

# 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 2015 Summit ~

The 2015 Mount David Summit, held on April 3, features the research, creative work, and performances of students from all Bates classes. It is organized into four sessions, three in the afternoon and one in the evening. The presentation abstracts are published in this booklet; the schedule of events for the summit is available in a separate booklet or on the Web.

The faculty believes that all Bates students will develop into scholars in their own right, and will be ready to articulate and defend their 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 first-years just beginning to explore ideas in depth, or they may be sophomores or juniors 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, film makers, and photographers—bring to their work a combination of technique, cultural and intellectual context, ways of thinking and seeing the world, and raw talent that is nurtured in a liberal arts environment.

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



~ ABSTRACTS ~  
(in alphabetical order)

**Eric Adamson '15**

***The German "PISA-shock" and Changing Attitudes toward Comprehensive Schooling***

**Jakub Kazecki, German, Advisor**

In 2000, Germany faced an educational crisis. The release of the PISA scores, an international test given to 28 OECD countries measuring academic abilities of 15-year olds, showed that Germany scored significantly below average. The long held belief of German academic excellence was shaken, but it was not clear if the "PISA-Shock" would result in sufficient public and political support to reverse a 50-year trend of resistance to the development of a comprehensive school program. Were PISA to be as great of a shock as the media made it out to be, then it is to be expected that real reforms would be made to the education system as public pressure mounted.

**Jack Adons '17 (with Eric Adamson '15)**

***Rwandan Reconstruction: An African Success Story? Two Sides of Economic Success and Authoritarian Governance***

**Elizabeth Eames, Anthropology, Advisor**

Despite a genocide resulting in over 800,000 deaths and an economy and civil society in shambles, since the mid-1990s Rwanda has been able to recover and sustain economic growth at rates nearing 7% per year. Integral to this recovery was President Kagame's "Vision 2020" plan. This plan, created after Kagame's election in 2000, detailed goals and economic changes that would be necessary in order to transform Rwanda's subsistent agricultural economy into a knowledge-based middle-income society. To date, Rwanda is considered by the international community to be a success story from an economic standpoint. A leading factor in this economic success has been the ability to maintain political and civil stability post genocide, but this was only accomplished through a series of oppressive political actions and legislative initiatives imposed by Kagame and his Reconstructionist predecessors. For this reason, Rwanda has become effectively a one-party authoritarian government. We explore how this history has left the international community and human rights organizations in the awkward position of praising a country for its development, while tacitly accepting violations of human rights and democratic values.

**John Albanese '16, Jack Allen '16, and Benjamin Wilentz '16**

***Innocents Abroad? Americans and the European Political Climate***

**David Das, Office of Off-Campus Study, Advisor**

Are Americans really "innocents abroad" compared to their worldly European peers? Are we less political and ideological? Three politics majors who studied abroad in

Denmark, Scotland, and France give their views on the European political scene. Come hear if American purity and simplicity trump European sophistication and urbanity.

**John Allard '16, see John Albanese '16**

***Innocents Abroad? Americans and the European Political Climate***

**David Das, Office of Off-Campus Study, Advisor**

**John Allen '15**

***Synthesis of Benzimidazolones via Oxidative C-H Amination***

**Patrick Jokiel, Chemistry, Advisor**

The objective of this research project is to investigate the application of transition metal catalyzed oxidative carbon-hydrogen (C-H) amination to the synthesis of benzimidazolones. In this reaction, a new carbon-nitrogen bond is formed along with a new ring of atoms. Multiple substrates were synthesized and their subsequent cyclization reactions were attempted. Several key reaction parameters (catalyst, oxidant, solvent, reaction temperature and order of reagent addition) were screened and an optimal set of reaction conditions was identified.

**Melody Altschuler '17**

***Social Preferences of At-Risk Infants: A Pilot Study***

**Georgia Nigro, Psychology, Advisor**

Social evaluations are essential for successfully navigating in our social world. Research has found that infants prefer individuals who act prosocially toward unrelated third parties over those who act antisocially, and that infants assess others on the basis of similarity to self. However, these studies did not examine the influence of infants' home environments on their social preferences. This study asks whether early environment influences the development of social preferences by assessing infants across a range of socioeconomic backgrounds, including infants in high-risk environments. Preliminary findings of this ongoing study support the view that a preference for prosocial others, and for individuals who share one's own tastes, are unlearned "default" human preferences that emerge across a wide range of early environments. Our findings add to the evidence that these two social preferences in infancy are based on an early-developing propensity to (a) distinguish positive from negative potential social partners and (b) like those whom we recognize as similar to ourselves. Our present research suggests that at-risk infants do not differ from the general population in their social preferences and strengthens the argument that preferences for prosocial and similar others are fundamental features of human psychology.

**Students in American Cultural Studies 100,  
Introduction to American Cultural Studies  
Documenting the History of African American Studies  
and American Cultural Studies at Bates**

**Aimée Bessire, American Cultural Studies & Art and  
Visual Culture, Advisor**

The twenty-fifth anniversary marks a timely moment to reflect on the history of the African American Studies and American Cultural Studies programs at Bates College. Narratives from faculty, students, and alumni reveal the texture of the two programs at Bates and within a larger national context. What were the events that led to the founding of the two interdisciplinary programs? How were the programs received? What can we learn from the twenty-five-year history of the AAACS? Students in Introduction to American Cultural Studies present their archival research and interviews recording the history of the programs in African American Studies and American Cultural Studies.

**Jenna Armstrong '15**

***Arih1 E3 Ubiquitin- Protein Ligase Knockdown  
Influence on the Stability of Encephalomyocarditis Virus  
3C Protease***

**T. Glen Lawson, Chemistry, Advisor**

The ubiquitin proteasome system (UPS) catalyzes the degradation of the encephalomyocarditis virus (EMCV) 3C protease (3C<sup>pro</sup>), which is responsible for the cleavage of viral proteins required for replication. Previous research identified Arih1 and DTX3L as E3 ubiquitin-protein ligases potentially involved in the ubiquitylation of EMCV 3C<sup>pro</sup>. Arih1 was studied by stably transfecting plasmids containing a Arih1 shRNA gene into mouse cells. Purified EMCV 3C<sup>pro</sup> was transfected into the knockdown cells and the stability of the protease was analyzed over time through SDS-PAGE and Western blots. No cytopathic effects on the cell were observed. To examine the effects of stronger knockdown conditions, the cells were transiently transfected with siRNA to knockdown both Arih1 and DTX3L ubiquitin-protein ligases.

