

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 2012 Summit ~

The 2012 Mount David Summit, held on March 30, features the research, creative work, and performances of nearly 350 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 specialists, math experts, 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 (alphabetical order)

Hunter Archibald '12

Joshua Henry, Chemistry

Building a Better Solar Cell: An Investigation of the Surface Chemistry of CdSe Nanocrystals with Infrared Spectroscopy

Production photovoltaic devices, devices that convert sunlight into electricity, are made entirely from poly- or single crystalline silicon. These devices are expensive and not particularly efficient in terms of converting solar energy to electricity. This has hindered the widespread adoption of solar energy. Photovoltaic devices made from chemically synthesized cadmium selenide (CdSe) nanocrystals could address both of these problems. Varying the size of CdSe nanocrystals alters the wavelength at which the nanocrystals are capable of accepting energy from the sun and this fact alone could result in a photovoltaic device with theoretical efficiencies well above current devices. At the moment, however, these devices operate at efficiencies which we believe is attributable to their surface chemistry. The aim of this project is to develop chemical procedures for modifying the surface chemistry of these nanocrystals and characterize the results using Infrared spectroscopy (IR). IR spectroscopy is a means of characterization that has not been widely used for this purpose and may provide additional insight as to the link between surface chemistry and photovoltaic efficiency.

Daniel Aupi '12

John Kelsey, Psychology

Attenuation of Morphine-Induced Locomotor Sensitization by Minocycline

While opioids are clinically useful for reducing pain, they have many undesirable side effects that include tolerance, dependence, and addiction. Recent research has implicated glial cells in both the enhancement and attenuation of these effects. More specifically, while glial cell inhibition has been shown to enhance the analgesic effects of opiates, it appears to attenuate the rewarding effects of all addicting drugs including opiates. The current study investigates whether the glial cell inhibitor, minocycline, blocks morphine-induced locomotor sensitization, an indirect measure of reward. In this experiment, male Long-Evans rats were injected with either 40 mg/kg minocycline or its vehicle 3 hours before an injection of 10 mg/kg morphine or saline and immediately placed in activity chambers for 1 hr on each of six sessions on alternating days. Before the two subsequent challenge sessions, all rats were injected with the vehicle and 10 mg/kg morphine combination and then with the 40 mg/kg minocycline and 10 mg/kg morphine combination, respectively. If glial cell inhibition reduces reward as hypothesized, then co-administration of minocycline should reduce the morphine-induced locomotor sensitization. This finding would further implicate glial cells in the modulation of drug-induced reward, and may lead to novel approaches to treating drug addiction.

Nazsa Baker '12, Nicolle Bugajski '12, Catherine Elliott '12, Reann Gibson '12, Jacob Kaplove '12, Julie McCabe '12 and Elizabeth McKean '12

Georgia Nigro, Psychology

Community-Based Research as Public Scholarship: A Presentation and Discussion Session

The Harvard Center for Community Partnerships supports students in pursuing academic research that meets significant public goals or needs. This semester, eight Community-Based

Research Fellows are working on collaborative research projects situated at the intersection of community interests and academic work in psychology, sociology, education, biology, and politics. In this session, students briefly outline their research projects and lead a structured dialogue about community-based research as public scholarship that illuminates the rewards and challenges of such work.

Arita Balaram '12

Krista Aronson, Psychology

Experiencing Difference on Campus

Conducted in collaboration with the Office of Intercultural Education, students from a range of backgrounds took part in this research by completing an online survey, participating in an interview, or participating in a focus group designed to elicit information about experiences and comfort with interacting across difference at Bates. Findings indicate that students do not feel as though they have the information or skills they need to effectively interact across difference: overall, students reported limited awareness of cultural difference, low comfort engaging in dialogue about difference, and confusion about how to handle situations where stereotypes are reinforced through humor and taunting. Students from underrepresented groups reported a perceived lack of concern/sympathy for their struggles, being treated as a "novelty" or "curiosity" and lack of representation in the academic curriculum. Common locales where tensions were experienced frequently on campus were Commons and the classroom. I discuss these findings and how they will be used to inform the development of a multimedia tool that can be used to enhance intercultural interaction at Bates.

Jordan Banez '14, Mikayla Foster '13, Gretchen Kaija '14, Lila Wilmerding '14 and Nina Wineburgh '14

Kirk Read, French, and Joseph Hall, History

Cultural Crossings: Tales from a Semester in France

In the fall of 2011, twenty-fives Bates students traveled to Nantes, France, for a semester of study that entailed intensive language study, courses on Atlantic France and French identity, homestays, and a variety of excursions that explored French culture from a number of perspectives and venues. This panel presents lessons learned from the personal experiences of five students from the program and their directors.

Arjada Bardhi '12

Michael Murray, Economics

Two Essays on the Optimal Control of Infectious Diseases: Examining Discrepancies between Discrete-time and Continuous-time Models

A growing body of literature on the optimal allocation of resources in controlling the spread of communicable diseases has garnered considerable attention during the last four decades. Although such literature is relatively unanimous formally speaking -- i.e., marrying tools of optimal control theory with epidemiological nonlinear models -- it has been quite polarized over both the theoretical question of the choice of time scale (i.e., discrete versus continuous) and, relatedly, the question of the most adequate optimization tool (Pontryagin's Maximum Principle versus Bellman's Dynamic Programming) to be employed in determining the lowest-cost policy for containing and eradicating the infection. This thesis theoretically investigates the roots of the discrepancies that exist between these two divided bodies of literature, seeking ways to reconcile the results that are obtained by these two different approaches. The central analysis focuses on two pairs of articles on the

control of SIS infections: 1) two classical articles written in the 1970s that disagree on the chattering behavior of the optimal policy over discrete and continuous time, and 2) two recent articles that examine the optimal allocation of funds between multiple connected populations when the social planner faces tight budgets, pointing out the difficulties that arise in analytically solving the problem in continuous time. The implications of this theoretical investigation extend to similar models in topics as diverse as fishery management, corruption control, and crime prevention, while its practical contribution lies in carefully prescribing optimal intervention strategies for public health policy makers.

Thomas Baroni '14, Camden Black-Ingersoll '15, Lucas Matarazzo '14, and James Moody '12

Elizabeth Eames, Anthropology, and Leslie Hill, Politics
Y'en a Marre (Enough is Enough): The African Spring in Senegal

On February 18, 2011, a Senegalese soldier demonstrated against the government by setting himself on fire in Dakar, outside of President Abdoulaye Wade's official residence. News sources such as Al Jazeera have compared such protests in Senegal to the Arab Spring in Northern Africa, where a public immolation also occurred in Tunisia. Opposition groups to Wade include the Y'en a Marre (Enough is Enough) hip-hop group, which symbolizes Senegalese youth's stance toward Wade's government. We examine this and other opposition groups and assess whether their motivations and claims to ideals of democratic freedom and African renewal satisfy the assertion that they resemble the Arab Spring.

Colin Barry '12, Heather Doolittle '12, Jennifer Lindelof '12, Peter Miller '12 and Haley Sive '12

J. Dykstra Eusden, Geology, and Beverly Johnson, Geology
Shortridge Symposium: Geology in Bates' Backyard
Located only an hour from campus, Bates' backyard extends far beyond the craggy heights of Mount David. The Bates-Morse Mountain Conservation Area (BMMCA), in Small Point, Maine, includes over 600 acres of rare, well-preserved coastline. Protecting a unique long-shore beach system, a rare pitch pine forest, and a delicate saltmarsh, the BMMCA serves as a resource for both recreation and scientific study. In the summer of 2011, five geology students completed field-based research in preparation for their yearlong senior thesis projects. Presented in this forum is the culmination of their research, which includes a wide range of geologic topics, including mineralogy, hydrology, tectonics, and bedrock geology. This Shortridge Symposium weaves the studies together to create an accessible and engaging presentation of their scholarly work. This presentation is made for everyone to enjoy: no science background required!

Mariah Barstow '12

Karen Palin, Biology

Working toward Pragmatic and Sustainable Exclusive Breastfeeding Practices among Somali Mothers in Lewiston, ME

Breastfeeding is the most complete form of infant nutrition and has health benefits for both the mother and infant. The U.S. Department of Health and Human Services Healthy People Goals aims for exclusive breastfeeding rates of 50% and 25% at 3 and 6 months postpartum, respectively. Women in Somalia and in refugee camps abroad routinely breastfeed their babies, but upon immigration to the United States, these mothers often face novel barriers that make it harder to breastfeed for the

recommended amount of time. In Lewiston, health care providers find that Somali mothers frequently supplement or replace breast milk with formula. In conversation groups with Somali women, this trend was confirmed and women expressed the belief that their breast milk was insufficient for their infant's nutritional needs. The first aim of this thesis is to understand breastfeeding knowledge and beliefs of local perinatal Somali women and how those beliefs translate to practice. Home visit interviews were conducted to collect data on breastfeeding practices and beliefs. This information is being used, along with public health recommendations concerning breastfeeding, to develop culturally relevant educational workshops. By building upon Somali women's current knowledge of breastfeeding, the workshops aim to encourage pragmatic and sustainable exclusive breastfeeding practices, which will in turn improve mother and infant health. Culturally sensitive programs such as this have the potential to effect real progress toward the lactation goals set forth in the Healthy People Goals and to cultivate healthier practices in the community.

Alexander Barton '12

William Corlett, Politics

Contested Landscapes: A Political Ecology of Landscape Identity in the Lowcountry of South Carolina

Commercial and residential development of Charleston County in South Carolina presents major implications for its contingent social and physical landscape. The region is characterized historically by landscape changes in response to economic and political processes that extend well beyond the borders of the polity. My presentation reports on the impact of these changes on the Gullah community, a cultural lineage rooted in the historical interaction of diverse African and Caribbean ethnic heritages during slavery. Taking a poststructural approach to political ecology, I am especially interested in the interplay between locally grounded political forces and the relatively unbound dynamics of economic forces. Working with a concept of individual and group identity called "Landscape Identity," I report on the findings of my recent field research. I address the changing cultural dispositions of Charleston's Gullah community and discuss their relation to the physical and social displacement associated with the area's development.

Camden Black-Ingersoll '15

Elizabeth Eames, Anthropology, and Leslie Hill, Politics
Y'en a Marre (Enough is Enough): The African Spring in Senegal -- see Thomas Baroni for abstract

John Borchert '12 and Kelley Madden '12

Paula Schlax, Chemistry

Transcriptional Regulation of *Borrelia burgdorferi*

This poster focuses on mRNA processing and degradation to elucidate transcriptional regulation of the rpoS, 16s, 5s, and 24s genes. Primers were designed for the genes of interest along with primers that span the intergenic region between the genes. Transcription levels are quantified via qPCR after RNA polymerase has been inhibited; this coupled with samples taken at various time points allows for the measurement of RNA degradation and processing rates in *Borrelia burgdorferi*. RNA polymerase was isolated via S30 extraction using techniques by Zubay et al. [1973]. Successful isolation of transcription and translational components was measured using Promega Luciferase Assay techniques. Transcription assays are to be performed to further characterize RNA polymerase. Through

understanding transcriptional regulation, future advances in Lyme disease prevention, treatment, and diagnosis are possible.

Ashley Brooks '14

William Ambrose, Biology

The Growth Rates of the Surf Clam, *Spisula solidissima*, from the Mid-Atlantic Bight for over 66 Years

Surf clams, *Spisula solidissima*, were used as proxies for marine climate change and their growth correlated with temperature off the New Jersey coast, and the Atlantic Multidecadal Oscillation (AMO). A chronology that spans from the 1940s to 2011 was constructed using an ontogenetically adjusted growth index (SGI) to examine inter-annual variations in growth. *Spisula* were collected from 1974-1977 off the coast of New Jersey, inshore and offshore (depth >30m) and then inshore again in 2011. Growth rates of *Spisula* were determined by cross-sectioning shells along the line of maximum growth and measuring exit lines. Growth performance (ϕ) of *Spisula* showed offshore clams collected from 1974-1977 grew 18.2% more than inshore individuals collected at the same time and 21% more than those collected in 2011. Inshore clams showed no difference with the clams collected in 2011. AMO accounted for 18% of inter-annual variation in the SGI. Analyzing other environmental parameters may further explain variation in inter-annual growth.

Molly Brown '15, Chike Cole '15, Heather Monty '14, and Christopher Speers '12

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

The War on Oil: Why Women in the Niger Delta Were Willing to Bare All for Justice

In the Niger Delta, multinational oil companies have stolen lands, murdered opposition leaders, poisoned waterways, and, in the process, destroyed local populations' ways of life, all in the name of profit. The Nigerian government has done nothing to regulate these practices. Up against such powerful odds, what contributions have women made to the struggle for self-determination in the Niger Delta? In the summer of 2002, women of the Niger Delta began to mobilize in response to these environmental and humanitarian atrocities. Hundreds of women nonviolently took over multiple refinement plants by threatening to strip naked, a salient cultural taboo. Through these actions and others, local women's groups have actually forced global oil corporations to agree to community demands.

Nicolle Bugajski '12

Georgia Nigro, Psychology

Community-Based Research as Public Scholarship: A Presentation and Discussion Session -- see Nazsa Baker '12 for abstract

Anne Burns '12

Michael Sargent, Psychology

How Participant Gender and Arousal Affect Choices of Sexual and Emotional Infidelity

Theorists have claimed that men show greater distress in response to sexual infidelity of their partner, while women show greater distress in response to emotional infidelity of their partner. Both Buunk et al. (1996) and Harris (2002) found this gender effect when participants were provided with forced-choice questions about hypothetical infidelity. However, when asked to recall an experience of actual infidelity, Harris (2002) found that the gender effect disappeared. Loewenstein (2005) studied hot and cold cognitive states and found that we are poor when predicting emotional behavior that occurs in the heat of

the moment. This could account for the gender effect disappearing. Participants responding to hypothetical infidelity could be seen as being in more of a cold state, while those responding to actual infidelity could be seen as being in more of a hot state. One of the ways we could potentially induce a "hot" cognitive state is by manipulating arousal with the use of images so that the higher arousal condition is seen as being parallel to actual infidelity. This leads to the hypothesis stating that the gender differences in response to imagined infidelity will be reduced when going from images of low arousal to images of high arousal. A sample of undergraduates that attend Bates College participated in this experiment. The majority of the results were not significant, although some were marginally significant.

Lorena Bustamante '12

Amy Douglass, Psychology

When Only I Know: The Effects of Asymmetrical Access to Evidence on Investigator-Eyewitness Interactions

Criminal investigative protocols are dynamic procedures in which investigators and witnesses have an active role in determining how a session unfolds. Previous research ignores the factors that influence the decision processes that occur during these interactions. This study explored the extent to which corroborating co-witness identifications affect the investigator-witness dynamic, specifically when the access to the evidence is asymmetrical. Participants, both witnesses and investigators, were randomly assigned to receive a corroborating co-witness identification after the witness had already identified a suspect from a target absent line-up. Witnesses and investigators were then allowed to interact, simulating an investigative interview. Statistical analyses indicate that asymmetrical access to corroborating evidence significantly affects the content and course of an investigative interview.

Christopher Calahan '12

Nancy Kleckner, Biology

Egestive Motor Output in the Pond Snail, *Helisoma trivolvis*, Investigated through Buccal A Cluster Cells and Phase I & III Motor Neurons

The feeding central pattern generator (CPG) in the pond snail *Helisoma trivolvis* controls a tri-phasic feeding rhythm, characterized by protraction, retraction, and hyper-retraction of a tongue-like structure called the radula. The CPG is made up of three groups of interneurons, S1, S2, and S3, each of which control associated motor neurons specific to each phase of the feeding rhythm. The CPG is further patterned by Buccal A Cluster (BAC) neurons, which are believed to play a role in the inhibition of phase 3 motor neurons that leads to egestive behavior. The purpose of this study is to investigate the circuitry controlling egestive behavior, through simultaneous recordings in BAC neurons and S1/S3 motor neurons. Egestive patterning has thus far been induced by either the perfusion of an emetic (Listerine) through the esophagus or by exposure of the ganglia to arginine vasotocin (AVT), an anti-diuretic peptide primarily found in vertebrates. Preliminary findings with these techniques have yielded results suggesting AVT causes BAC firing and corresponding inhibition of B19, a phase three motor neuron.

