individuals to shift to a risky response bias on a signal detection task by increasing their tendency to say "yes," they did see the item. This behavior has been attributed to prevention-focused individuals' vigilance against negative outcomes. This study investigated these concepts in a marketing context by looking at prevention and promotion-focused participants' performance on a signal detection task that included positive and negative information about restaurants. I predict that prevention focused individuals will demonstrate a risky response bias to negative information and potentially a conservative response bias for positive information, more so than promotion focused individuals.

**Andrea Newman '13**

Francisca López, Spanish

**Language, Linguistics, Literature, and Film: Spanish Thesis Research** -- see Kevin Crotty '13 for abstract**Phi Nguyen '13**

Glen Ernstrom, Biology

**Tracking How Neurons Talk with Acid**

Correct localization of synaptic proteins plays an integral role in proper neurotransmitter release and nervous system functioning. In particular, a specialized set of proteins implicated in GABA transmission have been identified in the nematode *Caenorhabditis elegans* and their synaptic functions well characterized in mammalian homologues. The function of the LAMP-like protein UNC-46, however, remains poorly defined. UNC-46 has been implicated in GABA release and is believed to be a regulator of the vesicular GABA transporter. In order to gain greater insight into UNC-46's functions, we will use UNC-46 tagged with a pH-sensitive fluorescent protein to test if it is localized to acidic compartments and synaptic vesicles. In parallel, we will also determine the extent of co-localization with fluorescently-tagged proteins specifically expressed in different organelles of the secretory pathway. The proposed project aims to localize UNC-46 and understand how it regulates GABA synaptic vesicles.

**Trinh Nguyen '13**

Karen Palin, Biology

**Effects of Elderberry Juice on Growth of Staphylococcus saprophyticus**

Elderberry juice, *Sambucus nigra*, has been used for centuries as an alternative remedy for treatment of infections as it has been proposed to have antimicrobial activities. Research suggests that bioactive components in elderberry juice may be responsible for this activity. My project examines the effect of elderberry juice on the growth of the uropathogen, *Staphylococcus saprophyticus*, an important cause of urinary tract infections in young women. Growth of *S. saprophyticus* was examined in vitro at varying concentrations of the elderberry juice. Initial results showed that elderberry juice inhibited growth and there appeared to be a threshold effect. Scanning electron microscopy is used to visualize this effect.

**Nolwazi Ngwenyama '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

**Conserve to Preserve: How Sub-Saharan Africans Protect Their Ecosystems, Cultures, and Communities** -- see John Albanese '16 for abstract**Ingrid Norrmen-Smith '13**

Jason Castro, Psychology

**The Effect of Social Dominance Hierarchies on Neurogenesis in Mice**

While much work suggests that olfactory neurogenesis – the proliferation of adult-born neurons – can be promoted by perceptual learning, comparatively less has addressed whether neurogenesis is enhanced by socially meaningful odors. This hypothesized role for neurogenesis is especially compelling given olfaction's central importance in recognizing kin, conspecifics, and mates. Building on previous studies showing that the odors of socially dominant vs. socially subordinate animals are discriminable, we hypothesized that neurogenesis is selectively elicited by the odors of dominant, but not subordinate individuals. We reared female mice in cage bedding from

dominant or subordinate males, who we identified using the tube-test assay. Females were injected with the DNA synthesis marker BrdU, and sacrificed after 28 days of odor rearing to quantify the number of newly proliferated neurons. A positive result will suggest that the adult brain is actively and selectively reorganized by signals of social hierarchy.

**Tara Notarianni '14**

Bonnie Shulman, Mathematics

**Mathematical Modeling of Bulimia Nervosa in American Colleges** -- see Margaux Donze '14 for abstract**Torben Noto '13**

Jason Castro, Psychology

**Genomic-Scale Analysis of Olfactory System Heterogeneity**

The mammalian vomeronasal system (VNS) detects nonvolatile chemical signals that coordinate a variety of social and sexual behaviors. Peripheral inputs to the VNS are detected by two families of receptors – the V1Rs and the V2Rs – which respond to distinct, though partially overlapping odors derived from conspecifics and predators. The V1Rs and V2Rs in turn project centrally to the anterior (a) and posterior (p) portions of the accessory olfactory bulb (AOB) to define two parallel processing streams. As the significance of these subdivisions is unclear, we used a genomic-scale atlas of gene expression to identify sources of molecular heterogeneity between the aAOB and pAOB. Using the Allen Mouse Brain Atlas, a publically available database of spatially registered, near-complete expression profiles of the mouse mRNA at cellular resolution, we analyzed differences in expression and localization between genes in the aAOB and pAOB. We observed 1) large families of synapse- and metabolic-related mRNAs exclusive to each of these structures, and 2) markedly enhanced expression of mRNAs related to opioid signaling in the aAOB. This suggests that the anterior and posterior AOB may be the targets of unique neuromodulatory systems. More generally, our findings underscore the promise of large-scale bioinformatics approaches to understanding brain function.