**Kendra Asklof '15**

***Cytokine Expression as an Indicator of the Influence of  
Developmental Hyperoxia on Decreased Lung Size***

**Ryan Bavis, Biology, Advisor**

It is common for preterm infants to experience hyperoxia while receiving supplemental oxygen in neonatal care units, but oxidative stress may cause lung inflammation. Three cytokines (IL-1 $\beta$ , TNF- $\alpha$ , and IL-6) were chosen as indicators of lung inflammation. Rats were kept in hyperoxia (60% O<sub>2</sub>) or control (21% O<sub>2</sub>) conditions until 6, 7, 13, or 14 days of life. ELISA results indicated reduced levels of TNF- $\alpha$  and IL-6 in both age classes in rats exposed to hyperoxia. This reveals that more moderate levels of hyperoxia than previously studied (typically 100% O<sub>2</sub>) have different effects upon the molecular factors modulating lung injury.

**Daniel Bak '15**

***The Effect of HBO on Bacterial Biofilms Found in  
Chronic Wounds***

**Lee Abrahamsen, Biology, Advisor**

Chronic wounds affect 6.5 million people in the United States alone, and often require complex and expensive treatment. Chronic wounds occur when the normal sequence of wound healing is interrupted, such that proper wound closure cannot occur. Non-healing wounds often become infected by bacteria that grow in communities known as biofilms, which adhere to a surface within the wound. One treatment option for chronic wounds is the therapeutic use of hyperbaric oxygen (HBO). While HBO can stimulate fibroblasts to promote wound healing, its effects on the bacterial flora within a wound are unclear. This study seeks to address how HBO affects the composition of bacterial biofilms found in chronic wounds.

**Jules-Philippe Ball '17**

***The Praetorship during the Roman Republic, from  
Origins to Sulla***

**Margaret Imber, Classical and Medieval Studies,  
Advisor**

In this paper I examine the role of the praetor throughout the early republic. I closely followed its creation, expansion, and growth, examining in particular the changes made to its position in the time of Sulla. Due to a number of factors, the praetor has often been overlooked by academics of Roman politics and law, but I argue that the presence of praetors in both spheres was formidable.

**Eliza Barkan '15**

***Recurrent Excitation Modulated by Activation of Delta  
Opioid Receptors in Mitral Cells of the Accessory  
Olfactory Bulb***

**Jason Castro, Psychology, Advisor**

Previous studies in our lab identified an unexpected modulatory role of opioids in accessory olfactory bulb (AOB) physiology. While the selective delta-opioid agonist DADLE mediated a net increase in recurrent excitation of AOB mitral cells, we could not disambiguate between pre- and post-synaptic mechanisms of action. Therefore, in ongoing work, we are investigating the effects of DADLE on mitral cells in voltage clamps to more clearly resolve individual synaptic events. Preliminary (and still inconclusive) results have shown changes in underlying EPSC event-rate, consistent with a presynaptic mechanism.

**Derrick Barnagian '15**

***Identifying Substructures in the Central Nervous System  
Using a Whole Genome Approach: Circuits in the  
Olfactory Bulb***

**Jason Castro, Psychology, Advisor**

We are using a neuroinformatic approach to investigate the fine-scale molecular organization of the mammalian olfactory bulb. Specifically, we are testing for the presence of parallel circuits in this structure by mining genome-scale expression data curated in the Allen Brain Atlas, an open-source, publically available database containing a map of all gene expression (~20K genes) in the mouse brain. In ongoing validity work, we are performing gene

ontological analyses of enriched gene sets in the main and accessory olfactory bulb, known functional subdivisions of the olfactory system.

**Marina Barsoum '16**

***The Twelve Tables***

**Margaret Imber, Classical and Medieval Studies, Advisor**

This paper examines the Twelve Tables. I consider why the Twelve Tables was a success for the plebeians rather than the patricians, which is what most research tends to show. I analyze certain provisions of the Twelve Tables to illustrate why the plebeians benefited more from the Tables. I also describe how the plebeians went about getting what they wanted from the elite patrician class.

**Claire Bartell '16**

***Teaching Philosophy with Robots: Creating a Lab Manual for Computational Modeling, Autonomous Robots, and Embodied Cognition***

**William Seeley, Philosophy, Advisor**

Examining our conception of intelligence is relevant to many fields including neuroscience, philosophy, and computer science. PHIL 321H, Computational Modeling: Autonomous Robots and Embodied Cognition, explores models in embodied cognition and artificial intelligence through simulations, robotics, and genetic algorithms. By examining various topics, students are encouraged to challenge their idea of intelligence. During labs students program LEGO Mindstorm robots to explore topics covered in class. Creating a lab manual for this type of lab presents challenges such as finding the correct balance between enforcing concepts learned in class and leaving room for creative problem solving during the lab period.

**Vanessa Beltran '15**

***But First, Let Me Post a Selfie: A Study of the Frequency of Sharing Photos on Facebook and the Direction of Social Comparison for Individuals Who Stake Their Self-Worth on Public-Based Contingencies***

**Helen Boucher, Psychology, Advisor**

Past research indicates that individuals who base their self-worth on their appearance, others' approval, or competition are more likely to share photos on Facebook (Stefanone, Lackaff, & Rosen, 2011). In addition to replicating similar results, this study examines the importance that individuals place on the number of "likes" their photos receive. Similarly, research has shown that Facebook users socially compare themselves to others on the site (Lee, 2014). Is the domain in which individuals stake their self-worth (appearance, others' approval, or competition) an indicator of the direction of social comparison (upward or downward) in which they engage?

**Stephanie Benson '15**

***Hypocrisy Induction to Increase College Students' Use of Condoms: A Dissonance-based Safe Sex Intervention***

**Susan Langdon, Psychology, Advisor**

Despite the effectiveness of condoms in preventing sexually transmitted infections (STI) and unwanted pregnancies, only 60% of college students consistently use condoms during sex. The current research utilized

hypocrisy induction, a dissonance-based intervention, to increase condom use among undergraduate students. The goal of hypocrisy induction is to increase individuals' intention to engage in a particular behavior in order to stimulate behavior change. The present research consisted of two studies: the first was administered in a laboratory and the second was administered via the internet. Both studies measured the immediate and longterm effects of hypocrisy induction on college students' actual use of and motivation to use condoms. It was hypothesized that participants in the hypocrisy condition would use condoms more frequently and demonstrate greater intent to use condoms than participants in the control condition. Additionally, it was predicted that the effects of hypocrisy induction on condom use would differ among males versus females, individuals in relationships versus hookups, and females taking hormonal contraception versus females not taking hormonal contraception.