Troy Calandra '13 and Carver Low '12

Stephanie Kelley-Romano, Rhetoric

Alien Abduction: A Constant Overseer

What makes someone believe they have been abducted by aliens? While studying the rhetoric of alien abduction, we

looked at a number of different mechanisms through which people become convinced they've had a "close encounter" with an extraterrestrial race, as well as the archetypal "abduction tale" that accompanies their belief. However, those two main facets of abduction did not interweave into an explanation we found plausible, so we sought to construct a narrative that connected these two aspects of alien abduction rhetoric. Using Michel Foucault's concept of the Gaze as a subtext, we created a film positing that abductees believe they have been abducted due to society's failure to provide normative meaning in their lives. The film's visual and narrative style reflects the "closing off" from human society that abductees experience during their conversion. Additionally it is grounded in literature on conversion, belief, and abduction.

Brenna Callahan '15, Edward Donaldson '15, Jessica Nichols '15, and Isaiah Rice '15

Elizabeth Eames, Anthropology, and Leslie Hill, Politics
Turning Soldiers into Children: Reintegration and Renewal of Child Soldiers in Post-War Sierra Leone

The use of child soldiers was widespread during the decade-long civil war in Sierra Leone in the 1990s, despite the fact that it is widely acknowledged as a morally and politically unjust practice. We explore the different strategies used to help child soldiers reintegrate into Sierra Leonean society by examining reports from the International Rescue Committee, UNICEF, and the National Commission for Disarmament, Demobilization, and Reintegration in Sierra Leone, in addition to personal testimonies of the civil conflict and life afterward. This research is important because it contextualizes the renewal process of soldiers, in particular child soldiers, and the restoration of human rights in post-war situations such as present-day Sierra Leone.

Elizabeth Carleton '12

John Kelsey, Psychology
Incubation of Nicotine Craving as Evidenced by Locomotor Sensitization

Relapse is a phenomenon affecting millions of drug-addicted individuals, and current research suggests that drug craving increases during abstinence, making sobriety increasingly difficult. Though much research has demonstrated this so-called incubation of drug-seeking behavior through self-administration in rats, locomotor sensitization may offer a less time-consuming method of measuring craving. Locomotor sensitization refers to the progressive increase in locomotion that occurs during repeated injections of drugs of abuse in rats, and results in increased drug-seeking. Moreover, locomotor sensitization to some drugs has been shown to increase during abstinence, e.g., following initial sensitization, the locomotor response to amphetamine and cocaine is larger after two weeks of abstinence than after one day (Grimm et al., 2001, Louk et al., 2000). The current study investigated if locomotor sensitization to nicotine increases during abstinence. Injections of nicotine (0.4 mg/kg) or isotonic saline were administered to rats for nine sessions every other day to produce sensitization. Following sensitization, locomotor activity in response to an injection of 0.4 mg/kg nicotine in all rats was recorded after a 14-day abstinence from nicotine. The rats sensitized to nicotine and then re-exposed 14 days later exhibited an increase in locomotor activity, indicating incubation. Surprisingly, rats injected with saline for days 3-15 (sessions 2-8), and administered 0.4 mg/kg nicotine on days 17 and 31 exhibited an even larger increase in locomotor activity from day 17 to 31, suggesting not only that

nicotine cravings can incubate, but also that a single injection of nicotine may be sufficient to produce incubation of nicotine craving.

Carver Low '12

Stephanie Kelley-Romano, Rhetoric
Alien Abduction: A Constant Overseer -- see Troy Calandra '13 for abstract

Benjamin Chebot '12

William Ambrose, Biology
Annual Timing of Growth Line Deposition and Comparative Growth Analysis of Modern and Archaic Mya arenaria from the Penobscot Bay Region, Maine
Correlative analyses of modern *Mya arenaria* growth rates with environmental data have shed light on the growth rates of archaic *M. arenaria* and historic environmental conditions. Growth rates were determined by using the annually deposited growth lines in chondrophores of shells as annual markers. The first objective was to determine the timing of growth line deposition. This was accomplished by near-monthly sampling of *M. arenaria* from Maquoit Bay, Maine. I found that 85.7% of the individuals begin their slowed growth period by mid-August, and the transition into relatively fast growth probably occurs in March-April. I then compared growth patterns of modern clams from five sites from North Haven Island, Penobscot Bay, with shells from the nearby Turner Farm shell midden. *M. arenaria* from 3600 years BP experienced significantly greater growth rates (13%) than modern clams.

Shlesma Chhetri '12

Heidi Taylor, Sociology
AIDS and Culture in India
Approximately 2.4 million people are living with HIV in India. There is wide geographical variation with approximately 70% of infections reported in six states: Andhra Pradesh, Tamil Nadu, Maharashtra, Manipur, Nagaland, and Karnataka. Sex workers, truck drivers, men who have sex with men, drug users, and migrant workers are identified as the populations responsible for the spread of HIV in India. Sex between men (MSM) is highly stigmatized in India and is not openly talked about, making it easy for people to underestimate how commonly it occurs. The estimated HIV prevalence among MSM in India is 7.3%. MSM do not consider themselves homosexual, and many have female partners. A large study in Andhra Pradesh found that 42% of MSM in the sample were married and 50% had had sexual relations with a woman within the past three months. Half of the sample had not used a condom. These men are the bridge population that transmits HIV to the general populations (their wives and children). The receptors in such sexual partnership are called "Hijras" who exist in Indian societies as third gender; they display a unique position in India. The existence of Hijras is rooted in the myths of Hinduism. This independent study lead to exploring the gender role of Hijras in the Indian society, and their reluctance to understand the severity of HIV and using protection against it. As a final part of this independent, study a musical play was presented to the Bates community based on ways to educate Hijras about HIV in their language so that they could understand and retain the message and act upon it.

Rebecca Clark '12

Thomas Wenzel, Chemistry

Diamagnetic Lanthanide Complexes as Chiral NMR Discriminating Agents

Diamagnetic lanthanum(III) and lutetium(III) tris β -diketonate complexes were synthesized and tested by ^1H NMR (nuclear magnetic resonance) spectroscopy for their ability to determine enantiomeric purity. These complexes are a potential alternative to paramagnetic complexes that caused too much broadening in the NMR spectra. A wide range of substrates, with functional groups that included amines, alcohols, sulfoxides, and ketones were tested in three different solvents, chloroform-*d*, benzene-*d*₆, and cyclohexane-*d*₁₂. The effectiveness of each complex was determined by looking for splitting of the substrate peaks into the two enantiomers on the ^1H NMR spectra. Results showed that in all cases, more discrimination was observed in benzene-*d*₆ and cyclohexane-*d*₁₂ than in chloroform-*d*. The differences between complexes and types of substrates were less clear, although the lutetium complexes seemed to be more effective in most cases and the majority of the substrates did show discrimination.

Sarah Cleary '12

Jennifer Koviach-Côté, Chemistry

Antioxidant Activity of Phenylpropanoid Glycosides

Plants produce a variety of compounds that are essential to survival: there are the primary metabolites (carbohydrates, lipids, proteins), and secondary metabolites, which are not directly involved in plant growth but provide plants with protection against both biotic and abiotic stresses. The largest class of plant secondary metabolites, and the subject of interest here, are phenylpropanoids (PPs). One or more of these moieties are often conjugated to sugar molecules, making up the phenylpropanoid glycosides (PPGs) class of compounds. PPGs are known free radical scavengers, and this activity is known to increase as more PP moieties are conjugated to the sugar. This work sets out to investigate the structural interactions involved in the antioxidant activity of PPGs. A set of mono-, di-, and tri-substituted PPGs was synthesized and subject to a DPPH assay, which allowed a comparative analysis of the PPGs and how each structural variation effected antioxidant activity.

Chike Cole '15

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

The War on Oil: Why Women in the Niger Delta Were Willing to Bare All for Justice -- see Molly Brown '15 for abstract**Leah Cole '12**

Áslaug Ásgeirsdóttir, Politics

Rethinking the War on Drugs in the United States

The goal of the "War on Drugs," declared by President Nixon in 1971, was to decrease and eliminate drug use in the United States. The war has concentrated on decreasing drug supply, focusing on combating international drug lords, drug traffickers, and drug dealers. As a result, current drug control policies view drug users as criminals. However, after over four decades, the war has proven to be in vain, wasting billions of dollars and countless lives. The failure of a policy to diminish supply has led to conversation about new policy models, which aim to decrease drug demand through treatment and programs. How can the United States decrease the demand for hard drugs? I look at this question in relation to the impact of Portugal's 2001 universal drug decriminalization policy and propose new policy

options for the United States combining both treatment and incarceration.

Sean Colligan '12

Nancy Koven, Psychology

Alexithymia and Working Memory: on a Recency Probes WM Task

Alexithymia is a multidimensional personality construct involving a lack of emotional processing. The orbitofrontal cortex (OFC) is thought to be critical in emotional processing and therefore may be disturbed in alexithymics. Recent research suggests that working memory could be a relative strength of alexithymics. Emotional stimuli may interfere with working memory and thus, the working memory of alexithymics lacks the interference from emotional processing. The dorsolateral prefrontal cortex (DLPFC) is critical to working memory, so it is possible that the OFC interferes with the DLPFC in nonalexithymics. Other research suggests that emotional information may actually aid processing in working memory tasks. To sort out these conflicting theories, a recency-probes working memory task was given to both non-alexithymics and alexithymic participants. Alexithymia was measured using the TAS-20 scale. The results of this task will indicate whether working memory is a strength or weakness of people who lack emotional processing skills.

Jordan Conwell '12

Heidi Taylor, Sociology

A Comparative Analysis of Kindergarten, Third-, Fifth-, and Eighth-Grade Test Outcomes for Black Immigrant Students and Black Nonimmigrant Students

This thesis analyzes the outcomes for black immigrant elementary school students (black students whose mothers were born in Africa, Latin America, or the Caribbean) on standardized tests in reading, math, and general knowledge science. Further, the thesis compares test outcomes for black immigrant students to those of their black nonimmigrant peers (black students whose mothers were born in the United States). Mean test scores demonstrate that black immigrant students are performing better than their black nonimmigrant peers on the tests, with few exceptions. Regression models reveal that black immigrants still perform better than their black nonimmigrant classmates, even when controlling for numerous salient factors such as parental level of education. These findings leave room for previous findings from the scholarly literature such as the "the immigrant paradox" and Ogbu's oppositional identity theory. Future samples should seek to deliberately over-sample black immigrant students so research can further substantiate claims from the literature.

James Cook '12

Hilmar Jensen, History

A Perfect Triangle: Aaron Lopez and the Colonial Mercantile System in Pre-Revolutionary Newport, Rhode Island

Aaron Lopez never made it back to Newport, Rhode Island, after fleeing the British invasion of the city in 1776. Tragically, the esteemed "Merchant Prince of New England," perished on his triumphant return to the city in 1782, at the age of 51. There is an uncanny symmetry between the rise and fall of Aaron Lopez and the city that made him one of the most successful merchants in Colonial America. The Sephardic merchant's arrival in Newport in 1752 coincided with the ushering of Newport into its golden years, 1750-1774, when an exceptional influx of earnings generated from the Triangular Trade transformed the sleepy port

of Newport into the "Venice of the Atlantic." Lopez embodied the resourcefulness and opportunism that had characterized Newport's celebrated merchant community, and his unique background facilitated the growth of his mercantile empire. As a devout Jew from a distinguished Portuguese family, Lopez was able to quickly enter the Sephardic trading network, and establish ties with creditors in England, plantation owners in the Dutch Caribbean, and merchants in South Carolina. These connections enabled Lopez to build a perfect triangular trade of his own. A key to Lopez, and other Newport merchants' success was smuggling. Due to the British Navy's negligence in enforcing Parliament's mercantilist policies in the decades preceding the American Revolution, Lopez and other Newport merchants were able to smuggle sugar into Newport, distill it into rum, and sell the rum in foreign markets, especially Africa, with a competitive advantage.

Peter Corcoran '12

Paula Schlx, Chemistry

Investigating Alpha Operon mRNA Segments Present in Synechococcus Strain cc9311: Implications on Translational Similarities to Escherichia coli

Marine phytoplankton account for approximately half of all organic matter on Earth, and have been decreasing globally by an estimated 1% per year. Specifically, the unicellular cyanobacterium *Synechococcus spp.* is responsible for the majority of carbon input into the marine ecosystem. *Synechococcus* growth rates are affected by a diverse range of environmental factors, such as nutrient composition, mineral abundance, temperature, and light levels in the ocean. Ribosomal protein and rRNA content per cell are tightly coupled to growth rate; rRNA content per cell increases linearly with growth rate, similar to *Escherichia coli*. As such, operons which encode ribosomal proteins and rRNA are subject to regulation in response to environmental factors. This study examined several RNA segments encoding various ribosomal proteins, contained within the alpha operon of the *Synechococcus* genome. Data obtained from sequencing these segments revealed distinct differences between the alpha operon of *Synechococcus* and that of *E. coli.*, suggesting that the two operons are regulated by different mechanisms. Understanding the mechanism of *Synechococcus* alpha operon regulation, and that of all operons encoding ribosomal proteins, is crucial to understanding the complex relationship between environmental factors and growth rate regulation of this marine phytoplankton.

Alison Cornforth '12, Emily Cull '12, Alana Folsom '12, Elizabeth Henry '12, Karen Nicoletti '12, Michelle Schloss '12 and Charlotte Simpson '12

Robert Farnsworth, English

Pipe Scheme: A Creative Thesis Reading

In this session, creative thesis writers read selections of their work.

Josalynne Cottery '12

Heidi Taylor, Sociology

The Effects of Educational Difficulties in the Latino Community

Due to the widening education gap, difficulties already faced by minority students are becoming more problematic. This study focuses on the educational backgrounds of Latino college students, and examines whether or not having Spanish as a first language caused problems during their primary and secondary education, or shaped their decision of attending a liberal arts

college in any way. A great deal of literature states that students of Latino heritage encounter more hardships throughout their education because of their language abilities. Through the contacting of a Latino student organization on campus, thirteen Latino students volunteered to be interviewed. The interviews focused on their education throughout the years and the information gathered was used to answer the main research questions. The main themes explored were bilingual schools, English as a second language (ESL) classes, family ties, perceptions of other people, and being an immigrant versus being the child of an immigrant. Ultimately, it was determined that the students' educational backgrounds did in fact have an effect on their decision to attend college, but was slightly, if at all, influenced by their knowledge of another language.

Corey Creedon '12

Sonja Pieck, Environmental Studies

World Bank-NGO Entanglements in Ecuador's Intag Region: Engagements that Favor a World Bank Hegemony or Allow for NGO Agency

Through exploring two modes of entanglement between Ecuadorian non-governmental organizations (NGOs) and the World Bank, the Inspection Panel, and the Extractive Industries Review, this thesis examines how effective these engagements have been through the eyes of the NGOs themselves and what these forms of overlap mean for both the World Bank and the involved NGOs. Understanding the roles played by NGOs and the consequences of their engagements with the Bank is an integral component of environmental and social justice in the Andean region and, more broadly, the global South. This analysis is informed by secondary-source research, World Bank documents, and field research undertaken with involved Ecuadorian actors. Relevant literature on World Bank-NGO interactions is organized into two broad theoretical perspectives before being applied to the specific case study of Ecuador's Intag region: 1) a point of view which favors a World Bank hegemony, an idea rooted in Gramscian thought arguing that the Bank is able to control the conversation and relationship it has with NGOs, absorbing and manipulating the critique it receives in order to reproduce its power and 2) a perspective that favors NGO agency in the sense that these groups are able to sway the Bank's social and environmental policies and operations, bringing about permanent change. This thesis investigates and affirms the existence of the aforementioned perspectives for Ecuadorian individuals and organizations and ultimately gauges the effectiveness of their entanglements with the World Bank, thereby seeking to inform future NGO-Bank interactions.