**Taryn O'Connell '13**

Darby Ray, Harvard Center for Community Partnerships

**Research and the Public Good** -- see Emily Egan '13 for abstract**Colin O'Leary '13**

Stephanie Richards, Biology

**Identification and Characterization of the Nuclear Export Signal of p90 ribosomal S6 kinase 1**

p90 ribosomal S6 kinase 1 is a downstream member of the mitogen activated protein (MAP) pathway that has been linked to regulation of cell survival, proliferation, and death. In vitro RSK1 has been demonstrated to, upon activation, translocate to the cell nucleus and activate several proteins that are responsible for regulating the cell's activity in the cell cycle. Mutations in RSK1 that lead to high levels of constitutive activity have been demonstrated to be involved in several types of cancer, including breast cancer, pancreatic cancer, non-small-cell lung cancer, and leukemia. For this reason, understanding the functionality of this protein is of importance, particularly for therapeutic targeting. RSK1 is suspected to contain a nuclear export sequence vital to its cellular functions. Using standard mutagenesis techniques, RSK1 was analyzed for the presence of a nuclear export sequence, allowing us to better understand the process by which RSK1 is removed from the nucleus.

**Scott Olehnik '13**

Rachel Austin, Chemistry

***Interactions of Lead with Metallothionein-3***

Lead poisoning continues to be a large problem in our society, and although the exact mechanism is not well understood, there is evidence to suggest that the interaction between lead and the brain-specific isoform of the zinc-binding protein metallothionein-3 (MT3) may play an integral role in that mechanism. This thesis aims to elucidate some of this ambiguity regarding the interactions of lead with MT3 and the metallothionein family. The MT3 protein was produced, purified through a suite of chromatography steps, and characterized using various forms of mass spectrometry. Preliminary data from lead-binding experiments, specifically Isothermal Titration Calorimetry (ITC) suggests that lead binds to MT3 with a higher affinity than does zinc, but more is to be done to fully understand the thermodynamics of zinc displacement.

**Daniel Peach '13**

Robert Strong, English

***The Research and Writing of Strong Graduate Fellowship Proposals*** -- see Spencer Collet '13 for abstract**Michael Peiris '13**

Lee Abrahamsen, Biology

***Testing for Contamination of the Water System at Bates College***

Recently, there have been instances of bacterial contamination of cell cultures at Bates College. The cause for this is unknown, but one possible source of the contamination may be the water used. It is expected that there are bacteria present in the tap water, but if the RO water or Nanopure water has been contaminated, this would be a problem requiring immediate resolution. Generally RO and Nanopure systems are effective at removing microorganisms from the water supply, so if there were contamination in the water, it would likely mean that there was biofouling of the membranes and apparatus used in the purification process. Using membrane filtration, I am investigating how much bacteria is in the three types of water samples from the Carnegie Science Hall (tap, RO, and Nanopure), and I will identify the major organisms of contamination.

**Matthew Perejda '14**

Bonnie Shulman, Mathematics

***Three-species Lotka-Volterra Predator Prey Model*** -- see Devon Brown '14 for abstract**Gabrielle Perenchio '16, Yessenia Saucedo '16, and Maria Vargas '16**Elizabeth Eames, Anthropology, and Leslie Hill, Politics  
***How Do Women Chiefs' Secret Societies Turn Girls into Women?***

The Sande Society is a fellowship of women teaching young Mende girls in Sierra Leone the responsibilities of adulthood and preparing them for their new roles as wives, mothers, and female community members. The fellowship holds powerful cultural significance to the Mende people promoting and enhancing women's political leadership. Managing Sande initiation supplements the authority and power women hold within Mende society, in ways often too complex for Western observers to understand. Through exploring both authentic Mende perspectives and anthropologists' investigations, we convey how this secret society is pivotal to the Mende and how

it affirms women's strength and capability in political spheres. The Sande Society provides women distinct opportunities for leadership in politics and family.

**Rosalie Philip '13**

Rebecca Corrie, Art and Visual Culture

***Internships in Museums and Galleries*** -- see Cara Garcia-Bou '13 for abstract**Kirsten Pianka '13**

Rachel Boggia, Dance

***Workings of A Dance Thesis*** -- see Zoë Fahy '13 for abstract**Margaret Pickoff '13**

Beverly Johnson, Geology

***Maine's Blue Carbon: Estimating Marine Carbon Stocks in Maine Salt Marshes***

Conservation of natural carbon sinks is a powerful tool for climate change mitigation often overlooked by policymakers and landowners. Coastal marine habitats are significantly more efficient at capturing and storing carbon than terrestrial ecosystems, yet they face severe threat of destruction. Maine has 79km<sup>2</sup> of tidal salt marsh, by far the most of any state in New England. In this study, carbon storage has been determined for four salt marshes in central and southern Maine. Salt marsh peat, where most carbon is stored as "blue carbon," ranges in depth from 0.5m to 3.3 m. Preliminary carbon density values of salt marsh peat range from .019 g C/cm<sup>3</sup> to .046 g C/cm<sup>3</sup>. Given this data, Maine salt marshes contain between 7.505 x 10<sup>5</sup> and 1.20 x 10<sup>7</sup> metric tons of carbon stored in belowground marsh sediment. Through the Regional Greenhouse Gas Initiative (RGGI) established in 2010, Maine is eligible to gain proceeds for reductions in greenhouse gas emissions through conservation of natural areas. Results from this study will encourage participation in statewide offset programs involving the conservation of Maine's vast salt marsh carbon sink.