**Andria Bhagwandeem '15**

***A State of Opposition: A Look at Wining in Trinidad and Tobago***

**Charles Carnegie, Anthropology, Advisor**

This project looks in depth at the dance form of wining, specifically in Trinidad, as an oppositional form of cultural creativity, drawing on anthropologist Peter Wilson's concepts of "reputation" and "respectability," and cultural theorist Richard Burton's discussion of Wilson's concepts.

**Sarah Bouchard '15**

***Endogenous Brain-Derived Neurotropic Factor and Its Relationship with Aerobic Functioning and Long-Term Memory Functioning***

**Nancy Koven, Psychology, Advisor**

Evidence shows that aerobic fitness increases levels of brain-derived neurotropic factor (BDNF) in the nervous system. Separate findings indicate that increased BDNF can improve long-term memory (LTM). My study explores whether aerobic fitness predicts LTM ability and whether such a relationship is mediated by endogenous BDNF. Urinary BDNF was measured using enzyme-linked immunosorbent assay. Clinical neuropsychological assessment was used to assess LTM profiles. Heart rate reactivity during a sub-maximal Step Test was used to index aerobic fitness. I predicted that LTM performance would improve as a function of aerobic fitness, as mediated by concomitant increases in BDNF.

**Andrew Briggs '15, Morgan Lee '15, and**

**Andrew Seaton '15**

***Linear Cryptanalysis: A Dualistic Approach***

**Adriana Salerno, Mathematics, Advisor**

Cryptanalysis is the study of information systems in order to find the encrypted information as well as flaws in the security system protecting encrypted information. Often the primary goal of implemented cryptanalysis is to recover the key being used to encrypt the target information. In this presentation, we detail the construction of a few ciphers. From stream ciphers to product ciphers, there are several interesting ways to encode information securely using simple arithmetic. Next, we examine methods to attack and decrypt using linear cryptanalysis. Stemming from Matsuru

Matsui's original paper, these attacks are complex but fundamentally interesting from a mathematics standpoint. Finally, we consider modern cryptography applications. This poster is one of four developed by students in MATH 495H, Elliptic Curve Cryptography.

**Eleanor Briggs '15**

***Mobilization of Metals by Fungi in Historic Graveyards***

**Hilary Christensen, Geology, Advisor**

Interactions among fungi, soil, and metals are at the heart of nutrient cycling in terrestrial systems. Chemical weathering of minerals by fungi makes metallic elements biologically available in soil. Mushrooms can bioaccumulate metals from soil, so edible mushrooms growing on soils contaminated with toxic metals can cause harm to those who eat them. This study focuses on metal content of mushrooms and soils from local cemeteries that are possibly contaminated with arsenic as a result of late nineteenth-century embalming practices. Concentrations of metals in mushrooms are compared to those of the soil in which the mushrooms were growing.

**Nicole Brill '15, Olivia Gregorius '15, Kara McGowan '15, Lydia Mitchell '15, Jessica Nichols '15, Sophia Pellegrini '15, and Martha Schnee '15**

***Theory into Practice: Community-Engaged Research***  
**Darby Ray, Harward Center for Community Partnerships, Advisor**

In community-engaged research, students undertake the creation of knowledge in collaboration with a community partner for the purpose of addressing a community need or interest. This year's Community-Engaged Research Fellows have worked on projects situated at the intersection of community interests and academic areas including environmental studies, art and visual culture, psychology, sociology, American cultural studies, and education. Projects focus on female youth empowerment, minority youth aspirations, the stigma and invisibility of homelessness, resilience-building programming for adolescents with cancer in the family, place-based education, power relations in a small Western town, and building effective campus-community partnerships. In this session, students share their work while highlighting the distinctive features of community-engaged research.

**Adina Brin '15, Eliza Kaplan '15, Emma Kate Lindsay '15, and Julia Orfman '15**

***Jewish Perspectives on Modern Judaism and Social Issues***

**Cynthia Baker, Religious Studies, Advisor**

We are four Jewish women who are writing or have written theses with Professor Cynthia Baker on the topic of Judaism and its modern applications and struggles, especially as related to current issues of social importance. This panel focuses on our experiences studying our communities/selves through the thesis process. Thesis topics include the assimilation of Jews in Turkey since the founding of the Republic, the divine feminine in Eve's desire for wisdom, collective victimhood in the Israeli-Palestinian conflict, and different Jewish models for interfaith families in twenty-first-century America.

**James Brissenden '15**

***Increasing Egoistic Perspective: How Facebook Affects the Success of Defocusing on College Students***

**Amy Douglass, Psychology, Advisor**

Humans tend to greatly overestimate the extent to which other people not only notice them, but also judge them harshly (Gilovich, Savitsky, and Medvec 2000), a tendency based in our innately egoistic perspectives. Defocusing is a tool used to lessen egoistic perspective taking, but has yet to be applied to current undergraduates who engage in activities that increase egoistic perspective taking. Thus, the success of defocusing is questioned by the egoistic pressures of engaging in social comparison: a product of frequently checking Facebook. The present study seeks to show, using a 2x2 design, how, due to the egoistic pressures of Facebook, defocusing is no longer an applicable tool with which to lower the over-estimation of perceived harsh judgment. Future research could work to provide a more modern tool, one that persists even through the egoistic pressures of modern technology.

**Linnea Brotz '15 and Ayse Ikizler '15**

***Curating Contemporary Art: Internships at the Bates College Museum of Art***

**Rebecca Corrie, Art and Visual Culture, Advisor**

The process of conceptualizing and realizing an exhibition can take up to several years in any museum. From conceiving the idea to sequencing the show, its development is a combination of interacting with artists, maintaining detailed records throughout, marketing, academic writing and research, and caring for the exhibited work. This talk focuses on the internships that we have had as curatorial assistants at the Bates College Museum of Art over the past couple of years, and the skills we have acquired in learning how to produce and organize the two current exhibitions at the Bates College Museum of Art.

**Molly Brown '15**

***Correlation between Performance and Pressure***

**Susan Langdon, Psychology, Advisor**

Previous research suggests that athletes who feel a sense of control while competing perform better in high-pressure situations. This study explores the accuracy with which participants predict making a game-winning shot in basketball, based on changes in control and confidence provided by the coach. An online study was used with premade scenarios describing end of the game situations. The scenarios expressed either the player feeling in control or out of control leading up to the shot, and whether the coach empowered the player or said nothing at all. A two-way repeated measures ANOVA was performed to see the correlation between percentage of making shot and factors of control and coaches' input. My hypothesis is that participants will report a higher percentage for making the shot when they felt in control and when the coach instills confidence in the player.