Emily Cull '12

Robert Farnsworth, English

Pipe Scheme: A Creative Thesis Reading -- see Alison Cornforth '12 for abstract

Shaina Deutsch '12, Tasnia Huque '12, Lu Li '12, Michael Massare '12, Metehan Mete '12, Daniel Sunderland '12, Emily Tato '12, and Yu Zhang '13

Meredith Greer, Mathematics

Applying Mathematics to Biology

The senior seminar is a senior capstone option for math majors. Students have the opportunity to apply four years of undergraduate classes in a final research- and presentation-based course. The mathematical and biological worlds are closely connected. The students in the senior seminar, Advanced Topics in Biomathematics, have explored this relationship in depth

throughout the semester. Several areas of mathematics such as differential equations, linear algebra, and modeling all have applications in the study of biology. Students apply mathematical methods to study topics such as the spread of disease and animal populations. In this panel we present an assortment of mathematical techniques and examples of biological situations to which the techniques can be applied.

Deniz Dolcen '13

Nancy Kleckner, Biology

Characterization of S1 Interneurons and Their Roles in the Modulation of Phase 2 and 3 of the Pond Snail, *Helisoma trivolvis*, Feeding Pattern

The ability to modify behavior to accommodate to the demands of the constantly changing environment is vital for an animal's survival. Such behavioral flexibility can be generated within a particular neuromuscular system by the modulation of the underlying neuronal circuitry. Central pattern generators (CPG) are such neuronal networks that control life-sustaining rhythmic behaviors. This thesis focused on the modulation of the feeding CPG in the pond snail, *Helisoma trivolvis*, which is composed of neurons divided into three subunits (S1-S2-S3) controlling the three phases of the feeding pattern. The electrical activities of the S1 CPG interneurons involved in the initiation of the feeding pattern were recorded and manipulated to observe the corresponding effects on the electrical activities of S2 or S3 motor neurons that control the muscles involved in the last two phases. The S1 interneurons were then stained with a fluorescent dye to determine their identities and analyze the correlation between the electrical activities of specific interneurons and the motor neurons. This way, it was possible to determine how the manipulation of a specific S1 interneuron changed the activity of a motor neuron, leading to a subsequent modulation in the feeding pattern. BCN1 cells, which are S1 interneurons, were shown to activate S2 and inhibit S3 motor neurons upon stimulation, suggesting that they are involved in the modulation of the feeding pattern from ingestion to regurgitation.

Nora Donahue '12 and Carlo Miani '13

Dennis Browne, Russian

Russian Movie Subtitling

This presentation focuses on the complexities of transcription, translation, and subtitling of a Russian movie. We examine subtleties of the differences between the two languages, and the difficulties in adapting a movie script to a subtitle format in a way that is accessible to a foreign audience. We demonstrate this by comparing the literal translation of various movie excerpts and our work.

Edward Donaldson '15

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

Turning Soldiers into Children: Reintegration & Renewal of Child Soldiers in Post-War Sierra Leone -- see Brenna Callahan '15 for abstract

Heather Doolittle '12

J. Dykstra Eusden, Geology, and Beverly Johnson, Geology

Shortridge Symposium: Geology in Bates' Backyard -- see Colin Barry '12 for abstract

Casey Dropkin '12

Paula Schlax, Chemistry

Exploring Gene Regulation in *Borrelia burgdorferi* with Microfluidics

Gene regulation in *Borrelia burgdorferi*, the spirochete bacteria responsible for Lyme disease, is largely uncharacterized. Promoter structures in *B. burgdorferi* often do not conform to consensus sequences and thus must be found and characterized experimentally. Our lab is studying RpoS and ribosomal gene regulation, both of which are uncharacterized but known to be essential for *B. burgdorferi* to transiently express their genes as required for their survival in both arthropod and mammalian hosts. The use of microfluidic chambers allows us to expose *B. burgdorferi* to an environmental or chemical gradient. Examining RpoS gene expression as indicated by the green fluorescent protein reporter gene across this gradient should provide valuable insight toward the mechanism of its gene regulation.

Ian Dulin '13

Timothy Cook, Geology

New Evidence of a Post-Laurentide Local Cirque Glacier on Mount Washington, NH

As global temperatures warmed and the last continental ice sheet receded ~18,000 years ago, there were several climate reversals during which time the average temperature in New England was abruptly reduced by several degrees Celsius. This temperature reduction, as well as an increase in precipitation linked to a climate shift, may have been enough to reactivate a mountain glacier in the pre-existing cirque found in the Great Gulf below Mt. Washington in New Hampshire. In order to confirm if this occurred, the source lithologies of rocks within the till that composes a previously mapped terminal moraine must be determined. Initial results indicate the moraine is composed of unsorted clasts with provenances ranging from local to regional. The former ice mass will be reconstructed using physical attributes of the cirque and the moraine to determine the necessary size for the glacier to have deposited the moraine, as well as climate conditions at that time.

Brigid Dunn '12

Megan Gahl, Environmental Studies

Reducing Household Water Consumption in the Arid Southwest: Targeting the Consumer through Regulation, Incentives, and Educational Programming

Water scarcity in the American Southwest poses multidimensional issues for local and state policy makers. Water supplies are rapidly depleting, droughts are increasing, and populations are expanding. Mechanisms for increased supply are consistently debated. Yet no economically feasible supplies will be able to adequately accommodate current rates of consumption with increasing populations. Per capita consumption needs to be greatly reduced within these communities. Local governments throughout the Southwest have implemented programs targeting the residential consumer to varying degrees. Governments use mixtures of mandatory and voluntary mechanisms to encourage conservation including: regulation, consumer incentives, and educational programs. Looking at four U.S. cities -- Las Vegas, Phoenix, Tucson, and Albuquerque -- this thesis analyzes the varying methods used throughout the Southwest to encourage conservation. The differing cultural, political, and environmental climates of these cities offer informative comparisons of what works where and why.

Jacqueline Easton '12

Rebecca Fraser-Thill, Psychology

Parental Decision Making in regard to Care and Education for a Child with Autism and the Resulting Post-Decision Feelings

Previous qualitative findings suggest that parental decision-making when selecting a school for a child with autism tends to be non-systematic, quick, and based on emotions (Fraser-Thill, Nigro, Sterzel, & Santy, 2005). In order to further confirm these results, parents of school-aged children with autism filled out questionnaires regarding their personal decision-making processes when choosing a school. The questions examined specific factors of the decision process, degree of parental involvement in the decision, and parental post-decision satisfaction. Questions inquiring about where the child falls on the Autism Spectrum (severity) were also included, as were general demographic questions. It was expected that higher parental involvement would result in higher ratings of parental post-decision satisfaction. It was also predicted that all findings from the previous qualitative research would be supported by this quantitative experiment. These findings are able to provide information that could aid parents facing this decision-making process in the future.

Catherine Elliott '12

Georgia Nigro, Psychology

Community-Based Research as Public Scholarship: A Presentation and Discussion Session -- see Nazsa Baker '12 for abstract**Ethan Emerson '12**

Thomas Wenzel, Chemistry

Cinchonidine Derivatives as Chiral Solvating Agents in NMR Spectroscopy

Cinchonidine derivatives were synthesized by reacting (-)-cinchonidine with 3,5-dinitrobenzyl chloride and 3,5-dinitrophenylisocyanate. Their effectiveness as chiral nuclear magnetic resonance (NMR) solvating agents for chloroform-soluble substrates was determined. These substrates interact through aromatic stacking between the electron-deficient poor dinitrobenzyl moiety of the host cinchonidine derivative and electron-rich aromatic rings which results in enantiomeric discrimination. This interaction is currently being studied by 2-dimensional NMR techniques to determine the exact nature of the interaction and how two different enantiomers are distinguished by their interaction with the host compound. Thus far, one of the cinchonidine derivatives has shown good enantiomeric discrimination for alcohol containing aromatics.

Sarah Fallon '12

Ryan Bavis, Biology

Carotid Body Growth and the Critical Period for Hyperoxia-Induced Developmental Plasticity in Rats

Chronic postnatal hyperoxia elicits both temporary and long-lasting plasticity in the control of breathing, primarily through effects on the carotid body. We hypothesized that the critical period for long-lasting changes to the development of the carotid body, and thus the hypoxic ventilatory response (HVR), would correspond to its period of postnatal growth (i.e., morphological plasticity). Although the critical period for long-lasting reduction of the HVR is limited to the first two postnatal weeks (Bavis et al., J. Appl. Physiol. 92: 1013-1018, 2002), a substantial increase in carotid body volume was observed through 10 weeks of age; growth rates and glomus cell division

(BrdU labeling) appeared to cease by 8-10 weeks of age. Rats were exposed to hyperoxia during a critical period of carotid body development (7-14 d) and points of slower growth (5 wk and 11 wk of age). The carotid body volumes were significantly smaller in 14 d rats exposed to hyperoxia than those exposed to a normoxic condition. There was no effect of hyperoxia on carotid body size at the five-and the 11-week period. This indicates that morphological plasticity in the carotid body is limited to the early postnatal period. This study is supported by NIH grant P20 RR-016463 (Maine INBRE).

Thomas Finkenstaedt '12

Kathryn Low, Psychology

Interventions to Reduce Excessive Drinking in College Athletes: A Meta-Analysis

Drinking among college students is very prevalent and has become an increasing concern in the health field. Research has shown that college athletes endorse a specific set of high-risk drinking habits that are not typical of all college students. I studied recent interventions designed to reduce high-risk college drinking and examined all of the studies that have specifically targeted college athletes, including both intervention studies and correlational studies. Effect sizes will be calculated so that we can combine and compare results across studies. By the end of the analysis we will have a good idea of which interventions are most effective and cost-efficient with athletes, and which strategies would be most beneficial to implement on college campuses.

Alana Folsom '12

Robert Farnsworth, English

Pipe Scheme: A Creative Thesis Reading -- see Alison Cornforth '12 for abstract**Mikayla Foster '13**

Kirk Read, French, and Joseph Hall, History

Cultural Crossings: Tales from a Semester in France -- see Jordan Banez '14 for abstract**Jarrett Freedman '12**

Senem Aslan, Politics

Israeli Settlers in the Holy Basin

Jewish Settlements in the Holy Basin are planned, paid for, and initiated by private groups and individuals with government assistance. Unlike in other East Jerusalem Settlements or in the West Bank, the Israeli Government places few restrictions on the settlers' plans or actions here. Additionally and dissimilar from settlement the West Bank and other portions of the city, the state refrains from actively engaging in the settlement, leaving most of the decision making to private groups and other non-state actors. This presentation discusses why Settlement in the Holy Basin has taken this form and what may be constricting state involvement in the settlement project in the Holy Basin.

Alex Friedman '12

Senem Aslan, Politics

Religious National Parties in Israel

In this presentation I will discuss my thesis work on religious national parties in Israel. One of my goals is to explain why religious nationalism has grown so much in Israel, especially over the last 15 years.

Owen Funk '12

Paula Schlax, Chemistry

Ribosomal Binding Site Strength in Borrelia burgdorferi

Borrelia burgdorferi is a pathogenic spirochete bacterium that causes Lyme disease in humans and other mammals. There is much yet to discover about this organism, particularly in regards to the expression and regulation of their genome. This study aims to identify and assess the binding strength of ribosomal binding sites (RBS) and promoter sequences in *Borrelia*. Using an expression vector with two known restriction sites, putative RBS and promoter sequences can be inserted into this plasmid. After transformation into a bacterium, this vector can be used to assess transcriptional and translational efficiency using a Green Fluorescent Protein reporter gene. It is our hope that this study will give insight into the gene expression of *Borrelia burgdorferi*.

Kristen Gavin '12

Kathryn Low, Psychology

Lateralization in the Perceptual Biases of Adults with Attention Deficit Hyperactivity Disorder

Much research has been done investigating the potential relationship between Attention Deficit Hyperactivity Disorder (ADHD) and anomalous lateralization, often operationalized as left-handedness or anomalous perceptual asymmetries, but the results have been mixed. Although some studies have found a significant relationship between ADHD and measures of anomalous lateralization, others have found none at all. However, none of these studies have controlled for all of the following contributing factors: gender, handedness, age, medication status, co-morbid learning disorders, ADHD subtype, and motor involvement.

Christina Gee '12

Megan Gahl, Environmental Studies

Paper vs. Electronic

My thesis work considers the costs and benefits of traditional learning methods with paper source such as textbooks and newspaper in contrast to more modern technological methods of ebooks and laptops. While schools in the United States become more willing to accept these modern advances, praising the benefits, there has been little consideration for the implications of these choices. On one hand, we are saving trees, and diminishing the containments from our national paper mills, but on the other hand, we are mining for material, transporting parts thousands of miles, and releasing toxic chemical waste into ground sources with poor recycling practices. My thesis breaks down the carbon and monetary costs of components of a laptop computer, an iPad, and a Kindle, compared to that of a standard textbook and newspaper. Though societal progression implies that our demand for these technologies is only going to increase, my thesis suggests that consumers, manufacturers, and the government work to make more sustainable devices with longer life capacities, higher restrictions on recycling, and consumer consciousness of the wider implications of their devices.

Reann Gibson '12

Georgia Nigro, Psychology

Community-Based Research as Public Scholarship: A Presentation and Discussion Session -- see Nazsa Baker '12 for abstract

Claire Gittleman '12

Claudia Aburto Guzmán, Spanish

A Comparative Study of Street Art among the Marginalized and Oppressed

My senior thesis for the Spanish major is a study in street art around the world, focusing specifically on East Los Angeles, United States, and La Victoria, Santiago, Chile. I have researched the origins of street art and its spread to these two places as well as analyzed works of various murals in each city. I analyze the works of art, their meaning, and reason for existence in each place. Although the styles vary greatly (graffiti in East Los Angeles and painted protest art in La Victoria) the reasons for their existence are very similar. In both places there is a large population of people who have felt marginalized or oppressed by society in one way or another; the act of painting the walls of their streets provides these communities with a sense of identity, solidarity, and unity among each other. It is a way for people to express themselves and maintain their voice within a population of the voiceless. In addition to analyzing these works of art and their *raison d'être*, I also focus on the legitimacy of these public displays of expression. There are a lot of people who do not consider street art a legitimate art form, if it's not in a gallery then it's not art, but I argue that it is and that there is value in the art created in the streets. Graffiti and murals are slowly becoming more and more recognized as a genuine art form, but they still do not get the respect that they deserve as a studied skill. The effort it takes to create a piece of work is just as much, if not greater, than the effort it takes to paint a picture. Graffiti and muralism are legitimate arts that the world is slowly starting to appreciate, but are not quite there yet. They are not paintings we should blindly pass by in the street, but rather study and appreciate because each one has a voice and each one is saying something different. We just need to stop and listen.

Joanna Goldin '12

Mara Tieken, Education

Bates' Community Involvement and Its Potential Influence on College Aspirations

The relationship between Bates and Lewiston is a long and complicated history. Involved in this relationship is the changing demographics of Bates students as well as the Lewiston residents. My research has shown that over the years, a social class divide has developed between the college and its surrounding community. Furthermore, as the college student body has grown in number, in Lewiston, fewer residents are graduating from high school. These divides in social class and educational attainment between Bates and Lewiston has presented an interesting research site. In my thesis, I use this environment to discern whether or not the presence of a college with the community has an effect on the local youth involved. Specifically, I look at local students who have previously engaged with Bates service-learners and whether or not the existing divides in social class and educational attainment between the college and the community played a part in these students' own college aspirations.