**Zachary Polich '15**

Bonnie Shulman, Mathematics

***Modeling the Economic and Personal Costs of Diabetes***

Extensive literature shows that the presence of diabetes in the United States not only influences the day-to-day life among diabetics, but also has a profound economic effect with staggering costs. Studies have shown that implementing a restricted dietary pattern can aid in prevention of the disease as well as reduce the negative health impacts of diabetics. Motivated by the desire to gain insight into this pertinent health problem affecting millions of Americans and individuals around the world, our goal of this study is to build two mathematical models and analyze the results: a difference equation conveying the level of insulin regulation in a controlled diet and a linear regression equation applying least squares analysis for the direct cost of health care for diabetes (on an annual basis). We aim to gain an increased understanding to the diabetic community and others affected in order to lower the potential per capita costs of the disease.

**Kristen Poulin '13**

Bonnie Shulman, Mathematics

***Modeling HIV Infection and the AIDS Epidemic*** -- see Kristen Barry '15 for abstract

**Tara Prasad '13**

Pamela Baker, Biology

***Mouthful of Cavities: Pediatric Dental Procedures Conducted under General Anesthesia***

Early childhood caries (ECC) is the most common chronic infection in the United States, affecting nearly 41% of children across the country. Defined as the presence of tooth decay in children younger than six, ECC is an infection in which *S. mutans* causes lactic acid breakdown of tooth enamel in the presence of sucrose, or table sugar. ECC disproportionately affects children who live in low-income areas, consume sweetened drinks, and infrequently brush their teeth. General anesthesia has emerged as a potential method to address this public health problem, allowing dentists to conduct several caries-removing procedures at once. As a Harvard Center Community-Engaged Research fellow, I have partnered with B Street Dental Clinic in downtown Lewiston to investigate the outcomes of general anesthesia procedures among Somali and non-Somali patients. This project will lead to the development of a sustainable community oral health education program.

**Tina Pruyn '13**

Michael Sargent, Psychology

***Gender Differences in Attitudes toward Infidelity***

Previous research has documented an ingroup bias in attributions, such that men and women both create more internal attributions for negative behaviors of the opposite gender. When observing someone of the opposite gender doing something damaging, participants have attributed it to personality, rather than the situation. Men and women have also been shown to become distraught by different aspects of infidelity. When forced to choose, men have been more likely than women to choose sexual infidelity as more distressing than emotional infidelity. If there is a link between these two phenomena, I predict we will see an interaction between a participant's gender, and the participant's attitude towards either a male or female actor engaging in emotional and physical infidelity. I hypothesize that male participants will have more of an ingroup bias when judging an actor who is engaging in physical infidelity rather than emotional infidelity. I also hypothesize that female participants will show more of an ingroup bias when judging an actor engaging in emotional infidelity rather than physical infidelity.

**Lisa Reedich '13**

Ryan Bavis, Biology

***The Effects of Chronic Hyperoxia on the Neurochemical Development of the Caudal NTS*** -- see Kathryn DeAngelis '13 for abstract**Kevin Regan '13**

Matthew Côté, Chemistry

***Analyzing the Properties of Gold Nanorods through Theoretical and Experimentation Work***

Plasmonics is the manipulation of light at the nanoscale. For my senior thesis I have studied the way noble metal nanostructures interact with light and yield localized surface plasmon resonances (LSPR) characteristic of the size, shape, dielectric environment, and type of metal. LSPRs result in the strong absorbance of light and a significant enhancement of the oscillating electromagnetic field near the surfaces of the nanostructures. Because of this, plasmonics has many potential applications in the fields of quantum computing, solar energy harvesting, and biological sensing.

**Students in RHET 265, The Rhetoric of Women's Rights "That's What She Said": Video Interviews, Feminist Issues**

Stephanie Kelly-Romano, Rhetoric

This is a panel features four videos that were created by students in RHET 265, The Rhetoric of Women's Rights. Students were instructed to use interviews as a starting point to create a video that addresses a social, political, and/or economic issue relevant to or concerning women. Students were encouraged to address global issues locally. Topics include an investigation of "motherhood" as experienced by female professors at Bates, an exploration of young Somali women in the Lewiston community and their experienced identity, and a critique of the current policies and attitudes surrounding consent at Bates College.

**Caroline Richards '14**

Bonnie Shulman, Mathematics

***Mathematical Modeling of Bulimia Nervosa in American Colleges*** -- see Margaux Donze '14 for abstract**Nathaniel Rickler '13**

Kathryn Low, Psychology

***An Investigation into Personal and Perceived Public Stigma toward Mental Healthcare Treatment and Help-Seeking Behaviors among College Students***

Research has shown that rates of mental illness and mental health treatment have risen in recent years on college campuses. Students are experiencing more mental disorders and mental illness. With this increase comes stigma about seeking mental health treatment in a college environment where one is surrounded by peers. Stigma can manifest in two forms – personal stigma and perceived public stigma. Public stigma occurs with the perpetuation of stereotypes and negative images about mental illness. Personal stigma occurs when individuals apply those stereotypes and prejudices to themselves. The current study examines the attitudes of 150 students on a college campus, and will survey their opinions and beliefs about personal stigma, perceived public stigma, and the barriers to and patterns of help-seeking behaviors toward mental health treatment service. The relationship between stigma and age, gender, race, athletic participation, and family and mental health history will be explored.