**Caleb Buck '15*****Synthesis and Characterization of Plasmonic Gold Nanorods*****Matthew Côté, Chemistry, Advisor**

Recently gold nanostructures have received heightened attention because of their plasmonic properties. Plasmons are collective oscillations of electrons within conductors. These oscillations concentrate light into sub-wavelength volumes. Due to this property, gold nanostructures have a variety of industrial applications in areas such as sensing, bioimaging, solar energy harvesting, and information storage. The plasmonic properties of gold nanostructures can be tuned by controlling their size and shape, and this project involved the synthesis of gold nanorods. I synthesized and characterized plasmonic gold nanorods that are engineered to interact strongly with 1550 nm wavelength light, which matches newly available pulsed laser sources.

**Alexandra Buonfiglio '18, Dacota Griffin '18, and Lily Taylor '18*****The Springboks: A Symbol of Hope in Post-Apartheid South Africa*****Elizabeth Eames, Anthropology, Advisor**

Spanning from 1948 until Nelson Mandela's release from prison and subsequent election to the presidency in 1994, the apartheid era in South Africa was a time of forced segregation and discrimination. With Mandela's election, a movement launched to abate the lingering effects of apartheid on Black and so-called Colored South Africans. Noticing a racial divide in sports culture, Mandela proposed an integration of rugby teams in order to help promote equality throughout the country. In this immediate post-Apartheid period, South Africans found hope in a unified country as Nelson Mandela and key rugby players such as François Pienaar worked to desegregate sports and, by extension, society. We explore various reactions to this notable moment in the politics of sport.

**Sarah Burkey '15*****MRSA Prevalence in the Athletic Facilities at Bates College*****Lee Abrahamsen, Biology, Advisor**

Antibiotic-resistant bacteria like methicillin-resistant *Staphylococcus aureus* (MRSA) are problematic because they are difficult to treat using current antibiotic treatments. Infections caused by MRSA, once only present in healthcare settings, are now present in the community. Called community-acquired MRSA (CA-MRSA), these are often caused by strains of bacteria different from those acquired in hospitals. Studies have shown that CA-MRSA is prevalent in athletic facilities and can be spread by physical contact in activities like sports. The goal of this study was to determine whether surfaces in Bates College athletic facilities were colonized by MRSA. Samples were taken from showers, ergometers, ellipticals, yoga mats, and swim mats and tested for *S. aureus* or MRSA colonization.

**Timothy Campbell '15*****A Paleolimnological Study Reconstructing Organic Carbon Accumulation and Climate History: Mealy Mountains, Labrador, Canada*****Michael Retelle, Geology, Advisor**

Under conditions of unprecedented warming, understanding the fate of CO<sub>2</sub> once it is released is critical in evaluating the impacts of future climate change. This project examined the sedimentary record from lakes located in the eastern Mealy Mountains of Labrador, Canada, in order to identify controls on organic carbon accumulation. A 1.43 m sediment core was analyzed using a multi-proxy approach that included total organic carbon and matter content, total nitrogen, magnetic susceptibility, ITRAX XRF elemental profiles, and chlorophyll pigments. A chronology was constructed using radiocarbon dates. These results will quantify past organic carbon accumulation rates and evaluate potential controls.

**Sarah Cancelarich '15*****Transcript Expression Levels of RNA Polymerase Subunits  $\alpha$ ,  $\beta$ , and  $\beta'$  in *B. burgdorferi******Paula Schlax, Chemistry, Advisor**

The gene regulation of *Borrelia burgdorferi*, the spirochete that causes Lyme disease, has been well categorized. During its enzootic life cycle *B. burgdorferi* experiences environmental changes that trigger changes in gene expression by transcription and degradation. In *B. burgdorferi* transcription initiation takes a significantly longer time than most bacteria, the reasons for which are unknown. Low levels of DNA dependent RNA polymerase or slow rates of transcription elongation may contribute to slow transcription initiation. This study measures relative concentrations of RNA levels of RNA polymerase subunits  $\alpha$ ,  $\beta$ , and  $\beta'$  in a wildtype and an RNase III knockout strain of *B. burgdorferi*. We predict these transcript levels will be lower than expected.

**Brian Carilli '15, Hannah Johnson '18, and Benjamin Wilson '18*****Shell Oil in Nigeria: Clamming up over Environmental Issues*****Elizabeth Eames, Anthropology, Advisor**

Oil was first discovered in the Niger Delta in 1957 by the Shell Oil Company. Today, oil accounts for over 90% of Nigeria's export earnings and some 80% of government revenue, making it crucial in both economics and politics. Unfortunately, from the point of view of those who inhabit this region—the Ogoni people in particular—the effects of oil extraction have been overwhelmingly violent and negative, both environmentally and politically. We found a long history of collaboration between the company and the Nigerian government to quash Ogoni resistance to Shell's devastating practices. In 1995, using the Nigerian military as a conduit, Shell was complicit in orchestrating the execution of several Ogoni leaders, including the poet Ken Saro-Wiwa. In 2009, the Royal Dutch Shell Company offered to settle the infamous Ken Saro-Wiwa execution case with a \$15.5 million compensation. Why would Shell prefer to admit complicity in serious humanitarian issues but not in environmental wrongdoing?

**Teika Carlson '15**

***Strategies of Resisting Assimilation in American Indian Boarding Schools***

**Patricia Buck, Education, Advisor**

Prior to using the Maine child welfare system to assimilate American Indian children, boarding schools were the preferred means of solving the "Indian problem." Most research on American Indian boarding schools focuses on the inhumanity of these institutions and specific ways that these government supported institutions assimilated Native American children. My research describes and classifies the strategies that Native American children used to resist assimilation within the boarding schools. In building awareness of Native Americans' efforts to resist assimilationist policy, my research envisions Native American youth as agents who actively work to maintain self respect and identity in the face of dehumanizing race politics.

**Lila Chalabi '15, Rebecca Norman '15, and Benjamin Smiley '15**

***Lattices and Cryptography***

**Adriana Salerno, Mathematics, Advisor**

We introduce cryptographic methods that use lattices and their associated properties as their fundamental building blocks. Our focus is first on the properties of lattices that make these cryptosystems possible and then we adjust our scope to the systems themselves, exploring their implementation, application, security, and efficiency. When shifting from lattices to the cryptosystems we examine two specific problems, the closest vector problem (CVP) and the shortest vector problem (SVP), and outline how these problems are the core of some cryptosystems. This poster is one of four developed by students in MATH 495H, Elliptic Curve Cryptography.