Dhariana Gonzalez '12 and Sylvia Leiva '13

Claudia Aburto Guzmán, Spanish

Legal Discourses that Stigmatize the Immigrant Body

Our study discusses the legal challenges faced by immigrants in the United States and how issues of legality make fear and instability a permanent presence in their lives. Legal processes and discourses stigmatize immigrants, especially those that are undocumented, thus hindering a functional life and integration

into American society. The objective of our study is to illustrate the many ways that immigrants are subjected to a second legal system that is not deemed fit for American citizens. We do so by first demonstrating how the Constitution grants undocumented immigrants rights, and then showing how these rights are violated through analyzing arguments against birthright citizenship and the legal processes used during immigration raids.

Munroe Graham '13

Karen Melvin, History

The Other Side: Identity of the Resistencia Nicaraguense

Historical memory in Nicaragua is what guides how people, places, and events are remembered. However, historical memory is not always a true indicator of what happened. For the Nicaraguan Resistance, also known as the Contra movement, historical memory has shaped an identity and perception of the organization that is not truly representative of whom it was. In my research, I explored the identity of the Nicaraguan Resistance and attempted to correct the historical memory that has permeated Nicaraguan culture. By analyzing the perception of the Nicaraguan Resistance, compared with the true identity, the truth behind the misconceptions becomes apparent. In addition to understanding their identity, I also evaluated human rights abuses, the reconciliation process, and analyzed the future for the Nicaraguan Resistance and the collective memory regarding their identity.

Samuel Grandgeorge '12

Ryan Bavis, Biology

Effects of Carotid Body Inhibition on Ventilatory Control of Rats Reared in Chronic Hyperoxia

Evidence suggests that the supplemental oxygen given to prematurely born human infants causes negative effects. My thesis experiment investigates this phenomenon by comparing neonatal rats reared in high oxygen conditions (hyperoxia) to a control group reared under normal oxygen conditions (normoxia). Rearing in hyperoxia is known to inhibit the development of the carotid body, an organ responsible for breathing responses to varying oxygen conditions. However, research has not yet shown how these conditions affect the development of the central nervous system (CNS). In low oxygen (hypoxia) the carotid body triggers an increase in breathing while the CNS slightly inhibits breathing. Injecting the rats with a drug called PPADS renders the carotid body ineffective and allows me to specifically assess any differences in the CNS contributing to breathing between the two groups. Thus the rats raised in hyperoxia should exhibit a lesser decrease in breathing than those from normal air indicating a link between supplemental oxygen during development and a damaged central nervous system.

Meredith Greene '12

Kathryn Low, Psychology

Moral Licensing and Compensation in Public and Private Domains

Past research strongly supports the notion that there are moral self-regulatory patterns of human behavior, such that individuals feel licensed to act unethically after having established "moral credentials" and feel a need to morally compensate after committing a transgression (Monin & Miller, 2001; Jordan, Mullen, & Murnighan, 2011; Sachdeva, Ilic, & Medin, 2009; Tetlock, Kristel, Elson, Green, & Lerner, 2000). The present study examines how the establishment of moral credentials or

deficits influences subsequent behavior depending on whether the behavior is public or private in nature. Approximately 100 undergraduate male and female participants took an online survey. They first completed a brief writing task intended to prime moral credentials or deficits and then evaluated five morally relevant vignettes that involve either public or private behavior. In line with previous research, it is expected that credentialed participants will be more likely to engage in unethical behavior and will judge the behavior as more permissible than participants in the deficit condition. Moreover, individuals will be more likely to transgress in a private setting and private unethical behaviors will be judged as more permissible than public ones. These findings would offer insight as to whether moral regulation is a self-presentational or impression management strategy.

Samuel Gretz '12

Jennifer Koviach-Côté, Chemistry

Synthetic Studies of Koshikalide

In late 2009, koshikalide was isolated from the marine cyanobacterium *Lyngbya sp.* in the Mie prefecture, Japan. It is part of a group of organic compounds called macrolides, which have been known poses antibiotic and cytotoxic qualities. Due to the size of koshikalide, retrosynthetic plans called for the synthesis of two "sides" of the target molecule, a right side and a left side. Progress on both sides of koshikalide will be presented.

Kerry Gross '12

Heidi Taylor, Sociology

Women's Rugby Isn't That Feminine: Challenging Gender Norms through Participation in Rugby

While the link between culture and sport is a complex and reciprocal relationship, this relationship both affects and is effected by normative understandings of gender. Given that the institution of sport is particularly gendered, sociological literature indicates that sport (and its intersection with culture) may be an ideal location to challenge gender norms. Drawing upon this literature and qualitative interviews, I examine how female rugby players use individual and group identities to create collective action for change, and present a possible challenge to gender norms within two distinct contexts: the United States and Argentina. In my analysis, I found that although the possibility to challenge gender norms through the concurrence of motivated identities exists in both the United States and Argentina, the differing cultural and gendered legacy of each nation shapes the discourse and actions of women in each setting. In the United States, where feminism has experienced significant advances, the women interviewed identified strongly as women who play rugby; however instead of advocating for explicitly gendered challenge to norms, they explained that other aspects of community building are more important avenues for their collect action. In contrast, in Argentina, where machismo still dominates all gendered relations, female rugby players try to negotiate their need to be feminine with their desires to play rugby like their male counterparts; despite conflicting ideas of femininity, these women's accounts coincide to demonstrate that they believe rugby is an important method to challenge gender norms, both in sport and across society.

Sydney Hare '12

Heather Lindkvist, Anthropology

Las Trans: How Gender Identity Affects Citizenship in Arica, Chile

Las Trans, a group of male-to-female transgender persons living in Arica, Chile, challenge the strict dual-sex, dual-gender system of Chile's family-oriented society. Chile presents an especially interesting case when analyzing the social position of sexual minorities due to the country's historically strong ties to the Catholic Church, and, on a political level, the experience of 17 years of dictatorship during a crucial period of time in world history. Drawing on ethnographic fieldwork conducted with *las Trans*, I consider how gender identity and gender expression affect to what extent an individual can achieve full personhood and full citizenship in this South American country. Because of *las Trans'* gender identities, they are unable to take advantage of many opportunities that are, in theory, guaranteed as basic human rights. Specifically, they are unable to attain legitimate jobs and are instead forced to earn a living through sex work, putting them at a heightened risk of being assaulted and contracting STDs. Additionally, *las Trans* experience numerous barriers in effectively accessing government institutions, like health care, which are allegedly "free" and "accessible" for all citizens. This thesis argues that such discriminatory and exclusionary practices, rooted in social discrimination and reinforced through government legislation, further marginalize those who fail to "conform" to culturally prescribed gender categories and norms.

Luke Harmeling '12

Ryan Bavis, Biology

Metabolism in Hyperoxic Neonatal Rats

Premature infants are often given supplemental oxygen when they are born to maintain normal tissue development, which can result in them receiving too much oxygen (hyperoxia). Using rats as a model, I tested the effects of hyperoxia on metabolism. It has been established that perinatal hyperoxia decreases metabolism when rats are returned to normal oxygen, but I used a drug to stimulate metabolism (measured as oxygen consumption) to determine whether rats retain the capacity to express normal metabolic rates. These experiments will have implications for the care of premature infants.

Elizabeth Henry '12

Robert Farnsworth, English

Pipe Scheme: A Creative Thesis Reading -- see Alison Cornforth '12 for abstract

Jasmin Hernandez '12

Rachel Austin, Chemistry

Materials for Photoelectrolyze of Water

Energy harnessed directly from sunlight offers a solution for the growing demand of "green" energy. Solar energy needs to be efficiently converted into chemical fuel, which can be stored and transported. Collecting and storing solar energy can be achieved through the photoelectrolysis of water using semiconductors. To accomplish the photoelectrolysis approach effectively, new inexpensive and stable materials must be developed to split water directly using sunlight. Metal oxide semiconductors are known to be the best materials due to their stability under oxidizing conditions. Unfortunately, few semiconductors satisfy both requirements of electronic structure and stability. Currently, there is no known stable material capable of efficiently and inexpensively photoelectrolyzing water with

visible light, therefore the SHArK Project's objective is to find stable oxide semiconductors. Using the SHArK Kit I am able to investigate a combination of metal oxide semiconductors to test their ability to trap sunlight and use its energy to split water into hydrogen and oxygen.

Jacob Hershey '12

Joshua Henry, Chemistry

CdSe Surfactants and Surface Chemistry

Our work focuses on the surface chemistry of cadmium selenide, a popular semiconductor used in many photovoltaic cells. While cadmium selenide has been well quantified in many respects, much of the surface chemistry remains a mystery. Using a variety of techniques including infrared spectroscopy, we have attempted to show that a total reduction of CdSe is possible, a discovery that could help in the removal of surfactants from nanocrystals as well as their synthesis.

Benjamin Horn '12

Jennifer Koviach-Côté, Chemistry

Perfecting the Use of Sonogashira Coupling in the Synthesis of A Spiroketal Enol Ether

Through the long work of Jennifer Koviach-Côté and her previous thesis students, a successful method for the synthesis of a natural product, derived from *Anthemideae*, was found. The use of transition metal catalyzed cross-coupling reactions is of rising interest in the field of organic chemistry. One of these reactions is known as Sonogashira coupling, which has been found to be effective in the coupling of an alkyne to a vinyl triflate. From previous work, it was determined the method of Sonogashira coupling developed by Halbes and Pale in 2002 would work best for the synthesis of the spiroketal enol ether of interest. After applying and practicing this method on the model compound, derived from ribose, it was applied to the synthesis of the spiroketal enol ether. For future work the biological activity of this compound will be thoroughly investigated.

Margaret Horvath '12

Karen Palin, Biology

Knowledge Surrounding Vitamin D in the Youth-Parent Population in Lewiston-Auburn

My project investigated knowledge about vitamin D among the youth-parent population in Lewiston-Auburn. The project was conducted with the help and support of my community partner organization, Advocates for Children. Advocates is a nonprofit group in Lewiston working to improve the health and wellbeing of families in the area. I hypothesized that there was a lack of knowledge about vitamin D deficiency in this particular at-risk population. Because of the latitude of Lewiston and therefore limited sunshine (a source of vitamin D), and the challenges that young-parents face, there was a high likelihood of vitamin D deficiency among this group and a need for more nutritional education. Advocates for Children agreed and supported the need for nutritional education among their youth-parent clients. I conducted workshops and home visits to assess the amount of knowledge about vitamin D in this population and to increase awareness and education about vitamin D as well. The goal is to improve the nutrition and health of members of our community.

Jessica Howard '12

Thomas Wenzel, Chemistry

Enantiomeric Discrimination of Isoxazoline Fused β -amino Acid Derivatives Using (18-crown-6)-2,3,11,12-Tetracarboxylic Acid as a Chiral NMR Solvating Agent

Optically active β -amino acids and isoxazolines have recently received attention due to their strong pharmacological potential as antibiotic, antifungal, and antiviral agents. Ways to synthesize these compounds in a stereoselective manner are complex and under development, thus products commonly result in a mixture of enantiomers. Two enantiomers of a chiral compound can have very different chemical properties and reactivities, which poses problems for their use in pharmaceuticals. Prior studies have shown that optically pure (18-crown-6)-2,3,11,12-tetracarboxylic acid (18-C-6-TCA) is a useful chiral solvating agent for substrates containing amine groups. By forming a complex via three hydrogen bonds to protonated amine groups, 18-C-6-TCA can help determine the enantiomeric purity of various substrates. In this study, racemic mixtures of isoxazoline fused β -amino acid derivatives were analyzed using 18-C-6-TCA and nuclear magnetic resonance (NMR) spectroscopy. Herein we report successful enantiomeric discrimination of these compounds.

Tasnia Huque '12

Meredith Greer, Mathematics

Applying Mathematics to Biology -- see Shaina Deutsch '12 for abstract

Hansen Johnson '13

William Ambrose, Biology

Resource Limitation Affects Heterocyst Formation and Productivity in Nitrogen-Fixing Cyanobacteria

The primary goals of this study were to compare *Anabaena circinalis* growth and heterocyst development over a nitrogen and phosphorus gradient as well as determine if substitutable resource acquisition strategies can differentially affect the environment. A regression design was used to establish growth solutions which were inoculated and incubated for 14 days. The phosphorus gradient had no significant effect on any treatment. Chlorophyll a concentration, filament length, and pH all agreed that optimal growth occurred at 30 mg/L nitrate. Heterocyst density showed that heterocysts only formed below 10 mg/L nitrate. Nitrogen acquisition strategies had differential effects on the environment as nitrate assimilation generated alkalinity while nitrogen fixation did not. Because nitrate assimilation generated alkalinity, the total pool of dissolved inorganic carbon actually increased as available nitrogen increased.

Amy Johnston '12

William Ambrose, Biology

Growth Rate and Shell Analysis of *Patella vulgata* (the Common Limpet) from the Sandwich South Site, Unst, Shetland Islands, UK

Patella vulgata shells were collected from a Norse site at Sandwich South, Unst, Shetland Islands, occupied from the 12th to the 15th century. Shell growth rate and oxygen isotope data were collected and compared to modern shells to provide environmental information across time periods. Modern-day limpets grew significantly faster (~60%) than shells from the 12th/early 13th century, 14th century, and the House Tephra phase (1362). This may be due to higher primary productivity, warmer sea surface temperatures, and less competition at present compared to the past. Modern shells were significantly less

enriched in ^{18}O than shells from all but one of the archaeological phases. If salinity was constant, modern-day and the late 13th/early 14th century temperatures may have been warmer than the three other archaeological phases. These data are being used to determine environmental changes at the site related to human inhabitation and climate change information.

Travis Jones '13

Michael Reidy, Rhetoric

Scenic Design Projects

Every theatrical production involves significant research when designing the scenic environment. This presentation details a scenic designer's process when developing a set for a play, from research and discussion with the director to drawings and models to the first set. The work presented showcases the designs for two shows: *Five Women Wearing the Same Dress* by Alan Ball, and *Spike Heels* by Theresa Rebeck, both directed by Katalin Vecsey.

Andrew Kageleiry '12

Nathan Tefft, Economics

Macroeconomic Conditions and the Utilization of Preventive Medical Services

This study is one of the first to comprehensively evaluate the relationship between state-level unemployment rates and the use of preventive medical care. Such services, including vaccinations, cancer screenings, and annual checkups have been shown to be effective in health spending reduction and important for public health. Employing CDC data from over 5 million interviews with Americans from 1987-2010, this study finds that an increase in the average state-level unemployment rate by one percentage point yields a 0.32% decrease in the probability that working-aged individuals will seek at least one preventive medical service. Results of analysis categorizing individuals by demographic groups suggest that the effects are amplified among females and blacks, as well as the uninsured, the unemployed, those with a high school education and those with lower incomes. This study has been accepted for poster presentation at the American Society of Health Economists (ASHEcon) Biennial conference (June 2012).

Gretchen Kaija '14

Kirk Read, French, and Joseph Hall, History

Cultural Crossings: Tales from a Semester in France -- see Jordan Banez '14 for abstract

Emily Kaldjian '13***Environmental Degradation and Self-Recognition in Armenia***

This presentation will be a short synopsis of my Phillips Fellowship in Armenia during the summer and fall of 2011.