**Ashley Roche '13**

Peter Wong, Mathematics

***The Art Gallery Problem***

Imagine you are standing in the middle of an art gallery. Look around. How many security guards do you see? Can these guards see the entire art gallery? What little corners can they not see? These questions can be answered using discrete computational geometry. The original Art Gallery Problem, posed in 1973 by Victor Klee, asked what the minimum number of guards was in order to completely observe the entire interior of a polygon with  $n$  vertices. Two years later, a solution was provided by Vasek Chvatal in which it is sufficient, and sometimes necessary, to have the smallest integer larger than  $\frac{n}{3}$  guards. There are various extensions from this original problem, some of which will be explored further here, including the case where all the angles formed by the boundary are right angles.

**Samantha Rothberg '13**

Rebecca Corrie, Art and Visual Culture

***Internships in Museums and Galleries*** -- see Cara Garcia-Bou '13 for abstract

**Zena Sabath '14**

William Seeley, Philosophy

*Consciousness Studies* -- see Evan Beinecke '14 for abstract**Lillian Salky '13**

Todd Kahan, Psychology

***Understanding the Role of the Dorsal Visual Processing Pathway in Tool Grasp Identification***

Research on the human visual system has implemented a method known as continuous flash suppression (CFS) in order to separate information processed by the dorsal and ventral streams in the brain (Almeida, Mahan & Carmazza, 2010). In continuous flash suppression, a rapidly changing pattern presented to one eye competes with a static image shown in the other eye, causing the static image to be suppressed (Tsuchiya & Koch, 2005). Studies have shown that while the ventral stream helps people identify "what" they have seen, the dorsal stream is responsible for identifying "how" to interact with visually presented objects (Fang & He, 2005). This study intends to discover whether the dorsal stream processes the way in which a tool is grasped and measures this by recording whether priming is greater when tool hand grip matches. Forty-three Bates college students with normal or corrected-to-normal vision participated in this study. Participants were presented with images of one-handed tools (i.e., wrench), two-handed tools (i.e., rake) or an animal image (control) in CFS, followed by a target image of a one-handed or two-handed tool. Participants were asked to indicate as quickly and as accurately as possible whether they saw a one-handed or two-handed target image. I predict that participants will be faster and more accurate on congruent trials (i.e., trials where the prime and target image are both one-handed or both two-handed tools) than on incongruent trials (i.e., trials where the prime and target images are different types of tools, one one-handed and the other two-handed). In addition, based on previous research, I predict that participants will be slower and less accurate on control trials (i.e., animal prime followed by a tool target) compared to incongruent and congruent trials.

**Ursula Sandstrom '13**

Bonnie Shulman, Mathematics

***Mathematical Modeling of the 1918 Spanish Flu Epidemic*** -- see Mark Charest '15 for abstract**Yessenia Saucedo '16**Elizabeth Eames, Anthropology, and Leslie Hill, Politics  
***How Do Women Chiefs' Secret Societies Turn Girls into Women?*** -- see Gabrielle Perenchio '16 for abstract**Leah Schulz '14**

Loring Danforth, Anthropology

***Bates to Saudi*** -- see Gintare Balseviciute '15 for abstract**Gretchen Sellegren '13**

Helen Boucher, Psychology

***"Haha! That's Disgusting!": An Exploration of Moral Judgment as a Function of Humor and Disgust***

McGraw and Warren's (2010) benign violation hypothesis of humor posits that a situation is funny if it violates one's expectations and it is benign (i.e., no lasting negative effects). The present study examines the extent to which disgust affects moral judgment and humor ratings of funny yet benign situations that violate human values and norms. Participants are first primed visually with either a disgusting or neutral stimulus. Then they read eight vignettes, four containing disgusting

benign violations and four containing no violation, in which they are asked to report whether they approve and/or disapprove and whether they are disgusted and/or amused by each behavior, which may be humorous but also morally transgressive. Follow-up testing included measures for trait disgust sensitivity (DS) and sense of humor. Analyses of covariates found that the prime had no effect on the approval ratings and mixed emotions; disgust-primed participants showed similar approvals, disgust, and amusement rates towards the benign violations. However, a high sense of humor had more mixed emotions than a low sense of humor, and high DS predicted lower approval ratings. Furthermore, political conservatives were more disapproving and less likely to experience disgust and amusement simultaneously, while liberals were mixed in approval and emotions. These findings suggest that moral judgment may be subject to more than emotional response to explicit stimuli. Perhaps inherent personality traits and social background also dictate moral judgment.