**Ryan Chinn '18, Maria-Anna Chrysovergi '18, David Dick '18, and Samuel Hersh '18**

***First-Year Seminar Scanning Tunneling Microscope Construction Project: Computer Programming***

**Matthew Côté, Chemistry, Advisor**

This is one of three posters developed by students in FYS 336, Nanotechnology Project: Manipulating Atoms. The class built a scanning tunneling microscope (STM). Building and operating an STM requires three major components: mechanical design, electronics, and a computer program. We programmed the computer using LabVIEW, a user-friendly computer programming application based on a graphical user interface and not lines of code. The program we wrote produces voltages to guide a probe in a raster scanning pattern across the sample surface area. At each point in the scanning pattern our program records the probe's vertical displacement. After completing a scan the program uses the acquired data to create a three-dimensional topographical image of the sample's surface. Because the instrument uses tunneling to monitor probe-sample distance, the image contains information on the atomic scale.

**Hannah Chory '15**

***The Effects of Opioids on Mice Odor Preference***

**Jason Castro, Psychology, Advisor**

Odor perception is heavily shaped by diffuse neuromodulatory systems. Given the known role of opioids in incentive salience, and the unexpectedly dense expression of opioids in the olfactory system, we sought to test the role of opioids in odor preference. We first investigated the spontaneous odor preference of mice (n=12) for a panel of six odorants. Next, we tested pairwise differences in investigation time for the single most and least investigated odorants under three conditions: control, morphine (1 mg/kg), and morphine (10 mg/kg). Our preliminary results show that morphine had the expected effect of motor activation, but no concomitant change in relative odor preference.

**Maria-Anna Chrysovergi '18 – see Ryan Chinn '18**

***First-Year Seminar Scanning Tunneling Microscope Construction Project: Computer Programming***

**Matthew Côté, Chemistry, Advisor**

**Gabriella Chua '18, Justin Pertierra '17, and Emmett Peterson '17**

***"This Disease is Un-African!" The Culturally Destructive Implications of Ebola in Western Africa***

**Elizabeth Eames, Anthropology, Advisor**

How has the 2014 Ebola outbreak affected the cultural values and traditions of Western Africa? Ebola has been labeled an innately "un-African disease" because the behavioral changes recommended by biomedical researchers fundamentally oppose common African cultural values such as reciprocity, dependency, and intimacy. Many African traditions such as hands-on burials and intimate forms of greeting are compromised by the restricting nature of contamination prevention practices. However, some community members have managed to find solutions in order to continue close interpersonal relationships despite the isolating virus. We examine Ebola from the ground up, analyzing these solutions, invented despite the way the disease both pressures preexisting structures of African health care delivery and threatens to constrict a population's preferred way of living.

**Students in Classical and Medieval Studies/English 121D, The Many Lives of King Arthur**

***A Collection of Arthurian Wiki-Studies***

**Sylvia Federico, English, Advisor**

This panel consists of three different presentations of research regarding different aspects of Arthurian Legend: Treason, The Lady of the Lake, The Fisher King. Each group will display and discuss its collaboratively authored Wikipedia entry for its topic.

**Peter Cole '15**

***Automated Computational Reconstruction of Biological Structure from Fluorescence Images***

**Travis Gould, Physics, Advisor**

We present an automated technique for 3D computational reconstruction of biological systems from fluorescence images. The development and implementation of image pre-processing, volume rendering, and feature detection



algorithms have produced an automated technique for 3D surface visualization and structure metric determination of neural circuitry. Adaptive thresholding and canny edge detection algorithms work to segment foreground from background with nonuniform illumination, and detect edges by determining local maxima of the image's gradient. Parallel medial axis thinning of the 3D volume matrix is implemented before triangulation methods calculate faces and vertices. Convolution filtering and euclidean trimming techniques are applied to determine branching and termination coordinates of the neural circuitry.

**Ryan Conrad '15**

***Effect of Helisoma Gonadotropin Releasing Hormone on Rhythmic Feeding and Reproductive Cell Firing in Helisoma trivolvis***

**Nancy Kleckner, Biology, Advisor**

The goal of this thesis is to observe the neuromodulatory effects of the *Helisoma* gonadotropin-releasing hormone (hGnRH) in *Helisoma trivolvis* feeding and reproduction. *Helisoma* have a three-part feeding behavior that, under proper conditions, switches to a two-part reproductive behavior, eliminating part three of feeding. *Helisoma* GnRH will be perfused onto the buccal ganglia targeting cells involved in parts two and three of feeding. It is expected that results will show a switch from feeding to a reproductive behavior caused by hGnRH. Results will broaden understanding of the role of hGnRH and lay groundwork for future studies on its effects.

**Alden Corbett '15**

***Examining the Recovery of Lower Manhattan following September 11***

**Ian Saxine, History, Advisor**

My presentation examines the recovery of Lower Manhattan following the attacks on the World Trade Center, and argues that the actions taken then put New York City back on the path that has led to its current well-being. By offering loans and grants to small and large businesses to offset their financial losses, the city restored confidence by reopening the stock market and other institutions in a short period of time. It also launched new programs to encourage residents to stay in Lower Manhattan.

**Meaghan Crowley '15**

***Lake Auburn Fish Kill: Determination of Ultra Low Phosphorus Levels by Spectroscopic Methods***

**Thomas Wenzel, Chemistry, Advisor**

In September 2012, over 200 dead trout were discovered along the shoreline of Lake Auburn (Auburn, ME). The Lake Auburn Water Protection Commission investigated the incident and determined elevated phosphorus levels as a possible cause. In this study, these levels are further investigated. A linear phosphorus standard curve was created (2-20 ppb) and used to analyze water samples from Lake Auburn. These levels of phosphorus push the limits of UV/Vis, so extensive glass cleaning and meticulous standard preparation are required to detect such low concentrations. These results can be used to determine possible sources of phosphorus and potentially prevent fish kills in the future.

**Victoria Dahlhoff '15**

***The Effect of Changes in Temperature on Predator-Prey Dynamics in the Rocky Intertidal: The Relationship between the European Green Crab (Carcinus maenus) and the Atlantic Dogwhelk (Nucella lapillus)***

**Joshua Lord, Biology, Advisor**

Global climate change is affecting the dynamics of most ecosystems, and one of the systems experiencing several changes is the rocky intertidal. In these experiments, I examined the effects that changes in temperature have on predator-prey interactions, which are at the heart of rocky intertidal life. In these experiments I used the European green crab *Carcinus maenus*, an invasive, as the model predator and the Atlantic dogwhelk *Nucella lapillus* as the model prey. Feeding and metabolic rates were measured in the dogwhelks in the presence and absence of the predator, and at varying temperatures, as a proxy for how these interactions might change in response to climate change.