Allison Kamm '12

Nancy Koven, Psychology

A Volumetric Analysis of the Amygdala as Related to Emotional Intelligence

As humans, we are constantly processing emotions, our own and others'. However, some people do this better than others. The term "alexithymia" has been given to individuals at the low end of this distribution and is marked by deficits in five areas: 1) awareness of one's emotions, 2) communication of emotions, 3) emotional display, 4) perception of others' emotions and 5) abstract thought. While several fMRI studies have linked decreased amygdala activation in response to emotional stimuli in alexithymics, to date no research has been done on potential

structural abnormalities of the amygdala underlying this phenomenon. To determine possible correlations between amygdala volume and trait meta-mood components, I performed a manual volumetry analysis in 30 healthy adults. The study correlates trait meta-mood components, as measured by the Trait Meta-Mood Scale (TMMS), with bilateral amygdala volume. It is expected that amygdala volumes will be positively correlate with TMMS sub-scales.

Jacob Kaplove '12

Georgia Nigro, Psychology

Community-Based Research as Public Scholarship: A Presentation and Discussion Session -- see Nazsa Baker '12 for abstract

Ryan Katon '12, Cameron Kaubris '15, Hillary Throckmorton '15, and Ryan Weston '12

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

African Perspectives on White Saviors in Cinema

How do Africans respond to Western cinematic depictions of their struggles? American films consistently immerse their audiences in white redemption rhetoric, depicting Western influences in Africa as wholly beneficial. However, when we juxtapose African opinions of white "saviors," it becomes evident that the white hero is historically inaccurate and tendentious. Our poster examines the recently released Kony 2012 short film and the resulting reactions by Africans in order to show how white saviors misrepresent Africa and conceal injustice by manipulating historical fact.

Cameron Kaubris '15

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

African Perspectives on White Saviors in Cinema -- see Ryan Katon '12 for abstract

Bethel Kifle '14

Sue Houchins, African American Studies

Sankofa

This talk is centered on the use of art as an expression of celebrating the African diaspora. Sankofa, a club that uses art in this manner, presented *A Journey of Our Own* on January 16, 2012. The production highlighted the varied experiences of black people in four branches of the African diaspora: the Caribbean, the United States, the continent of Africa, and Latin America. This talk considers the organization of the production and its use of poetry, dance, song, drama, and dress as a means to express the humanity and dignity of black people across the diaspora. The presentation presents theories of performance, examples of other productions centered on the African diaspora, and establishes the connection between the audience, the performer, and the creator of the production.

Abigail King '12

Rebecca Sommer, Biology

Low-Dose Arsenic Toxicity Early in Development Impairs LTP in Mice via CamKII

Arsenic (As) is a neurotoxin that contaminates groundwater sources across the world. Previous studies have associated As poisoning with long-term potentiation (LTP) impairments, resulting clinically in learning and memory deficits. Unfortunately, the processes through which this toxicity occurs remain unknown. Ca^{2+} /calmodulin-dependent protein kinase II (CaMKII), a protein essential for the induction of LTP, depends on its autophosphorylation to maintain synapse potentiation.

Other heavy metal toxicity has been shown to decrease the autophosphorylation of CaMKII, though studies on the effect of As on CaMKII activity are scarce. I am investigating the relationship of low-dose arsenic toxicity and CaMKII autophosphorylation during development in mice through Western Blots and histological analyses. This study will provide a better understanding of the mechanism underlying memory and learning deficits associated with arsenic poisoning, allowing further advances in treatment, diagnoses, and arsenic toxicity education.

Carolyn Kussmaul '12

Karen Palin, Biology

Trimethoprim and Sulfamethoxazole Resistance in Uropathogenic Isolates of Staphylococcus saprophyticus

Urinary tract infections are one of the most prevalent community-acquired bacterial infections, affecting over 6 million women each year. While 80% of UTI are caused by *Escherichia coli*, *Staphylococcus saprophyticus* is the second most common cause. *S. saprophyticus* disproportionately affects young healthy women, including college-age women. This study examines antibiotic resistance among clinical isolates of *S. saprophyticus* to two first-line drugs for UTI treatment. Data showed that all strains tested were initially susceptible to Trimethoprim-sulfamethoxazole (TMP-SMX), the current first-line treatment. However, upon culture in vitro, spontaneous mutants were observed and identified as resistant to trimethoprim and sulfamethoxazole. One proposed mechanism for this antibiotic resistance is altered activity of dihydrofolate reductase, an enzyme critical to folic acid production. To determine if the resistant isolates were utilizing this mechanism, a dihydrofolate reductase assay was performed.

Kelsey LaFreniere '12

James Richter, Politics

Commemorating the Holocaust and Communism: The Politics of Hungarian Public Memory

All nations make use of historical narratives in their quests to build unity and achieve other political goals. Those who control memories of the past are often able to affect changes in the future. Hungary is a historically-conscious society with a dark and problematic recent past, which is currently being considered by an increasingly controversial political leadership. This thesis explores this dynamic between power and history by examining public memories of the Holocaust and communism, as represented in the public sphere by museums. It focuses on the narratives told by those with power, and seeks to identify the functions of these stories. What motivates groups to tell which stories, and what purpose do these public memories serve? This thesis analyzes the narratives that historical museums tell. It examines the unique representations of the Holocaust and communism, yet also identifies when memories of the two events converge. I argue that these public memories often compare the Nazi Arrow Cross with the communists, conflating both regimes into a single narrative of foreign-imposed oppression and victimization.

Kara Leasure '12

Nancy Kleckner, Biology

Neuropeptide Phenylalanine (NPF) Induced Modulation of Phase I Feeding Behavior through Excitation of Buccal A Cluster (BAC) Neurons in the Pond Snail, Helisoma trivolvis

In pond snails, specific neurons produce three phases of feeding: protraction (S1), retraction (S2), and hyperretraction (S3).

Buccal A cluster (BAC) neurons are capable of influencing phasic neurons, resulting in behavior modification. To better understand how BAC neurons alter feeding and how S1 motor neurons are influenced, intracellular recording and imaging was used to study BAC neuron and S1 motor neuron responses to neurotransmitters (dopamine and neuropeptide phenylalanine) and morphology. In saline, BAC neurons showed long, slow EPSPs during retraction and S1 motor neurons showed firing in protraction with hyperpolarization in retraction. Preliminary results indicate occasional activation of BAC neurons which, correlated with inhibition of S3 motor neurons, could represent a switch to egestion or satiation. During BAC activity, S1 motor neurons showed either non-S2 PSPs corresponding with BAC firing in retraction or transient inhibition. Understanding how sensory input modifies feeding in snails allows us to understand control of rhythmic behaviors.

Sylvia Leiva '13

Claudia Aburto Guzmán, Spanish

Legal Discourses that Stigmatize the Immigrant Body – see Dhariana Gonzalez '12 for abstract

Lu Li '12

Meredith Greer, Mathematics

Applying Mathematics to Biology -- see Shaina Deutsch '12 for abstract

Jennifer Lindelof '12

J. Dykstra Eusden, Geology, and Beverly Johnson, Geology

Shortridge Symposium: Geology in Bates' Backyard -- see Colin Barry '12 for abstract

Jordan Lupo '13, Talia Mason '15, Ilana Meyer '15, and Matthew Record '14

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

Ghana's Young Voices: an Investigation into Child Trafficking

International human rights organizations suggest that, worldwide, 1.2 million children are trafficked annually. In the Ghanaian capital of Accra alone over 30,000 children are said to be forced into formal and informal labor every year. After gathering information from Ghanaian NGOs, local authorities and community members, we convey how this issue is currently being addressed differently in these various social contexts. By exploring various African perspectives on this complex subject, we work hard to refine our Westernized understanding of human rights with respect to child labor without losing touch with our ethical sensibilities.

Deborah Mack '12

Karen Palin, Biology

Using Pictograms to Improve Understanding and Appropriate Use of Prenatal Medications for Somali Women in Lewiston and Auburn, ME

Recent community work has revealed that many Somali refugees in Lewiston and Auburn, Maine, are non-literate in any language and have low compliance with medication use. Health literacy barriers that affect the understanding of medication instructions are medical concerns, especially for pregnant women. This study was designed to address the literacy barriers associated with medication use among local Somali patients through the development of pictorial instructions. Conversation groups, workshops, patient interviews, and home visits were used to assess medication adherence among pregnant women.

Participants were patients eligible for the Women Infants and Children (WIC) program and patients at Women's Health Associates, Lewiston, Maine. The results of this project will provide valuable data on medication literacy in this population and the pictorial medication sheets developed could improve understanding about prenatal medication in the local community.

Colby Maldini '12

T. Glen Lawson, Chemistry

The Use of Interfering RNA to Evaluate the Ubiquitin Mediated Degradation of the EMCV 3C Protease in vivo

The 3C proteases encoded within the RNA genomes of picornaviruses are responsible for the majority of viral polyprotein processing events that release mature viral proteins necessary for virus replication. Studies suggest that during certain viral infections the accumulation of 3C protease negatively impacts several host cell processes, and subsequently, virus replication. We propose that some picornaviruses, including the encephalomyocarditis virus (EMCV), have evolved to optimize virus replication by utilizing the cellular ubiquitin-proteasome system (UPS) to limit the concentration of potentially cytotoxic 3C protease in infected cells. Our laboratory has shown at least three pathways catalyze the ubiquitylation of the EMCV 3C protease, thereby tagging the viral protein for destruction by the proteasome. For this study, I used interfering RNA to reduce in cultured mouse fibroblasts the expression of isozymes of the ubiquitin-conjugating enzyme UbcH5, which is a member of one of the EMCV 3C protease-ubiquitylating pathways, with the goal of determining whether the attenuation of this pathway alone results in 3C protease accumulation in virus-infected cells. The UbcH5 expression knockdown and 3C protease accumulation were evaluated using Western blotting. A near future extension of these experiments includes the measurement of how reduced UbcH5 concentration impacts infectious virion production that results from EMCV infection.

Haley Manchester '12

Rebecca Sommer, Biology

Low-dose Developmental Arsenic Exposure Alters Carcinogenic and Diabetogenic Gene Expression in Male Mice

Inorganic arsenic is a known carcinogen associated with type II diabetes mellitus. Developmental exposure to arsenic induces low birth weight and fetal malnutrition, possibly causing diabetes and obesity later in life. Over a hundred million people consume arsenic-tainted groundwater at concentrations higher than the EPA and WHO standard of 10 ppb. While high dose exposure (>300 ppb) is clearly linked to cancer and diabetes, the role of low dose exposure as a carcinogen and diabetogen is still uncertain. In this thesis, I examined possible genetic and epigenetic mechanisms of toxicity resulting from transplacental arsenic exposure in male mice. I hypothesized that male mice developmentally exposed to arsenic would exhibit aberrant expression in genes related to diabetes and liver cancer. I also hypothesized that these changes originated from abnormal epigenetic programming. I hope that this thesis will help us determine the possible diabetogenic and hepatocarcinogenic mechanisms of low-dose developmental arsenic exposure in mammals.

Nicholas Marinakis '12

John Kelsey, Psychology

The Effects of Repeated Administrations of MK-801 Following Memory Reactivation of a Morphine Withdrawal-Induced Conditioned Place Aversion

Drug addiction is a chronic relapsing disorder suffered by millions in the United States alone. Extinction therapy is a commonly utilized intervention to decrease relapse. The underlying theory of extinction therapy is that during drug taking, drug-associated cues become paired with the rewarding and/or negative drug effects. Such cues are a major cause of relapse and can trigger the return of compulsory drug-seeking behavior long after physiological dependence. During extinction therapy, drug-associated cues are presented in the absence of the drug in order to weaken established connections between cues and drug effect. Unfortunately, extinction is typically not a sufficient therapy to avert relapse. For example, in Experiment 1, I showed that a conditioned place aversion (CPA) induced by morphine withdrawal could be extinguished, but could then be reinstated by injections of the opiate antagonist naloxone. The current study investigates the disruption of a process known as reconsolidation as a potential more permanent alternative to extinction therapy. Reconsolidation refers to a process by which well consolidated memories are returned to a vulnerable labile state following reminders. Recent evidence suggests that administration of the amnesic drug, MK-801, following the reactivation of a drug-induced conditioned place preference can selectively eliminate that preference. In Experiment 2, I hope to determine if MK-801 can similarly disrupt reconsolidation of a CPA induced by morphine withdrawal such that the CPA cannot be reinstated by re-exposure to naloxone.

Julie McCabe

Georgia Nigro, Psychology

Community-Based Research as Public Scholarship: A Presentation and Discussion Session -- see Nazsa Baker '12 for abstract**Sean McGhee '12*****Experiencing Ghanaian Culture through Teaching***

The primary goals for my Phillips Fellowship were to teach mathematics in a junior secondary school in Accra, Ghana, and to contribute positively to the development of Ghana's young people. This was an empowering experience: it allowed me to visit Africa while simultaneously doing what I love, helping people in a subject that I adore. Even though I experienced some challenges in teaching the students, I know that they learned a great deal and I believe I made a lasting difference in their lives. A secondary goal that I had for the program was to learn about Ghana. Both inside and outside of the classroom, I interacted, shared knowledge, and explored many of the historic and educational sites; including Cape Coast Castle and the W.E.B. Du Bois Memorial Centre for Pan-African Culture. My daily experiences gave me the opportunity both to impact the students' lives and to experience African culture.

Elizabeth McKean '12

Georgia Nigro, Psychology

Community-Based Research as Public Scholarship: A Presentation and Discussion Session -- see Nazsa Baker '12 for abstract**Kelley Madden '12**

Paula Schlax, Chemistry

Transcriptional Regulation of *Borrelia burgdorferi* -- see John Borchert '12 for abstract**Talia Mason '15**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

Ghana's Young Voices: an Investigation into Child Trafficking -- see Jordan Lupu '13 for abstract**Michael Massare '12**

Meredith Greer, Mathematics

Applying Mathematics to Biology -- see Shaina Deutsch '12 for abstract**Lucas Matarazzo '14**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

Y'en a Marre (Enough is Enough): The African Spring in Senegal -- see Thomas Baroni for abstract**Rebecca Merten '12**

Aimee Bessire, History

Natureland: Conceptions and Manifestations of Nature in the Development of the Bronx Zoo

This thesis examines the Bronx Zoo, one of the many zoos that began to dot the urban landscape in the late nineteenth century and early twentieth century. These parks and zoos were born out of larger movements that placed importance on civic public amenities and valued certain open spaces as inherently good. This thesis questions what we can learn about our understanding and use of nature by following this development. Zoos offer a rich context in which to analyze human considerations about the world they occupy because the spaces are heavily constructed yet display natural elements that park and zoo leaders had to consider, assign value to, organize, and present. By examining the development and presentation of the landscape, animal exhibits, and human exhibits it becomes clear that city officials, park designers, and zoo designers considered nature and its human utility in varied, complex, and even contradictory ways. An analysis of zoos through both archival records and academic writing reveals that humans created these spaces in the hopes of bettering the lives of their cities' residents, with their own personal motivations and visions, and with the willingness to create hybrid spaces that offered disparate elements in public green space.

Metehan Mete '12

Meredith Greer, Mathematics

Applying Mathematics to Biology -- see Shaina Deutsch '12 for abstract**Ilana Meyer '15**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

Ghana's Young Voices: an Investigation into Child Trafficking -- see Jordan Lupu '13 for abstract**Carlo Miani '13**

Dennis Browne, Russian

Russian Movie Subtitling -- see Nora Donahue '12 for abstract

Hannah Miller '14 and Alana Plaus '12

Claudia Aburto Guzmán, Spanish

The Familial Immigrant Experience along the U.S.-Mexico Border

The migration between Central America, Mexico, and the United States is a process filled with obstacles. The difficulties that migrants face are based on differences of nationality, gender, ethnic origin, and socioeconomic status, among others. While these obstacles are unique to individual situations, commonalities exist. The motivations for immigration, problems faced, utilization of resources like coyotes, and legal processes post-migration differ for women, men, and children. The differences particularly for women and children result from physicality, connections to the country of origin, the people they leave behind, financial resources and expectations, and social perceptions of distinct demographics. Acknowledging these discrepancies in border crossing, this presentation analyzes the ways in which the motivation, the experience, and the social and legal aftermath are unique for mothers and children. This study uncovers the politics behind additional hardships faced by this demographic on the US-Mexico border.