**Adnan Shami Shah '15**

Loring Danforth, Anthropology

***Bates to Saudi*** -- see Gintare Balseviciute '15 for abstract**Raisa Sharmin '13**

Darby Ray, Harvard Center for Community Partnerships

***Research and the Public Good*** -- see Emily Egan '13 for abstract**Cameron Sheldon '13**

Robert Strong, English

***The Research and Writing of Strong Graduate Fellowship Proposals*** -- see Spencer Collet '13 for abstract**Conor Smith '14**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

***Conserve or Preserve: How Sub-Saharan Africans Protect Their Ecosystems, Cultures, and Communities*** -- see John Albanese '16 for abstract**Students in SPAN 217: Literature and Screen**

David George, Spanish

***Birri Film School***

In this session we will present four photo-documentaries and screen two documentary films made for SPAN 217 in winter 2013. Enacting the ideas laid out by Argentine filmmaker Fernando Birri in his manifesto, "The Roots of Documentary Realism," we "ventured forth" in small teams with still and video cameras, and recorders to testify, critically, to unseen or unacknowledged problems in Lewiston. Following a brief introduction to Birri's ideas about filmmaking, we will show our documentaries and then invite discussion of the problems as well as of the films themselves.

**Stephanie Sprague '13**

Kathryn Low, Psychology

***Fat Talk and Weight Bias in Adolescents***

It is well known that weight bias is found in people of all ages, beginning from age three and lasting into late adulthood. Research has demonstrated that mothers' negative attitudes toward overweight and obese persons influence their children's attitudes toward overweight persons (Holub et al., 2011). This study seeks to expand on these findings by examining whether both mothers' and fathers' attitudes towards overweight and obese persons are associated with their adolescents' beliefs. In

addition, this study attempts to determine whether "fat talk" is a mechanism through which these negative attitudes are transmitted from parents to children. Between 40 and 60 high school students and an estimated 40 first-year college students and their mothers and fathers will complete measures on weight bias and fat talk. It is predicted that mothers' weight bias will be more strongly associated with their daughters' and sons' weight bias than fathers'. It is also expected that weight bias in daughters will be predicted by parents' "fat talk," and that sons will report less engagement in "fat talk." This study has potential implications for the development of weight bias reduction interventions.

#### **Amrit Sridhar '13**

Glen Ernstrom, Biology

##### ***The Role of UNC-46 in Synaptic Transmission in *Caenorhabditis elegans****

The regulation of synaptic vesicles is instrumental in chemical synaptic transmission. Vesicles must be specialized in order for it to be correctly localized in the neuron. We are interested in what proteins are involved in this task of specialization. One way to determine this is to look at potential chaperone proteins for vesicular transport. Previous studies have shown that UNC-46 is a putative vesicular GABA transporter protein in *Caenorhabditis elegans* as shown by UNC-46 mutants inability to correctly localize vesicles. We tested the hypothesis that UNC-46 is on acidic synaptic vesicles and that it maintains the vesicular GABA transporter at synapses. We tested this by analyzing the distribution of UNC-46 protein tagged with pH sensitive green fluorescent protein, UNC-46: pHluorin via genetically altering the pH of vesicles through mutating V-ATPase. We also looked at the localization of UNC-46 tagged with other organelle markers.

#### **Mackenzie Stelle '13**

Karen Palin, Biology

##### ***Examining the Diets of Single Mothers in Lewiston, ME, and Arica, Chile***

Globally, the connections between socioeconomic status and poor health are becoming more and more apparent. In both the United States and in Chile, single mothers of low socioeconomic status tend to have minimal knowledge of nutrition and low accessibility to healthy food, which could put they and their children at risk for health problems. The consequences of eating highly processed, cheap food can be detrimental to the health of the mother and her children causing impaired immunity, decreased muscle mass and growth as well as blood and hormonal disorders. The proposed study seeks to investigate knowledge of nutrition among mothers of low socioeconomic status from two differing cultures in Lewiston, ME, and Arica, Chile.

#### **Nicholas Steverson '15**

Dolores O'Higgins, Classical and Medieval Studies

##### ***Plautus's Captivi*** -- see Michaela Brady '14 for abstract

#### **Christina Stiles '15**

Bonnie Shulman, Mathematics

##### ***West Nile Virus Epidemic*** -- see Jenna Armstrong '15 for abstract

#### **William Strathmann '13**

Todd Kahan, Psychology

##### ***The Neurobiological and Buddhist Function of Meditation***

As meditation is becoming more popular in the West there has been a corresponding increase in research conducted in the field of neuroscience. Studies are aimed not only at the underlying neurophysiological changes associated with meditation, but also at the possible function of meditation used in the field of healthcare and clinical therapy. While the benefits of insight meditation and Mindfulness Based Stress Reduction (MBSR) have been noted in areas such attention, emotional regulation, personal wellbeing, and even cardiovascular health, Buddhist meditation was historically used for religious and spiritual development. While pulling together contemporary neuroscience research and first person perspectives in the Tibetan Buddhist tradition this thesis seeks to answer the question of whether, from a Buddhist perspective, these psychological and physical effects are mere byproducts of a religious pursuit or if they are in themselves a serious of necessary improvements required on a spiritual path. Does a meditative practice that dates back thousands of years serve two distinctly different functions when used for psychological improvement versus spiritual pursuits? Are the noted benefits only necessary means to be able to fully understand a higher, spiritual nature; or could it be that with enough meditation the plasticity of the brain could eventually *rewire* itself to function toward a more spiritual or *enlightened* self? This comprehensive East-meets-West review seeks to answer these questions as attempt to show the multifaceted function that a simple contemplative practice can produce.