**Brielle Dalvano '16**

***Juvenile Lobster (Homarus americanus) Feeding Behaviors and Metabolic Rate after Exposure to Carcinus maenas and Hemigrapsus sanguineus Crabs and Effluent***

**Joshua Lord, Biology, Advisor**

Green crabs (*Carcinus maenas*) and Asian shore crabs (*Hemigrapsus sanguineus*) are successful invaders of the northwest Atlantic that compete with and alter the interactions of native species. To determine how the invasive crabs affect the feeding behaviors of the region's native lobster species, *Homarus americanus*, juvenile lobsters were fed while exposed to caged *C. maenas* or *H. sanguineus*. The crabs' effects on *H. americanus* metabolism were also analyzed by exposing juvenile lobsters to *C. maenas* or *H. sanguineus* effluent. Both invasive crab species alter normal feeding behaviors and metabolic rates of juvenile *H. americanus*.

**Nicole Danser '15**

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

**Robert Farnsworth, English, Advisor**

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

**Kathryn Davis '15 and Emily Regan '15**

***Reward Sensitivity and Attention in Orthorexia Nervosa***

**Nancy Koven, Psychology, Advisor**

Orthorexia nervosa (ON), a disordered pattern with similarities to OCD, OCPD, and anorexia, is characterized by an obsessive desire to regulate diet with the aim to be healthy, natural, and spiritually/physically pure. This rigid pattern of eating jeopardizes personal values, relationships, previously enjoyed activities, and sometimes even physical health. In an effort to characterize the cognitive endophenotypes that underlie orthorexia, this study focuses on patterns of reward processing, reward sensitivity, interoceptive and exteroceptive attention, and the degree of attentional flexibility. It is predicted that highly orthorexic individuals will present with a strong degree of internal-

focused attention at the expense of external attention, will show low impulsivity, and will display a high affinity to large, delayed rewards.

**Hanna De Bruyn '18, Benjamin Roop' 18, Deeping Syangtan '18, and Amelia Wilhelm '18**

**First-Year Seminar Scanning Tunneling Microscope Construction Project: Electronics**

**Matthew Côté, Chemistry, Advisor**

This is one of three posters developed by students in FYS 336, Nanotechnology Project: Manipulating Atoms. The first-year seminar class constructed a working scanning tunneling microscope (STM). The project was split into three separate groups: electronics, mechanical design, and programming. As the electronics group of the project, we focused on building the needed electronic circuit. To design the circuit, we first needed to understand how the STM worked. The concept of tunneling was researched, as the tunneling current is central to the negative feedback system driving the circuit. The main goal of the circuit is to maintain a constant tunneling current throughout the scan, allowing the computer to use the data generated from the scan to create the image. This constant tunneling current was maintained using a servo loop. The overall circuit was composed of several smaller circuits, which modified the tunneling current, changing it into a voltage that allowed the computer to produce a digital image of the sample.

**Lucia De Rose '16**

**Use of FCS to Study Photophysical Properties of Fluorescent Dye ATTO 488**

**Travis Gould, Physics, Advisor**

I am currently measuring some photophysical properties of a fluorescent dye, ATTO 488. Due to its use in imaging living cells, the dye has several biological applications in fields such as cardiology, neuroscience, and cell biology. I am using the confocal microscope to perform a noninvasive technique known as fluorescence correlation spectroscopy (FCS). The data obtained are analyzed by taking autocorrelation curves as a function of laser intensity. This study primarily focuses on how the blinking of the dye changes as a function of buffer conditions and laser wavelength.

**Sachith Rochana De Silva '15**

**Lead Binding Interactions of Metallothionein-3(MT3)**

**Rachel Austin, Chemistry, Advisor**

Metallothionein-3(MT3) is a brain-specific isoform of the metallothionein protein family found almost exclusively in mammalian brain tissue. MT3 plays a significant role in the mediation of Zn(II), Cu(II) and other heavy metals in organisms. Considered a "heavy metal sponge," MT3 has the ability to protect tissues from deleterious effects of toxic metals such as lead. To elucidate the potential lead binding interactions with MT3, isothermal titration calorimetry (ITC), UV-titration, and inductively coupled plasma mass spectrometry (ICP) were carried out. Results indicate that lead binding to MT3 is thermodynamically favored, implicating an important aspect of lead chemistry in biological systems.

**Denise Del Villar '16**

**Mexican Migration since 1994**

**Claudia Aburto Guzmán, Spanish, Advisor**

My presentation focuses on Mexican migration to the United States since the signing of the North America Free Trade Agreement (1994). It considers the reasons for migration and the criminalization of the migrant in the U.S. media. I demonstrate that NAFTA profited the United States but had detrimental effects on Mexican economy, causing an increase in migration. However U.S. media capitalized on the growth of the narco traffic industry, creating an image of the migrant as criminal. My presentation focuses on facts, debunking media sensationalism, in order to elucidate the real reasons behind recent migration growth.

**Michelle Devoe '15**

**Deformation Post-doming: New Mapping of the Oliverian Jefferson Dome, Mt. Dartmouth 7.5' Quadrangle, NH**

**J. Dykstra Eusden, Geology, Advisor**

The Mt. Dartmouth 7.5' Quadrangle, west of the Presidential Range, contains the southeastern portion of the Jefferson Dome, the largest of the Oliverian Domes. As part of a USGS NHGS EdMap StateMap project, the purpose of this study was to remap this part of the Jefferson Dome and perform a structural and mineralogical analysis of its rock units to develop a better understanding of the tectonic history of the Northeast. Structural analyses show shear zones and folded foliation which suggest deformation post-doming. Literature claims shear zones exist throughout the Northeast, and this analysis discovered shear zones through the Jefferson Dome.

**David Dick '18 – See Ryan Chinn '18**

**First-Year Seminar Scanning Tunneling Microscope**

**Construction Project: Computer Programming**

**Matthew Côté, Chemistry, Advisor**

**Christine Dong '15**

**Analysis and Comparison of Physical Properties and Morphology of Impact Melt Flows on Venus and the Moon**

**Gene Clough, Geology and Physics, Advisor**

The cratering process sometimes produces melt that flows out of and away from the impact crater. These features have been found on both Venus and the Moon. This study compares the morphology and roughness of impact melt flows on Venus and the Moon using data from the Magellan mission, the Arecibo Observatory and the Lunar Reconnaissance Orbiter's Mini-RF instrument with the goal of characterizing their differences. Venus impact melt flows appear to be smoother and longer in relation to crater diameter than those on the Moon. It is theorized that these differences are influenced by the two bodies' atmospheric conditions.