Peter Miller '12

J. Dykstra Eusden, Geology, and Beverly Johnson, Geology
Shortridge Symposium: Geology in Bates' Backyard -- see Colin Barry '12 for abstract

Lesley Mo '12

Rachel Austin, Chemistry

The Effects of Oxidative Stress on Metallothioneins

Metallothioneins are small, cysteine-rich proteins that lack aromatic groups. They are found in a variety of organisms including mammals, plants, fungi, and microorganisms. They are believed to have antioxidant properties and play a role in heavy metal detoxification, radical scavenging, and metal ion homeostasis. In mammals, metallothioneins are found bound to zinc under normal physiological conditions. Although metallothioneins bind zinc with a high thermodynamic stability, they are able to undergo fast ligand exchange reactions, allowing zinc to be bound or released quickly. In the presence of excess toxic metals or under conditions of oxidative stress, zinc can be displaced by other metals because it has a lower binding affinity to metallothionein; this property makes metallothionein useful for metal detoxification, making toxic metals such as lead and cadmium more likely to be chelated.

Heather Monty '14

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

The War on Oil: Why Women in the Niger Delta Were Willing to Bare All for Justice -- see Molly Brown '15 for abstract**James Moody '12**

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

Y'en a Marre (Enough is Enough): The African Spring in Senegal -- see Thomas Baroni for abstract**Olivia Moody '12**

Nancy Kleckner, Biology

Stimulatory Effects of Small Cardioactive Peptide B (SCPb) on the Third Phase of Feeding in Helisoma

In the pond snail, *Helisoma trivolvis*, a triphasic feeding system is controlled by the buccal ganglia in the brain. This pattern normally fires in the order S1-S2-S3, which corresponds to the protraction of a tongue-like radula, retraction of the radula, and

hyperretraction of the radula. Small cardioactive peptide B (SCP_B) is a neuropeptide thought to modulate the third phase (S3) of feeding, mimicking the excitatory effects on S3 that are sometimes observed with serotonin (Murphy, Lukowiak & Stell, 1985). Using standard intracellular recording, I am looking at B19 (an S3 motor neuron) and comparing the effects of applying SCP_B (1µM) and serotonin (1-3µM). Preliminary results indicate that SCP_B stimulates firing during phase 3 and speeds up the rhythm of B19, while often simultaneously hyperpolarizing the cell's baseline membrane potential. Serotonin also increased the frequency of action potential firing and the rhythm in B19 but B19 occasionally displayed a slightly depolarized baseline membrane potential. This suggests that SCP_B may stimulate firing by a mechanism different than that by which serotonin stimulates firing. Understanding the role of neuropeptides in this feeding circuit allows us to better understand how a single neuronal circuit can produce a variety of behaviors through chemical modulation.

Brooke Morse-Karzen '12

Rebecca Fraser-Thill, Psychology

The Influence of Attributional Style on Symptom Expression

Previous research has proposed a variety of factors that account for somatization, the translation of psychological distress into physical symptoms. This study investigates the role of bias against mental illness and attributional style as predictors of somatic symptoms. A sample of college students was given an explicit test assessing bias against mental illness, a scale measuring somatic symptoms, and a scale assessing their attributional style as either external and organic or internal and psychological. These were analyzed using a 2 (attitude toward mental illness: positive or negative) x 2 (attribution style: somatic or psychological) ANOVA on degree of somatic symptomatology. It is predicted that participants with greater biases against mental illness and external, organic attribution styles will show higher levels of somatic symptoms, and that participants showing greater bias against mental illness will tend to have an external, organic attribution style.

Shauna Mulvihill '12

Lynne Lewis, Economics

Show Me the Money: Drivers of Container Recycling

This study explores the drivers of container recycling in an effort to determine whether economic incentives are the only efficient motivator in encouraging high rates of recycling. This study uses new data based on survey work completed during the months of October and November 2011 to analyze different factors that affect everyday recycling practices. Survey work examined behaviors of attendees to bottle redemption centers in the cities of Lewiston and Auburn, Maine. Additionally, this study seeks to understand the differing motives of individuals who recycle at bottle redemption centers in order to analyze the deposit-return system as an overall policy.

Sangita Murali '12

Nancy Koven, Psychology

Relationship between White Matter Brain Changes in Five Parcellated Regions of the Corpus Callosum, Cognitive Performance, and Vitamin D Blood Serum Levels in Patients with Multiple Sclerosis

The positive immunomodulatory effects of dietary supplements like vitamin D suggest a possible therapeutic role of this vitamin for autoimmune and neurodegenerative disorders like multiple sclerosis (MS). While genetic factors account partially for MS

susceptibility, environmental factors also play a role in disease etiology, as evidenced by reduced incidence as dietary supplements of vitamin D and exposure to sunlight increase. Since it is believed that vitamin D is neuroprotective, the focus of the present study is to investigate the relationship between white matter brain changes in the corpus callosum (CC), cognitive performance, and vitamin D serum levels in individuals with MS. Because little information exists on the precise locality of CC degeneration in MS, the present study parcellates the CC into five distinct midsagittal segments in order to determine a more specific locus of white matter change as a function of vitamin D level. Analysis of brain and behavior correlates of vitamin D levels in afflicted patients is critical to assess the utility of vitamin D as a neurocognitive enhancing agent.

Megan Murphy '13

Sawyer Sylvester, Sociology

Prenatal Substance Exposure and Social Policy

Prenatal exposure, especially to alcohol, tobacco, marijuana, cocaine, and other opiates is an incredibly prevalent social issue in the United States, but it is only since the late 1980s that the issue has entered into the public sphere. Both scientific research and government policies considering prenatal exposure have made vast improvements in both understanding and addressing the issue since the 1980s, however both fields still have a ways to go. Scientific studies observing the effects of drugs on fetuses have significant threats to the validity of their conclusions, mostly attributed to the nature of drug addicts of subjects, and the laws from state to state are not consistent. In this presentation I outline the generally accepted effects that drug and alcohol exposure has on a fetus, and examine the ways in which social policy has developed to address the issue and address possible policy improvements that might be implemented.

Desmond Mushi '13

The Causes of Famine in the Context of Africa

In 1981, writing about the great famines of the last century, Nobel laureate Amartya Sen noted that droughts are natural phenomena, but famines are manmade. In Africa, more die of hunger than from HIV/AIDS and malaria combined. Additionally, the impending global food crisis and the events that occurred in the Horn of Africa last year threatens to make things worse. This presentation uses a political-economy approach to understand the dynamics of the causes and impacts of famine. The presentation touches on the role of domestic and international political factors, including powerlessness of famine-affected groups, and the role of U.S. and E.U. subsidies.

Swe-Htet Naing '12 and Saba Parvez '12

Rachel Austin, Chemistry

Purification of ω -alkane Hydroxylase (AlkB) from *Alcanivorax borkumensis* and Probing Its Mechanism of Action

Natural oil seeps and anthropogenic oil spills constantly pollute the marine environment. Since the alkanes present in the oil cannot be broken down by most organisms, they pose a great threat to the marine plants and wildlife. However, some bacteria have evolved to use the alkanes in the environment as energy source using enzymes that are capable of oxidizing the C-H bonds in alkanes. Understanding the structure of these enzymes and the mechanism of their action will be useful in environmental bioremediation. ω -alkane hydroxylase (AlkB), an

enzyme found in some soil and marine bacteria, is shown to be the primary site for the oxidation reaction. Our goal for this thesis is to purify the enzyme from *Alcanivorax borkumensis*, one of the predominant bacteria in oil spills, and characterize it using X-ray crystallography. We will also do some mechanistic study to understand the mechanism of the catalysis reaction.

Caroline Neville '12

John Kelsey, Psychology

The β -lactam Antibiotic Ceftriaxone as a Treatment for the Symptoms of Parkinson's Disease and L-DOPA-Induced Dyskinesia in 6-OHDA-Lesioned Rats

Parkinson's disease (PD) is a progressive neurodegenerative disorder caused by the loss of dopamine (DA) neurons. The most effective treatment is DA replacement therapy using the DA precursor L-DOPA, which can often result in L-DOPA-induced dyskinesia (LID). Animal studies in hemi-parkinsonian rats have shown NMDA receptor antagonists to be effective in treating both PD symptoms and LID, however the cognitive side effects prevent these drugs from passing clinical trials. Upregulation of GLT-1, the primary glutamate transporter that removes glutamate from the synapse, could be an alternative to direct receptor antagonism. The β -lactam antibiotic ceftriaxone has been shown to substantially increase GLT-1 protein expression and activity without side effects. I have determined that 100 mg/kg ceftriaxone causes a long term increase forepaw stepping, a common measure of bradykinesia, in hemi-parkinsonian rats alone and in combination with L-DOPA. Next I will establish a dose-response curve for ceftriaxone on forepaw stepping and determine if ceftriaxone will decrease abnormal involuntary movements (AIMs), used to measure LID, in hemi-parkinsonian rats made dyskinetic with repeated injections of LDOPA.

Giang Nguyen '12

Ryan Bavis, Biology

Effect of Chronic Hyperoxia on Metabolism of Neonatal Rats

In previous research, neonatal rats reared in high oxygen gas (hyperoxia, 60% O₂) were found to have lower oxygen consumption while breathing normal air (normoxia, 21% O₂). However, there was no difference in growth between the hyperoxia and control group, where rats were reared in normoxia. This suggests that despite their lower oxygen consumption in normoxia, hyperoxia-treated rats can supply the required amount of oxygen in hyperoxia. In order to test this hypothesis, oxygen consumption is measured and compared between a group of 4-to-5-day-old rats reared in hyperoxia and a control group, each breathing normoxia and hyperoxia consecutively. This research may provide insight into potential side effects of O₂ therapy in newborn infants.

Jessica Nichols '15

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

Turning Soldiers into Children: Reintegration & Renewal of Child Soldiers in Post-War Sierra Leone -- see Brenna

Callahan '15 for abstract

Karen Nicoletti '12

Robert Farnsworth, English

Pipe Scheme: A Creative Thesis Reading -- see Alison Cornforth '12 for abstract

Patricia Noto '12

Jane Costlow, Environmental Studies

A Proposal for an Educational Student Farm at Bates College

This poster focuses on the proposal aspect of my environmental studies thesis, which studies college and university farms in the United States. My thesis looks at the elements of existing student farms through a series of case studies that describe farms at schools ranging from Bowdoin College to Michigan State University. After examining how these farms function, I have put together a proposal for how Bates could feasibly incorporate an educational student farm on or near campus. I will present this proposal, along with some of the findings from my case studies, on my Mount David Summit poster.

Lucy O'Keefe '12

John Kelsey, Psychology

The Effect of a Selective GABA_A α 5 Inverse Agonist on Symptoms of PCP-Induced Schizophrenia

The underlying neurophysiology of schizophrenia is still widely unknown. Research has shown the relevance of excess dopamine transmission through the effectiveness of typical antipsychotics, which blocks dopamine D₂ receptors. However, these drugs only treat the positive symptoms. Recent research has implicated the potential relevance of the GABA_A α 5 receptor in regulating dopamine levels and positive-like symptoms of schizophrenia. This study will explore the effects of a GABA_A α 5 inverse agonist, MRK-016, on PCP-induced schizophrenia-like symptoms in rats. In a hole board apparatus, acute injections, of PCP increases locomotion, a putative positive symptom, while decreasing head dipping into the holes, a putative negative symptom. I expect that injections of MRK-016 will increase both PCP-induced symptoms of schizophrenia compared to PCP alone.

Connor Pacala '12

Todd Kahan, Psychology

Counting the Bars: An Analysis of Two Competing Theories for Grouping in the Standing Wave Illusion

The standing wave illusion occurs when two frames are alternated rapidly, one with a central bar and another with two flanking bars, which results in participants not perceiving the central bar. Enns (2002) hypothesized that objects grouped with the flanking bars dominated perception. However, his experiments contained a confound: specifically, the groups containing the flanking bars also had a larger number of bars. This study investigates whether the bars that group with the outermost bars dominate perception in the standing wave illusion, or if the bars that group with the greater number of bars dominate perception. Participants took part in a computer-based experiment. The results and implications for theories of the standing wave illusion are discussed.

Tessa Pals '12

Jennifer Koviach-Côté, Chemistry

Synthesis of Ashitabaol A

Ashitabaol A was recently isolated from the *Angelica keiskei*, a plant native to Japan. Ashitabaol A was proven to exhibit anti-oxidative properties. As this is a pharmaceutically valuable property, it is of great interest to make ashitabaol A synthetically. To date, synthetic pathways using Wittig chemistry, Diels-Alder chemistry, and enolate alkylations have been explored. The Wittig and Diels-Alder reactions proved challenging due to the harsh, complex conditions required. At

this point in the research, the alkylation is the focus and direction in which the synthesis is moving.

Saba Parvez '12

Rachel Austin, Chemistry

Purification of ω -alkane Hydroxylase (AlkB) from *Alcanivorax borkumensis* and Probing Its Mechanism of Action* –see Swe-Htet Naing '12 for abstract*Michael Pasek '12**

Michael Sargent, Psychology

In Defense of Israel: How Social Context Affects Jewish Americans' Moral Reasoning

The American Jewish community is liberal, yet some contend that American Jews become more conservative when thinking about the defense of Israel. Recent research suggests that conservatives base their moral judgments on the foundations of fairness, minimizing harm, in-group favoritism, respect for authority, and purity. By contrast, liberals largely base moral judgments on just two foundations: fairness and harm-minimization. This thesis investigates the extent to which thinking about Israel alters the moral reasoning of Jews, compared to non-Jews. If thinking about Israel makes American Jews more conservative, Jews should also alter moral judgment in ways consistent with conservatives. To test this hypothesis, a series of studies primed Jews and non-Jews to think about Israel or a different location, and measured the accessibility and relevance of moral foundation categories. Data analysis will indicate whether priming Jews (but only Jews) to think about Israel produced conservative shifts along moral foundations.

Addie Pelletier '12

Helen Boucher, Psychology

The Effect of Relational-Self-Concept Confusion on Worldview Defense

Research indicates that threats to other systems of meaning produce similar worldview defense effects to those of mortality salience in terror management theory (e.g., Heine, Proulx, & Vohs, 2006). Relational self-construals provide individuals with stability and meaning in life by situating the self-concept in relation to significant others (e.g., Chen, Boucher, & Tapias, 2006). The link between relational self-construal and meaningfulness suggests that threats to relational self-concepts will produce worldview defense, especially for those who define themselves in terms of their relationships. Participants (undergraduate students from Bates College) completed measures of self-esteem and relational-interdependent self-construal (RISC, designed to examine the importance of relationships for self-definition; Cross, Bacon, & Morris, 2000), before describing one of their relational selves. The relational self-concept confusion group later indicated three instances where they acted unlike their reported relational self-concept, and the control group described three instances where they acted in concordance with previously reported characteristics. After reading a pro-Bates and an anti-Bates essay, designed to bolster or threaten their worldview, participants rated the authors of the essays. Evidence compiled from previous research suggests that individuals with relational self-concept confusion will rate the pro-Bates essay author more positively and the anti-Bates essay author more negatively than will those in the control group, and this effect will be magnified among participants who score relatively high on the RISC scale.