#### **Catherine Strauch '14**

David Das, Office of Off-Campus Study

##### ***Getting Engaged Abroad*** -- see Kathryn Ailes '14 for abstract

#### **Katharine Straw '13**

Jennifer Koviach-Côté, Chemistry

##### ***A Partial Synthesis of Ashitabaol A***

Ashitabaol A is a unique, naturally occurring free radical scavenger isolated from the seeds of the Japanese plant *Angelica keiskei*. The herb *A. keiskei* has a history of being used in traditional medicine and has been shown to possess a number of medicinal properties. This newly discovered compound, first isolated and characterized by Aoki and Ohta in 2010, from the Nagahama Institute of Bio-Science and Technology in Japan, is of great interest pharmaceutically because it contains structural motifs rarely found in nature and has been shown to exhibit a notable degree of antioxidant activity. Ashitabaol A is therefore an excellent synthetic target, and the complete synthesis of this compound will allow for further biological testing. The bicyclic core of Ashitabaol A has successfully been synthesized via an aldol reaction and a Luche reduction. Currently, the synthesis of the 3-methylbut-2-enylidene unit is being attempted using Wittig chemistry.

#### **Brenton Talbott '14**

Bonnie Shulman, Mathematics

##### ***Three-species Lotka-Volterra Predator Prey Model*** -- see Devon Brown '14 for abstract

#### **Devin Tatro '14**

David Das, Office of Off-Campus Study

##### ***Getting Engaged Abroad*** -- see Kathryn Ailes '14 for abstract

**Natalie Thompson '13**

Lillian Nayder, English

***Jane Austen and the Art of Revision: Reading, Fiction, Feminism***

The wealth of criticism on Jane Austen and her fiction—recent feminist criticism in particular—neglects insight crucial to understanding her political and literary messages. Because the depth and breadth of Austen's reading is often disregarded, critics overlook the extent to which her reading appears, strategically revised, in her own writing. Austen's use of her reading—in allusion, parody, thematic reference and outright revision—reveals the ways in which she differs from her predecessors, in her political and social beliefs as well as her literary style. This thesis uncovers previously unknown or disregarded sources for Austen's work and, in analyzing these sources in concert with Austen's own novels, reveals her criticism of the patriarchy. In recognizing the literary context of Austen's work—a context familiar to her intended audience, but often forgotten by modern readers—critics and fans alike can interpret Austen's alleged ambiguities with greater clarity.

**Carla Tilchin '13**

Donald Dearborn, Biology

***A Comparative Study of Songbird Immune Response to the Causative Agent of Lyme Disease, Borrelia burgdorferi***

Immunological responses of wild vertebrates to various pathogens are understudied despite their potential relevance to ecosystem dynamics and public health. *Borrelia burgdorferi* sensu lato, the causative agent of Lyme disease, circulates between *Ixodes* tick vectors and a large range of vertebrate hosts, including songbirds. Songbirds are particularly interesting reservoirs because they can expand the spatial distribution of *B. burgdorferi* s.l., and species differ in their ability to transmit *B. burgdorferi* to uninfected ticks. The sensitivity of *B. burgdorferi* s.l. to serum from seven different species of songbirds was analyzed by incubating bird serum with *B. burgdorferi* for 1 and 4 hr and determining number of live vs. dead cells using BacLight stain. In a two-factor ANOVA, a significant effect from time and species was found with higher borreliacidal activity at 4 hr, and highest killing ability from gray catbirds *Dumetella carolinensis*. American robins *Turdus migratorius* showed no borreliacidal ability when compared to the control. These findings provide a possible mechanism to explain previous documentations of high and low transmission rates to ticks from these species respectively. Additionally, in progress is an experiment using EDTA, MgEDTA, and heat inactivation to assess whether the classical or alternative complement pathway is responsible for the immune response. This will show whether the immune response is antibody dependent or not. Understanding these differences in immune function is critical in understanding the dynamics of the pathogen and predicting the risk they pose to human and animal populations.

**Hannah Turner '13**

Lee Abrahamsen, Biology

***Understanding the MAPK RAS/RAF/MEK/ERK Signaling Cascade: Implications for Molecularly Targeted Therapies for Cancer Treatment***

Disregulation of the process of cellular proliferation in normal tissues, controlled by proto-oncogenes and tumor suppressors, coupled with aberrant regulation of intracellular signaling cascades can result in carcinogenesis. Traditional therapies used to treat cancer are not perfectly selective for malignant cells and therefore produce collateral damage. In order to minimize this

damage it is imperative to understand the molecular and biochemical processes that underlie carcinogenesis so that they may be targeted specifically. Many molecularly targeted therapeutic drugs, such as those being developed for the selective inhibition of the MAPK RAS/RAF/MEK/ERK signaling cascade, are currently undergoing clinical trials. While these drugs have produced positive results in patients with the target mutation in one tissue, they can be less effective in other malignant tissues characterized by the same mutation. It is possible that there is another level of regulation or genetic expression yet to be fully understood that allows some cancers the ability to evade these molecularly targeted therapies.