**Katherine Donovan '15**

**Interleukin-8 Production by Colon Epithelial Cells in Response via Proteinase-activated Receptors**

**Stephanie Richards, Biology, Advisor**

Inflammatory bowel disease (IBD), which comprises Crohn's disease and ulcerative colitis, affects 1.4 million

people (Crohn's and Colitis Foundation of America). The cellular signaling events underlying the inflammatory processes that go awry in these diseases are thought to be connected in part to the cell surface proteinase-activated receptors (PARs). Stimulation of PARs is thought to induce mitogen-activated protein kinase (MAPK) signaling pathways, ultimately increasing expression of the inflammatory cytokine IL-8. This project will verify the role of PAR stimulation in the production of IL-8 by human colon epithelial cells by quantitative PCR (qPCR) and by ELISA.

**Alison Dowey '15 and Cira Mollings Puentes '16**  
***Cationic Cyclodextrins as Chiral NMR Solvating Agents***  
**Thomas Wenzel, Chemistry, Advisor**

Previous work has shown that cationic cyclodextrins produce larger enantiomeric discrimination in <sup>1</sup>H NMR than native cyclodextrins. The effect of size and enantiomeric purity of the cationic group was tested for improved enantiomeric discrimination. The cationic cyclodextrins were synthesized in a two-step process. Either racemic or enantiomerically pure epichlorohydrin was reacted with trimethyl-, triethyl-, or tri-n-propyl amine hydrochloride to produce the desired ammonium salt. This was subsequently reacted with  $\alpha$ -,  $\beta$ -, or  $\gamma$ - cyclodextrins. Each cationic cyclodextrin was tested with a range of anionic aromatic compounds. Fixing the enantiomeric purity of the group did not consistently lead to larger discriminations but improved enantiomeric discrimination often seen with the larger triethyl and tri-n-propyl derivatives.

**Tayla Duarte '17 and Yolanda Rodriguez '15**  
***Chiral NMR Differentiation of Primary Amines with (18-crown-6)-2,3,11,12- Tetracarboxylic Acid***  
**Thomas Wenzel, Chemistry, Advisor**

The compound (18-crown-6)-2,3,11,12-tetracarboxylic acid (**1**) is an excellent chiral NMR solvating agent for primary and secondary amines. A protonated amine is necessary for strong association with an 18-crown-6 ether. An advantage of **1** over many other crown ethers is that it can be used with neutral amines because mixtures of a neutral amine and **1** undergo a neutralization reaction producing the protonated amine. The effectiveness of **1** as a chiral NMR solvating agent for twelve primary diamines in neutral and protonated forms was evaluated. **1** produced enantiomeric differentiation in at least one resonance in the <sup>1</sup>H NMR spectrum of every substrate.

**Christopher Eddy '15**  
***Defining Bro Culture: A Qualitative Study***  
**Susan Langdon, Psychology, Advisor**

In high schools and colleges today one might hear students referring to themselves or others a "Bro." This term identifies individuals as members of a larger bro culture that promotes specific traits and behaviors. Traditionally, men are seen as the only true members of bro culture and thus masculine norms play a large role in bro culture as a whole. Through the use of interviews and answers to short

essay questions, a definition of bro culture has been established that paints an interesting picture of what bro culture is and the characteristics of the people who embody it.

**Tomisha Edwards '15, Anna Lanoe '15, and**  
**Isaiah Rice '15**

***Building a Dance Thesis: Winter Semester***  
**Senior Dance Majors**

**Carol Dilley, Dance, Advisor**

Creating a dance thesis is a complex process that entails an intellectual as well as physical challenge. Senior dance majors spend months exploring a subject, refining a particular topic, and utilizing the art form of dance to create a piece and an academic text that reflects both their topics and themselves as individuals. The thesis process is the accumulation of dance majors' four years as dancers and thinkers at Bates. This semester senior dance majors Anna Lanoue, Isaiah Rice, and Tomisha Edwards are presenting three unique pieces informed by their academic interests. Anna Lanoue's work explores the relationship between mental illness and creativity as well as the stigma that surrounds psychiatric disorders. Isaiah Rice's work explores power and agency within the commercial world of hip hop. Tomisha Edwards' work explores femininity as activism in the world of dance. In this panel the three majors will discuss the development and final product of this process.

**Jackson Emanuel '15**

***Mechanisms for Transcriptional Regulation in *Borrelia burgdorferi*, the Spirochete that Causes Lyme Disease***  
**Paula Schlax, Chemistry, Advisor**

*Borrelia burgdorferi*, the bacterium responsible for Lyme disease, has a complex life cycle involving both tick (*Ixodes*) and mammalian hosts. In order to establish an infection in a new environment, *B. burgdorferi* must rapidly alter its gene expression through a variety of molecular mechanisms. This project examines these mechanisms via clonal insertion of genetic material into *Borrelia burgdorferi* via a plasmid vector.

**Brett Emmons '15**

***Creating a Moral Empowerment Program***  
**in Lewiston, ME**

**Rebecca Fraser-Thill, Psychology, Advisor**

To move humanity toward what is right has been the perennial challenge of moral education since its inception. This subject of study continues at a youth center in Lewiston, ME, where I initiated a program to strengthen the moral character of its K-12 youth. I drew upon the psychological field of moral development and the Bahá'í Faith to design my program. Since September 2014, I have guided and tracked its development. I conducted interviews to generate formal insights about growth and effectiveness. It was hypothesized that the program would advance both the moral character and climate at the center.

**Thomas Endean '18, Drew Korn '18, Mickoy Nichol '18, Theodore Pender '18, Santiago Rozas '18, and Kelly Wasserman '18**

***First-Year Seminar Scanning Tunneling Microscope Construction Project: Mechanical Design***

**Matthew Côté, Chemistry, Advisor**

This poster is one of three posters developed by students in FYS 336, Nanotechnology Project: Manipulating Atoms. In the first-year seminar we constructed a scanning tunneling microscope (STM). The project was split into three different teams, with each responsible for a separate part of the STM. As the mechanical design group, we designed and constructed the physical parts of the microscope. To do this our team split up into three different subgroups, each tasked with creating a different piece of the STM. Our poster represents the process that each subgroup went through to develop their parts and ultimately come to a functioning microscope.