Shachi Phene '12

Michael Sargent, Psychology

The Effect of Mortality Salience and Psychological Distance on Charitable Donations

Why do people donate to charity? Research suggests that there are numerous factors behind people's decisions to contribute to charitable organizations. Terror management theory proposes that when humans are made aware of their own mortality, they deal with the paralyzing terror that ensues by upholding their cultural worldviews and bolstering their own self-esteem through methods such as contributing to charity. Meanwhile, construal level theory explains that the way in which people think about things depends on how they are construed that is, if they are framed as abstract or as concrete to the individual. Whether something is abstract or concrete to a person describes how psychologically distant that thing is to the person. This psychological distance can be measured in a number of ways including physical distance, familiarity, and temporal distance, the latter of which is looked at in this study. The idea is that an event in the near future is considered 'concrete' while an event in the far future is considered more "abstract." The purpose of this study is to find out whether there is an interaction between mortality salience and abstraction in their effects on charitable contributions. If the results are significant, they could provide useful insight to nonprofit organizations on how best to garner contributions from potential donors.

Alana Plaus '12

Claudia Aburto Guzmán, Spanish

The Familial Immigrant Experience Along the U.S.-Mexico Border --see Hannah Miller '14 for abstract**Politics 312**

Áslaug Ásgeirsdóttir, Politics

The Challenges of Ocean Governance

In this presentation, students in the international politics course, *Ocean Governance: Local, National, and International Challenges*, will discuss about the challenges of balancing the multiple uses of the oceans to ensure their future health. Topics range the impact of the world of sushi and challenges in governance to ocean trivia. For a list of participating students, please see the 2012 Summit program.

Matthew Record '14

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

Ghana's Young Voices: an Investigation into Child Trafficking -- see Jordan Lupo '13 for abstract**Daniela Reichelstein '12**

Senem Aslan, Politics

Maids in the Middle East: The Story Behind Jordan's Unprecedented Labor Law Reforms

There is an international consensus that domestic migrant workers in the Arab League States are frequently subjected to exploitation and abuse at the hands of employers and recruiting agency officials. Although the introduction of protections for domestic helpers, primarily in the form of employment contracts, is progressing at the state level in Arab countries, cases of exploitation occur frequently. This is due to gaps in national labor laws and visa systems that create a situation of uneven bargaining power in favor of employers and recruitment agents. In 2008, Jordan became the first country out of the circle of Arab League States to introduce concrete legal protections for its relatively large population of migrant domestic servants. This

paper examines the factors that induced Jordan in particular to make the most progress in the region towards protecting the rights of its migrant domestic workers. This study finds that deteriorating economic conditions that heightened Jordan's dependence on foreign aid, in addition to external pressures concerning the threat of U.S. human trafficking sanctions, pressured Jordan to reform its Labor Law to include domestic servants.

Isaiah Rice '15

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

Turning Soldiers into Children: Reintegration & Renewal of Child Soldiers in Post-War Sierra Leone -- see Brenna Callahan '15 for abstract**Vanessa Robinson '12**

Stephanie Richards, Biology

An siRNA Investigation on Sos Regulation in NRas Mutant Melanoma

The purpose of this thesis was to use siRNA as a biochemical tool to study the cellular response by NRas-mutant melanoma when specific tumor-promoting machinery is disabled. The siRNA treatments specifically targeted NRas and Sos because their interaction is a focus of the investigation. NRas and Sos protein levels are a function of the rate of gene expression. Gene silencing experiments were qualitatively measured by western blots, which show the impact on the final protein products. NRas and Sos are highly coordinated molecules, and their spatiotemporal interaction is integral for tumorigenesis and tumor maintenance. The knock-down of this tumor-promoting machinery was examined according to its effect on the other Ras isoforms and the downstream effectors within the MAPK and PI3K pathways.

Monica Rodriguez '12

Xing Fan, Asian Studies

Examining Creative Censorship in Beijing's 798 Art District

My thesis concerns the relationship between contemporary art and Chinese politics, a topic which is also addressed in the documentary film, *Project 798*, by German filmmaker Lucius C. Kuert. I discuss my field research in Beijing, where I interviewed eight artists, some of whom were profiled in the film. We discussed their reaction to censorship in this arts district. I will show clips from the film as part of my presentation.

Lydia Rubenstein '15, Rebecca Salzman-Fiske '14, Cody Tracey '15, and Hamilton Wood '15

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

Somali Piracy: A Response to Environmental Injustice

In 1991, the Somali government collapsed. In the wake of the ensuing instability, European ships began dumping waste off of the coast of Somalia. When, to protect their waters, Somali fishermen rebelled against this injustice, Western media depicted them as "sea bandits." On the subject of Somali piracy, we present a portrait distanced from that of Western media. Grassroots organizations as well as African media sources present a more accurate portrayal of such environmental justice issues as the dumping of nuclear waste. We discuss how social and political forces veil and manipulate the true issues that fuel piracy on the Gulf of Aden and the Indian Ocean.

Samuel Schleipman '12

John Cole, History

Hunting Practices of the Maasai

For one month during my semester abroad, I lived in Engare Sero, a rural Maasai village in northern Tanzania. Engare Sero is a four-hour drive to the nearest town. It lacks electricity, running water, cellular coverage, and paved roads. While there, I studied traditional hunting practices. With the help of a translator, I conducted 100 interviews with village elders and Morani warriors about their hunting techniques and the meaning of hunting in the local culture. I found that while hunting is on the wane, it is still undertaken to eradicate vermin, defend cattle and homes, and to win honor. This aspect is particularly important as there are still two ceremonial lion hunts each year, and 75% of my interview subjects had participated in one of these hunts.

Michelle Schloss '12

Robert Farnsworth, English

Pipe Scheme: A Creative Thesis Reading -- see Alison Cornforth '12 for abstract

Andrew Scichilone '12

Donald Dearborn, Biology

Comparative Analysis of Genetic Variation within Single Populations of *Ambystoma maculatum*, *Ambystoma jeffersonianum*, and *Rana sylvatica* Found in an Isolated Vernal Pool

This project is to compare genetic variation between three species commonly found in vernal pools in Pennsylvania (Spotted salamander, Jefferson salamander, Wood frog). Tissue samples of specific organisms were taken, the DNA isolated, and a microsatellite analysis used to determine the amount of genetic variation. The results of the microsatellite analysis will be compared to the mobility of the three species.

Philip Scott '12

Todd Kahan, Psychology

Holistic Processing of Words

Researchers have examined the holistic processing of faces for over 30 years, and more recently theories of holistic processing have been discovered to apply to other objects and also to words. The study of the perception of words has been a topic of controversy though. While some research suggests that words are processed based on the extraction of features using letter-to-sound conversion rules, other studies indicate that words may be processed more holistically. For example, Wong and Bukach (2011) designed a composite task to examine if words are processed holistically. Their results soundly support the conclusion that words are processed holistically; however, one result remained unclear. The researchers found larger congruency effects for words of low frequency than high (i.e., greater levels of holistic processing for low- relative to high-frequency words). This result, if correct, would indicate a processing system different from that of objects where familiar objects are more likely to be processed holistically. However, the authors dismissed this result as likely occurring because of extraneous variables. This study examined the holistic processing of high- and low-frequency words while controlling extraneous variables (e.g., bigram frequency, orthographic neighborhood density, phonological neighborhood density, number of phonemes, and number of syllables). Implications of the results for theories of word processing are discussed.

Rina Senbonmatsu '12

Nancy Koven, Psychology

A Neuropsychological Evaluation of Orthorexia Nervosa

Originally conceptualized by Steve Bratman (2000), orthorexia nervosa (ON) describes a fixation to eat healthy food and an obsession for proper nutrition, which in turn leads to extreme dietary restrictions. Eventually this restrictive eating style omits valuable food groups, such that nutritional deficiencies may occur over time. There is a lack of consensus in whether ON is a subtype of anorexia nervosa (AN), or obsessive-compulsive disorder (OCD), or a truly unique category. Given the known cognitive sequelae associated with AN and OCD, the purpose of this study is to determine whether individuals with ON present with a unique neuropsychological profile or one that approximates that of AN and/or OCD. Participants have completed self-report questionnaires about ON, AN, and OCD and have subsequently completed neuropsychological tests chosen for their sensitivity to AN and OCD: Behavior Rating Inventory of Executive Functioning Adult version, the Reading subtest of the Wide Range Achievement Test Fourth Edition, the Wisconsin Card Sorting Test, the California Verbal Learning Test, Second Edition (CVLT-II), the Color-Word Interference Test, the Trail Making Test, and the Verbal Fluency and Design Fluency Tests. Self-report measures are used to determine rates of comorbidity among symptoms.

Cameron Sheldon '13

Francisca López, Spanish

Los Olvidados de Dios: The Rights of Prisoners, the Politics of Protest, and the Realization of Justice in Bolivian Prisons

The oral presentation based on my independent academic study and field work explores the contemporary situation of human rights in Bolivian prisons. It begins with an introduction to the problem, stemming from the insufficient means provided by the Plurinational State of Bolivia to bear the expense of nourishment and other basic services. The presentation then illuminates the national and international norms that protect the human rights of prisoners and offer a comprehensive discussion as to the complexities of present conflict including the critical degree of overpopulation, illicit gang activity and the U.S. war on drugs. The talk addresses the politics of protest and how the prisoners' plight has radicalized, throwing light on key stakeholders and their perspectives (i.e. prisoners, offices of government, the United States, and NGOs). Finally, it proposes and provokes ideas related to improving the penitentiary system and ensuring lasting change.

Charlotte Simpson '12

Robert Farnsworth, English

Pipe Scheme: A Creative Thesis Reading -- see Alison Cornforth '12 for abstract

Haley Sive '12

J. Dykstra Eusden, Geology, and Beverly Johnson, Geology
Shorridge Symposium: Geology in Bates' Backyard -- see Colin Barry '12 for abstract

Christopher Speers '12

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

The War on Oil: Why Women in the Niger Delta Were Willing to Bare All for Justice -- see Molly Brown '15 for abstract

Elizabeth Sonshine '12

Beverly Johnson, Geology

Characterizing Organic Carbon in Sedimentary Cores from *Zostera marina* beds, Maquoit Bay, Gulf of Maine

Seagrass beds are important ecosystems in nearshore environments. They provide nutrients and habitat for commercially important fish species, buffer against storm erosion, and are effective at sequestering carbon. Globally, seagrass beds are in a general state of decline due to human activities such as pollution, climate change, and dredging in the nearshore zone. Little is known about natural fluctuations in seagrass distribution through geologic time because long and unequivocal records of paleo-seagrass have yet to be produced. The purpose of this study is to use organic geochemical techniques (lipid biomarker concentrations and isotope composition) to determine if seagrass organic matter can be detected in sediment cores from Maquoit Bay, Casco Bay, ME. Maquoit Bay has extensive beds of the seagrass *Zostera marina* (hereafter referred to as eelgrass) and is located off of Casco Bay in the Gulf of Maine. Seven sediment cores (ranging between 20-50 cm in depth) were taken from Maquoit Bay using a Livingstone corer. These cores were subsampled for organic geochemistry (bulk and higher plant leaf wax lipid carbon isotope composition), lead-210 chronology, and grain size determinations. Within all of the analyzed cores, the $\delta^{13}\text{C}$ of the bulk sediments ranged from -17‰ at the coretop to -22‰ deeper in the core. Given the multiple sources of carbon with varying $\delta^{13}\text{C}$ values in the system, it is impossible to determine, with certainty, the degree to which eelgrass contributes to the total organic pool. Preliminary analysis of the lipid biomarker data indicates that eelgrass does contain some higher plant leaf wax lipids (C_{24} , C_{26} , C_{28} fatty acids), as do the sediments in the core. Isotopic analyses of the higher plant leaf wax lipids are currently underway and may provide an important proxy for eelgrass in other nearshore environments.

Saya Srisamart '12

William Ambrose, Biology

Seasonality of Drinking Place Brook Site, Vinalhaven, ME, Based on Margin Analysis of Archaeological Tomcod Otoliths

Evaluation of site seasonality is an integral part of archaeological research. The aim of my study was to determine seasonality of occupation of Drinking Place Brook, an 840-year-old site on Vinalhaven, ME, using archaeological tomcod otoliths. This was done through otolith margin analysis, which was based on the assumption that growth ring type (opaque or translucent) at the otolith margin can be used as an indicator of season of capture. In addition, midden otoliths were compared to modern otoliths of winter-caught fish from St. Anne River, Quebec, to examine the characteristics of annual zone formation. The margins of 33 out of 44 midden otoliths yielded a summer estimate for season of capture. While the seasonal results could extend to fall due to a possible delay in growth ring formation, they disagreed with local archaeologists' initial assumption that Drinking Place Brook was used as a winter fishing site.

Steven Staffa '15 and Catherine Tuttle '13

Hiroya Miura, Music

Clarinet Duet

For our presentation, we will play a short clarinet duet, Duet in C major, by Franz Wilhelm Ferling (1796-1887).

Hope Staneski '12

Francisca López, Spanish

Indignaos: The Spanish Protests in Context

In May 2011, thousands of Spanish youth took to the streets to demonstrate their discontent with the Spanish political and financial systems. Globally, the ongoing protest, beginning after the revolutions of the Arab Spring and before the Occupy movement in the United States, is just one example of social unrest that the world saw in 2011. In a more local context, the protest shows the continued growth of a country that transitioned from dictatorship to democracy only a generation ago. Spanish intellectuals, many of whom were instrumental in Spain's transition to democracy, have emphasized the importance of the protest and encouraged the Spanish youth to grow the movement. In analyzing the movement, I look specifically at the interaction between Spain's protesting youth and the vocal Spanish intellectuals in order to gain a perspective that includes both present and historical contexts.

Emma Stevens-Smith '12

Stephanie Richards, Biology

Identification of Ribosomal S6 Kinase 2 (RSK2) Nuclear Localization Sequence

RSK 2 is a member of highly conserved serine threonine kinases involved in a variety of cellular processes such as cell growth, proliferation, and survival. The RSK family are downstream effectors of the Ras-mitogen activated protein kinase (MAPK) pathway and inappropriate regulation of this signaling network has been implicated in numerous human diseases and disorders, including a variety of human cancers. Activation of the Ras-MAPK pathway and subsequent activation of RSK 2, results in RSK translocating to the nucleus, where it can phosphorylate a diverse collection of nuclear substrates. The mechanism, including the nuclear localization sequence (NLS), describing RSK 2s movement into the nucleus remains elusive. Potential NLSs were mutated, amplified using site directed mutagenesis, fused with Green Fluorescent Protein (GFP) and transfected into HEK293T. Results were visualized using inverted fluorescence microscopy techniques and indicated important localization sequences in amino acid regions 455-458 and 507-512.

Kate Stillman '12

Todd Kahan, Psychology

The Immediate Effects of Vinyasa-Style Yoga on Attention

The physical benefits of yoga as well as its ability to reduce anxiety have been well-documented in psychological research. Studies have also been conducted looking at the short- and long-term improvements in attention provided by meditation and breathing practices, which bear some similarity to the practice of yoga. In addition, research has shown that yoga may be a viable intervention, in conjunction with medication, for children with Attentional Deficit and Hyperactive Disorder (ADHD). However, there are few studies examining the immediate effects of yoga upon attention. Prior studies have tended to focus on the long-term effect or the effects of several yoga sessions. The current study seeks to determine if one hour-long vinyasa yoga session, involving moving through a variety of poses, has an immediate impact upon experienced and inexperienced yoga practitioners relative to controls.

Angela Su '12

Rachel Austin, Chemistry

Lead Interactions with Metallothionein-3

Metallothioneins (MT) are cysteine-rich, low-weight, metal-binding proteins. Since MTs have been shown to play a role in heavy metal toxicity, we conducted experiments to monitor the interactions between Pb(II) and MT-1 and MT-3, specifically lead binding affinities and displacement of bound metals. Mouse Zn7MT-3 and Zn7MT-1 were purified. Protein and metal concentrations were confirmed using inductively coupled plasma-optical emission spectrometry (ICP-OES). Pb(II) displacement of Zn(II) was followed using UV-spectroscopy. Pb(II) was shown to bind to both MT-1 and MT-3. Efforts to quantify the binding affinity are underway.