**Catherine Tuttle '13**

Francisca López, Spanish

***Language, Linguistics, Literature, and Film: Spanish Thesis Research*** -- see Kevin Crotty '13 for abstract**Maria Vargas '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

***How Do Women Chiefs' Secret Societies Turn Girls into Women?*** -- see Gabrielle Perenchio '16 for abstract**Griffin Wagner '13**

Jennifer Koviach-Côté, Chemistry

***The Assessment of Radical Scavenging Activity of Phenylpropanoid Glycosides by the ABTS Assay***

Plants are exposed to a variety of stressors such as high light and ultraviolet (UV) conditions, wounding, low temperatures, nutrient deficiency, and pathogen attacks. Plants are able to cope with these environmental stresses by engaging an antioxidant defense system and through the use of phenylethanoid glycosides. Phenylethanoid glycosides support plant survival by providing defensive mechanisms such as creating barriers that physically prevent pathogens from entering the plant or by acting as a microbial agent. Phenylpropanoid glycosides comprise a subdivision of phenylethanoid glycosides, and have additional phenylpropanoid groups. In recent years, PhGs and PPGs have gained the interest of scientists and medical professionals due to their antioxidant characteristics that allow them to scavenge for free radicals. The primary goal of this study is to investigate the importance of phenylethyl group and the phenylpropyl group in the role of radical scavenging. The number of caffeoyl groups attached to the glucopyranoside core was assessed through the use of synthetically produced mono- and di-substituted PPG analogs to determine how changing the number of attached caffeoyl groups affected the radical scavenging activity. The radical scavenging activity of the PPG analogs was measured by performing an ABTS assay, using  $\alpha$ -tocopherol as a standard.

**James Walsh '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

***Blood, Exploitation, and Murder, All for a Cell Phone?*** -- see Sarah Brooks '16 for abstract**Destinee Warner '13**

Robert Strong, English

***The Research and Writing of Strong Graduate Fellowship Proposals*** -- see Spencer Collet '13 for abstract

**Jessica Washington '13**

Charles Nero, Rhetoric

***Black Onyx: Shadeism within the Black Community***

The thesis and video reflect the impact shade and skin pigmentation has on members of the black community. The video is a series of interviews, where students and staff members give their insight and opinions about the ways in which success, media, and acceptability are shaped by the pigment of one's skin.

**Sarah Wason '13**

Jill Reich, Psychology

***Plugged In: The Effect of Study Music on Reading Comprehension of Students***

Many college students listen to music while studying; research has shown mixed results regarding the effects of this habit on academic task performance. This study examines the effects of study music on reading comprehension performance. College students completed a series of reading comprehension tasks while listening to silence, instrumental music, foreign language music, and English language music. Participants also completed an extraversion measure (the NEO PI-R) and a study habits questionnaire. Repeated measures ANOVA was used to analyze reading comprehension performance within subjects, and other variables were analyzed through t-tests. Based on prior research, those who frequently study with music and are familiar with the music are expected to perform best under music conditions. Extraverts are expected to perform best in music conditions, and introverts best in the silent condition. Such results would imply that developing a personalized study environment based on one's personality traits could benefit academic performance.

**Edward Wells '13**

Lee Abrahamsen, Biology

***Latent Tuberculosis in Maine's Refugee Population: The Process, Problems, and Potential Solutions***

The rate of tuberculosis remains disproportionately high among the foreign-born population within the United States. It is accepted by health officials that this is due to the reactivation of latent tuberculosis infection (LTBI) contracted before or during the immigration process from a high-prevalence country. Individuals with LTBI are at a significantly higher risk for developing active disease, and are a principal public health concern. This project strives to assess the effectiveness of the current system in the state of Maine to receive, diagnose, and treat LTBI among the refugee population, in order to prevent the persistence of active disease in the community. Functioning as a step-by-step overview of this process and the roles of the key health officials at each of these steps, we intend this report to act as an educational tool to help refugees and health officials better understand the current process, highlight what soluble problems currently exist, and develop feasible solutions to these problems.

**Douglas Welsh '14**

Pamela Johnson, Art and Visual Culture

***Zines, Yarn Bombing, and the Arts House*** -- see Julia Foxworth '13 for abstract**Amanda Wescott '13**

Michael Retelle, Geology

***Tracking Seasonal and Storm-Induced Recession of the Popham-Seawall Barrier Beach Complex, Phippsburg, ME***

The Seawall-Popham complex, located at the mouth of the Kennebec River in Phippsburg, midcoast Maine, is a dynamic,

transgressive barrier beach system. In recent years, the migration of two main tidal inlets in the barrier system has played a major role in increased beach erosion at Popham Beach State Park and on the pocket beaches of Cape Small. Changes in the Seawall barrier in recent years have been minimal, however since 2010, landward recession of the frontal dune ridge has become apparent. The purpose of this study is to document physical changes along the barrier complex, pocket beaches and associated tidal inlets, from summer 2012 through winter 2013. Detailed seasonal and storm-induced changes on the beach system were documented by topographic profile survey, activation rod analysis, high resolution GPS tracks, and time lapse photography. Longer term (annual) changes were documented using high resolution georeferenced satellite imagery and air photographs. Beach front at Popham Beach State Park has undergone sustained, documented erosion since 2007 when the Morse River migrated towards State Park beaches with the eastward longshore growth of the Seawall Barrier spit. Although the long Seawall spit was breached by avulsion of the Morse River, erosion has continued along the beach front. Likewise, pocket beaches at Cape Small are continually eroded by the westward shift of the Sprague River, forced against the Cape Small headland by the westward development of the southwestern Seawall spit. Recent changes in the 2.25 km-long Seawall barrier beach are evident with up to 15m of landward migration of the frontal dune ridge in many sectors of the beach since 2009.

**Elisabeth White '13**

Donald Dearborn, Biology

***Microsatellite Analysis of Genetic Drift in Spotted Salamanders (*Ambystoma maculatum*) from Vernal Pools in Central Pennsylvania***

Wetland amphibians are some of the most threatened or endangered animal species globally. In particular, amphibians that breed in vernal pools have had sharp declines in numbers in recent years, and these declines can be explained in part by habitat fragmentation caused by human development. This study investigated populations of spotted salamanders (*Ambystoma maculatum*) from various vernal pools in central Pennsylvania using microsatellite markers to evaluate the degree of genetic interaction between pools, as well as the influences of the surrounding environment on the genetic structure of the pools. Salamander DNA was examined at eight loci using PCR with fluorescent primers, and sequences were analyzed using GeneMapper software. The frequency of alleles and the percentage of heterozygotes at each locus was found to vary between pond populations, which suggests that environment has a considerably influence genetic structure.

**Jonathan Woelfel '13**

Bonnie Shulman, Mathematics

***Modeling the Zombie Infection*** -- see Fergus Moynihan '13 for abstract**Jazmine Woodruff '16**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

***Tending Orphans – African Strategies*** -- see Jamilia Davis '15 for abstract**Sean Woods '14**

Bonnie Shulman, Mathematics

***Modeling Lobstering Policy in Maine*** -- see Jordan Buetow '14 for abstract

**Timothy Woods '13**

Thomas Wenzel, Chemistry

***Calix-(4)-resorcinarenes as Chiral NMR Solvating Agents***

Calix(4)resorcinarenes, a class of cavity molecules (cavitands), were investigated for their suitability as chiral NMR solvating agents (CSA's) in the organic phase, continued from previously published research. Alcohol-footed cavitands were prepared with chiral tertiary amines substituted along the upper rim, contributing to chiral discrimination of substrate molecules. Also investigated was the effectiveness of a water-soluble CSA obtained by oxidation of the alcohol "feet" to carboxylates.

**Kailey Worboys '13**

Sharon Kinsman, Biology

***Grasshopper Body Size Patterns over an Altitudinal Cline and through Time: Different Apparent Effects of Warming on Nymphal and Egg Diapausing Grasshopper Species***

Global temperatures have risen about 0.76°C since 1850; effects on animals and plants should vary with species' environment, physiology, and thermal sensitivity. Dependent on external heat sources to move, grow, and reproduce, some ectotherms already show developmental effects of global warming. I compared adult body sizes of four Rocky Mountain grasshopper species from mid-twentieth century collections with conspecifics collected recently. In the past, all four species were smaller at higher elevations (thus at lower temperatures), suggesting a positive relationship between temperature and body size. Now, however, only the two species that winter-diapause as nymphs are larger with warming, while the two species that overwinter as eggs are smaller. While additional twenty-first-century data are needed to confirm this pattern, the results suggest that the timing of warming over the developmental life stages influences how warming affects body size.

**Ciara Zagaja '13**

Lee Abrahamsen, Biology

***Methods for Typing and Classification of Hospital-Acquired and Community-Acquired Methicillin Resistant Staphylococcus aureus and Methicillin Sensitive Staphylococcus aureus Strains***

Infectious diseases caused by methicillin resistant *Staphylococcus aureus* (MRSA) and methicillin sensitive *Staphylococcus aureus* (MSSA) are a constant threat to public health worldwide. The purpose of this study was to explore the antibiotic resistance patterns and characterization schemes of MRSA and MSSA, which are relevant to our research of the period prevalence of MRSA and MSSA at Bates College and the wider Lewiston-Auburn community, and the differences associated with hospital-acquired and community-acquired strains. Typing methods and identification tools for the categorization of hospital-acquired and community-acquired MRSA and MSSA were examined and evaluated for clinical and epidemiological application. Antibiotic susceptibility patterns were compared for hospital and community acquired MRSA and MSSA strains, so we could identify phenotypic characteristics associated with various types and subtypes of strains. We concluded that antibiotic susceptibility profiling provides medically and epidemiologically relevant information that should accompany all typing methods for complete strain characterization.

**Victoria Zapack '13**

Heidi Taylor, Sociology

***The Potential for Conflict between the Lobstering Industry and Offshore Wind Development in the Gulf of Maine***

The lobstering industry is important to the state of Maine both economically and culturally. Also important is the ability of Maine to meet the energy needs of its residents and industries. Maine has huge potential to develop offshore wind energy generation and in doing so could eventually drastically reduce the cost of energy as well as the environmental impact of Maine. However, the notion of territory is quite important to the lobstering industry and the placement of wind turbines could be seen as an intrusion into territory which has belonged to a family for generations. This study is an exploration of the potential for conflict between the lobstering industry and offshore wind developers with a particular focus on emotions, territory, and the social embeddedness of economic interactions.