Daniel Sunderland '12

Meredith Greer, Mathematics

Applying Mathematics to Biology -- see Shaina Deutsch '12 for abstract

Emily Tato '12

Meredith Greer, Mathematics

Applying Mathematics to Biology -- see Shaina Deutsch '12 for abstract

Olivia Tawa '12

Karen Palin, Biology

Iron-Deficiency Anemia in Pregnant Somali Women: Addressing Deficiencies through Education

Iron-deficiency and anemia are critical issues among pregnant Somali women in Lewiston and Auburn, ME, and must be addressed to decrease negative birth outcomes. Somali women often lack information about healthy diet and nutrient supplementation during pregnancy because they are uncomfortable attending the prenatal education classes that address these topics. In this study I collaborated with community partners including the Women, Infants, and Children Program and St. Mary's Hospital to collect data on diet and anemia and to increase understanding about this nutritional problem through education. Knowledge about iron-deficiency anemia, its causes, and other prenatal health concerns was gathered through conversation groups. During home visits, women's iron intake through diet and supplementation was assessed through a nutritional survey and a survey of food in the homes. This data was used to determine content for hands on workshops to teach about the importance of eating iron-rich foods during pregnancy. Through this study, I hope to increase understanding about the importance of women's everyday diets and thus improve the overall health within our local community.

Katherine Thorn '12

T. Glen Lawson, Chemistry

Site-Directed Mutagenesis of EMCV 3C Protease: The Role of the Ubiquitin Proteasome System in Picornavirus Replication

Picornaviruses rely heavily on the viral 3C protease (3C^{pro}) to facilitate replication. It has been observed, however, that 3C^{pro} is rapidly degraded by the host ubiquitin-proteasome system (UPS) *in vivo* and that accumulation of 3C^{pro} due to a dysfunctional UPS leads to early-onset cytopathic effects in infected mouse cells. Using the encephalomyocarditis virus (EMCV) 3C^{pro} as a model substrate, we aim to determine the extent to which picornaviral replication depends on the host UPS. We hypothesize that accumulation of 3C^{pro} interferes with the delicate balance of genome replication and viral particle

synthesis. To evaluate the consequences of 3C^{pro} accumulation in the host cell, mimicking a dysfunctional UPS, without disturbing other cellular processes that involve components of the UPS, we have worked toward generating two catalytically inactive 3C^{pro} clones. One of these is resistant to UPS-facilitated degradation. These proteins will be used to transfect mouse fibroblast cells in the absence and presence of EMCV infection, for the purpose of evaluating the effects of elevated 3C^{pro} concentration on virus replication success.

Translation Scholars**Beyond Translation: Processes and Challenges of Writing Poetry in Translation**

Students of English, French, German, Russian, and Spanish language and literature present and discuss the collaborative process that culminated in the *Beyond Translation* project, in which students in a poetry workshop class created works that were collaboratively translated by students in different foreign language classes. This panel not only presents some of the poems and translations, but also explores, in a roundtable discussion, the process and linguistic challenges both poets and translators experienced. How does witnessing and assisting in the translation process sharpen awareness of the poets' language as a medium of expression? How do translators negotiate the creative act of translation while preserving the poets' original voice? How does a poem's meaning and spirit get preserved across languages? For a list of participating students, please see the 2012 Summit program.

Hillary Throckmorton '15

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

African Perspectives on White Saviors in Cinema -- see Ryan Katon '12 for abstract

Vanessa Truglio '12

Krista Aronson, Psychology

The Effect of a Teacher-led Extended-Contact Intervention on Prejudice Reduction in Elementary School Children

According to extended-contact literature, the mere knowledge that other members of one's ingroup have outgroup acquaintances may be sufficient to reduce prejudice. Prejudice reduction interventions have successfully utilized extended contact among children in school environments. However, all such interventions have been conducted by researchers or students foreign to the classroom setting. The current study examines whether the same positive changes in intergroup attitudes emerge if teachers implement a storybook intervention. Two first-grade, two second-grade, and one mixed first-/second-grade classrooms (100 participants) were assessed on various measures associated with prejudice after reading and discussion of extended contact storybooks by teachers for six consecutive weeks. Information was also solicited from teachers about their experiences leading the intervention through informal focus groups. Implications of these findings serve to better understand and adapt a storybook intervention as a self-administered, school-based tool to improve intergroup relations in racially and ethnically diverse academic environments.

Catherine Tuttle '13

Hiroya Miura, Music

Clarinet Duet -- see Steven Staffa '15 for abstract

Alix Vandeventer '12

Karen Palin, Biology

Gestational Diabetes Mellitus in Pregnant Somali Women: Addressing the Problem

Gestational diabetes mellitus (GDM), glucose intolerance first detected during pregnancy, is a public health concern worldwide and affects pregnant immigrant Somali women in Lewiston and Auburn. Discussions with health care providers indicate that this may be due to changes in diet and exercise with new lifestyles. GDM creates adverse effects for both the mother and the fetus that may be life-threatening. My project is part of collaborative work focusing on local Somali women's knowledge and understanding of factors affecting prenatal health. My research investigates the knowledge about GDM, diet, and exercise among Somali women using conversation groups, home visits, and questionnaires. Working with community partners, I am conducting educational workshops about GDM and its prevention by means of nutrition and exercise. The effect of the workshops can be measured by asking women what they learned and, over time, by seeing if rates of GDM differ for women who attended the workshop.

MacKenzie Vile '12

Helen Boucher, Psychology

A Cross-Cultural Belief in Emotional Residue

The current study seeks to explore the dimensions of the belief in emotional residue and the application of the property transmission heuristic to that belief across the Japanese and American cultures. Previous research has given evidence supporting the hypothesis that belief in emotional residue exists cross-culturally, and that people treat emotional residue as an entity that can affect a person's emotional state. By comparing Japanese and American participants this study seeks to corroborate recent research as well as to expand upon earlier findings. Particularly the current research attempts to discern the effects of time from the emotional event on belief in emotional residue and its effect on subsequent individuals who come into contact with that residue.

Kathleen Walker '12

Nancy Koven, Psychology

The Effect of Childhood Adversity on Memory Function

Early life stressors can have a significant impact on brain development in childhood and, consequently, on cognitive function in adulthood. Periods of prolonged stress lead to hyperactivation of the HPA-axis, which can have detrimental effects on the integrity of hippocampal structure and function. The purpose of this study is to provide retrospective assessment of the nature, frequency, and severity of childhood adversity and the long-term and working memory domains affected in early adulthood. Childhood adversity is assessed using two measures, the short-form Childhood Trauma Questionnaire and the Holmes and Rahe stress scale for non-adults. Memory function is measured using subtests of the Wechsler Memory Scale, Third Edition. Given what is known about childhood stress and hippocampal development in childhood, it is hypothesized that young adults who have endured greater childhood stress, independent of the nature of the stressors, will show greater difficulty in long-term memory compared to young adults without a background of childhood adversity. Results of this study will be analyzed using a series of multiple regressions with subscales of the CTQ as independent variables and the WMS-III scores as dependent variables. Pending results of this study, a follow-up study is proposed in which participants will

be categorized into two groups based on the best predictor of memory function from the first study (those with highest and lowest reported childhood adversity). Participants in this second study will be given two additional neuropsychological tests of long-term memory ability, one assessing verbal long-term memory (California Verbal Learning Test, Second Edition) and the other assessing visual long-term memory (Rey Complex Figure Test). These tests provide a means to examine differences in encoding strategies across subjects. Results will be analyzed for both tests using multivariate analyses of variance to determine if there are encoding differences across trauma groups.

Shannon Walsh '12

T. Glen Lawson, Chemistry

Purification of Ubiquitin-Protein Ligases that Recognize Picornaviral 3C Protease

3C proteases are synthesized by picornaviruses, including encephalomyocarditis virus (EMCV) and hepatitis A virus (HAV). They are required for mature viral protein production, and their concentrations are closely regulated by ubiquitylation. In this process, ubiquitin attaches to the target protein, which in turn signals for the protein to be degraded. There are multiple ubiquitylation pathways that all use three enzymes--E1, E2 and E3--to regulate 3C proteases. My project was primarily focused on purifying the protein ligases (E3s) that recognize 3C picornaviral proteases. Preliminary results suggest that the same E3 may function in two different pathways. Additionally, I optimized conditions to radioactively label ubiquitin and subsequently tracked the radioactivity in reconstituted ubiquitylation systems. Characterization of these E3s will help our understanding of ubiquitin-proteasome system that is involved in 3C protease degradation.

Ryan Weston '12

Elizabeth Eames, Anthropology, and Leslie Hill, Politics

African Perspectives on White Saviors in Cinema -- see Ryan Katon '12 for abstract**Lila Wilmerding '14**

Kirk Read, French, and Joseph Hall, History

Cultural Crossings: Tales from a Semester in France -- see Jordan Banez '14 for abstract**Keller Wilson '12**

Kathryn Low, Psychology

Social Networking and College Students' Perceptions of Infidelity

Evolutionary theory suggests that men are more distressed over physical infidelity as it calls into question their paternity, whereas women are more distressed over emotional infidelity, as it may take away their partner's commitment and resources for their offspring (Buss et al., 1992). The internet, with social networking websites such as Facebook, has created new types of infidelity. The current study explores sex differences in jealousy responses to online sexual and emotional infidelity. The participants include about 100 undergraduate college students, half male and half female, ages 17 to 23. All participants are administered an online survey, in which they are presented with infidelity scenarios involving the internet. It is expected that a greater proportion of females will evaluate online emotional infidelity as the more upsetting scenario, whereas a greater proportion of males will rank online sexual infidelity as the more upsetting scenario. The current study also explores issues

of privacy and surveillance, participants' likelihood to end a relationship over online infidelity, and the role of the target of the online infidelity. Implications for this study include a further understanding of how individuals perceive interactions in virtual realms, and how these actions affect their offline relationships. The study will shed light on evolutionary understandings of jealousy and its existence in the cyber world.

Nina Wineburgh '14

Kirk Read, French, and Joseph Hall, History

Cultural Crossings: Tales from a Semester in France -- see Jordan Banez '14 for abstract

Nina Wolf '12

Meredith Greer, Mathematics

A Mathematical Model of the Fall 2009 H1N1 Pandemic at Bates College

In early October of 2009, H1N1 was confirmed to be on campus at Bates College. Bates students were hit hard by H1N1 for the two weeks between Parents and Family Weekend and the start of fall break. During that time it was estimated that 275 to 500 students were infected. At a residential college like Bates, events that allow for a greater amount of mixing by students than usual can cause a disease to spread rapidly. My goal is to see if there were certain events on campus that caused a disturbance in the mixing of students. I first construct a modified SIR model that captures the outbreak specifically at Bates. Using that modified SIR model along with mathematical analysis, I examine how students' personal networks were affected during those mixing events.

Ethan Yackulic '12

Timothy Cook, Geology

A Multi-Proxy Analysis of Human Disturbances on a Forested Watershed, Trout Pond, Lyme, NH

Understanding the sensitivity of natural systems to accelerated land-use changes is important in quantifying human disturbances, both past and present. Lake sediments provide an ideal chronology for past environmental changes preserved in compositional and geochemical variations. Two sediment cores were taken from Trout Pond, a small, mesotrophic lake in Lyme, NH, for sedimentary analysis. A long-term chronology for Trout Pond was constructed using Pb and Cs profiles along with radiocarbon dating techniques, and yields a record of over 2,000 years. The content of this record was evaluated at 1-5 cm intervals for bulk density, organic carbon content, total nitrogen content, bulk $\delta^{13}\text{C}$, and diatom content. By combining a chronology to these proxies, it is possible to evaluate the effects of human disturbances on the Trout Pond watershed in comparison with long-term natural variability. Initial results indicate increased sedimentation and disturbances in the system that are likely related to mid-nineteenth-century human activity, followed by signs of recovery towards pre-settlement conditions.

Roya Yavari '12

Paula Schlax, Chemistry

Modification of a Plasmid-Based Shuttle Vector for the Study of Transcription and Translation Regulatory Mechanisms in *Borrelia burgdorferi*

A new genetic tool is needed in order to better understand the complex genetic regulatory systems of *Borrelia burgdorferi*, the causative agent of Lyme Disease. As the spirochete transitions from tick to mammal, notable changes in gene expression allow for the adjustment to remarkably different environments, while

contributing to the bacterium's pathogenic strategy. Within the *B. burgdorferi* genome, the cp32 plasmids have been previously investigated as a viable family for gene expression studies, and cp32-based shuttle vectors have become a novel methodology for quantifying expression in both *Escherichia coli* and *B. burgdorferi*. In constructing a cp32-based shuttle vector with a cassette adjacent to a green fluorescent protein reporter gene, we hoped to generate a plasmid that allows independent variability in promoter sequence and ribosome binding site. Ultimately, the aim of this thesis project is to generate a shuttle vector which allows for a thorough analysis of *B. burgdorferi*'s coordinated regulation of gene expression.

Helen Yuan '12

Nancy Koven, Psychology

Individual Differences that Might Moderate Whether Anger is Approach Versus Avoidance

When studying emotion, two competing models have prevailed: the valence/arousal model, which emphasizes the importance of valence (i.e., how positive and negative a feeling state is) and arousal (i.e., the intensity level of the feeling state), and the single-factor motivational model of affect, which argues that all emotions can be categorized by the single dimension of motivational bias. Neuroimaging has shown frontal lobe asymmetry to be critical for emotional valence, with left > right and right > left activity in the experience of positive and negative emotions, respectively. On the other hand, the motivational model predicts left > right and right > left frontal lobe activity for approach and avoidance behavioral tendencies, respectively. Anger, as a discrete emotion, pits these two models against each other, but little research has examined trait anger in the context of individual differences. In an attempt to relate frontal lobe asymmetry, anger, gender, and cultural background, six neuropsychological tests were conducted to evaluate frontal asymmetry. The State Trait Anger Expression Inventory-2 (STAXI-2) was used to measure trait anger, and the Individualism-Collectivism Interpersonal Assessment Inventory and the Self-Construal Scale was used to assess cultural background. It is hypothesized that women and men will endorse internalizing and externalizing anger traits, respectively, while individuals from collectivistic and individualistic societies will endorse internalizing and externalizing anger traits, respectively. I further anticipate that individuals most prone to internalize anger will score better on neuropsychological tests sensitive to right frontal lobe functioning, whereas individuals most prone to externalize anger will score better on those sensitive to left frontal lobe functioning. Mediation analyses will be conducted to determine if frontal lobe asymmetry mediates the relationships between gender/culture and anger profiles.

Kristy Zera '12

William Ambrose, Biology

A Comparison of the $\delta^{13}\text{C}$ Stable Isotopes and Trace Mineral Concentrations of Modern and Archaeological *Mya arenaria* Shells from the Turner Farm Midden and Nearby Mudflats on North Haven Island, Penobscot Bay, ME

My study compares organic carbon stable isotopes and trace mineral concentrations in archaeological *Mya arenaria* shells from the Turner Farm midden on North Haven Island, Penobscot Bay, ME, and modern shells from nearby mudflats to determine whether shell geochemistry reflects changes in the near-shore ecosystem. Modern shells are 3.52‰, 2.3‰ and 1.52‰ more enriched in $\delta^{13}\text{C}$ than shells from 4400, 1200 and 875 years BP, respectively. This may be a consequence of differences in

amounts of primary productivity, its sources, or temperature. Similarly, Ba:Ca ratios decreased significantly from 24.6 to 8.5, and Mg:Ca ratios increased from 669.0 to 1691.5 over the last 4400 years. These may indicate decreasing productivity and increasing temperature, respectively. These data suggest temperature differences may be responsible for differences in $\delta^{13}\text{C}$ over the last 4400 years but difference among time periods in primary production sources are also possible.

Yu Zhang '13

Meredith Greer, Mathematics

Applying Mathematics to Biology -- see Shaina Deutsch '12 for abstract