**Sean Enos '15**

***Reconstruction of the Post-Glacial History of the Peddocks Island Salt Marsh, Hull, MA***

**Michael Retelle, Geology, Advisor**

Climate change and associated sea-level rise is of great concern, and studying environmental history will allow for better predictions for the future. Salt marshes provide excellent environments for the study of sea level change as they migrate inland and accrete at a rate pacing sea level rise. This project involves the reconstruction of a salt marsh on Peddocks Island, MA. Detailed analysis of downcore changes in physical and organic components in sediment cores from the marsh allows for reconstruction of the marsh history and interpretations of the impact of sea level rise in Boston Harbor and the Peddocks Marsh.

**Julia Eyman '15**

***The Social Effects of the Holocaust: A Study of the Social Adaptation of Second- and Third-Generation Holocaust Survivors***

**Heidi Taylor, Sociology, Advisor**

This thesis explores the concept of intergenerational transmission of trauma on second- and third-generation Holocaust survivors manifested in social adaptation through shaping personal identities, religious identification, and the construction of families. Through in-person interviews of second- and third-generation Holocaust survivors, this thesis analyzes the degree to which Holocaust decedents adapt to their social environment. By gathering qualitative interview data I analyze larger relationships among second- and third-generation survivors. I hope to gain insight into the effects of the Holocaust on descendants' daily lives seventy years after the liberation of the Nazi concentration camps.

**Wilder Felix '15**

***Characterization of mGluR Receptors on Helisoma trivolvis B19 & B27 Buccal Neurons***

**Nancy Kleckner, Biology, Advisor**

Central pattern generators (CPGs) are neuron networks that create unique, complex behaviors. The tri-phasic feeding behavior of the pond snail *Helisoma trivolvis* is one such behavior resulting from its relatively simple CPG system. It

is known that glutamate is a neurotransmitter that modulates a great part of this CPG system, however what specific receptors it activates are not yet known. In order to characterize these receptors, cells implicated in this CPG were exposed to different glutamate receptor agonists and antagonists at varying concentrations to correlate the effects these drugs had on cell activity with specific receptor activation.

**Kathleen Fitzpatrick '15**

***Knowledge and Attitudes about HPV Vaccination and a Partner's Vaccination Status***

**Kathryn Low, Psychology, Advisor**

Human papillomavirus (HPV) infection is the most common sexually transmitted infection (STI) in the United States. The CDC recommends that both men and women receive a vaccination that prevents two high-risk strains of HPV that are strongly linked to multiple cancers. The study looks at the relationship among knowledge, attitudes, vaccination status, and intention to get the vaccination. Additionally, this study analyzes differences between men and women for these same categories. We also examine changes in attitudes and knowledge over time by comparing our results to the scores of knowledge and attitudes from previous research (Doherty and Low, 2008). The presumption is that people will be more aware of HPV and have more favorable attitudes toward vaccination in 2015. Last, this study examines if people are aware of, or interested in, their partners' vaccination history and to explore gender differences in interest in partners' vaccination status.

**Benjamin Foote '15**

***Smartphone Lock Screen Enhancement of Brief Motivational Interventions***

**Kathryn Low, Psychology, Advisor**

There has been a great deal of research within the field of psychology on college-age drinking and the negative consequences of heavy alcohol consumption. From this research have emerged several empirically based, individually oriented techniques that result in significant reductions in both alcohol consumption and negative consequences among students. The current study tests the effects of smart-phone lock screens and brief motivational interventions on alcohol consumption and negative outcomes. Specifically, I examine whether lock screen images chosen by college students as helpful for curtailing unhealthy drinking behaviors alter the impact of Personalized Normative Feedback and cost-benefit interventions on student drinking behaviors.

**Margaret Foster '15**

***The Impact of an Acceptance and Commitment Therapy Group for the Treatment of Anxiety and Depression in Veterans***

**Amy Douglass, Psychology, Advisor**

Generalized anxiety disorder and major depressive disorder are significant problems in the veteran population. Negative beliefs about mental health treatment-seeking may prevent veterans from receiving the care they need. Previous research has found that acceptance and commitment therapy (ACT) is effective in treating anxiety and

depression among veterans. In ACT, clients are encouraged to accept negative emotions and commit to living a valued life in the presence of discomfort. The current study evaluated an ACT treatment group for anxiety and depression at the Lewiston VA outpatient clinic. Valued living scores were examined before and after treatment.

**Shoshana Foster '15**

***The Home of the Dead, Religions of the Living: The Distinctions between the Jewish and Christian Communities in Ancient Rome as Observed in the Catacombs of the Second through Fourth Century C.E.***  
**Margaret Imber, Classical and Medieval Studies, Advisor**

We often view Judaism and Christianity as two separate religions, but they are more connected than we tend to recognize. This thesis explores how the Christian community emerged out of the Jewish community in Ancient Rome. While it considers the literary evidence, it relies more heavily on the archaeological evidence, specifically the Jewish and Christian catacombs (underground tombs) in Rome in order to trace the divergence of the two communities. An examination of the language and content of the inscriptions, wall paintings, and sarcophagi reveals many similarities and differences. Recognizing this often forgotten relationship between the Jewish and Christian communities may allow for interactions with less tension and animosity and instead with more ease and amity.

**Joshua Freedland '15**

***Measuring the Attitudes and the Likelihood of Concussion Reporting by Testing Implicit Attitudes in Collegiate Football Players***

**Susan Langdon, Psychology, Advisor**

Concussions are an important health issue because of their high prevalence in the United States, with over 300,000 sports-related concussions reported annually. This study tested the implicit attitudes of collegiate football players toward concussions using an experimental method of having players consider football game scenarios, and then measured their likely concussion reporting behavior. The current study observed how different scenarios tap into implicit attitudes, and the degree to which the likelihood of reporting varies by year, position, and previous concussion history.

**Samuel Gazecki '16**

***Philosophy and Neuroscience of Art: Knowledge Effect and Selective Attention***

**William Seeley, Philosophy, Advisor**

Philosophers of art are riddled by questions such as how do viewers make evaluative judgements about works of art, as artworks can be replete with arbitrary visual sensory information. Cognitive science seems to shed light on the causal mechanisms that allow viewers to extract semantic content from an artwork to enable these types of judgements. By appealing to theories of selective attention in cognitive neuroscience and knowledge based effects in cognitive psychology, I hope to tell a story of how this processes works.

**Ramya Ghantasala '15**

***Individual and Synergistic Effects of Oxytocin and Dopamine on Fluid Intelligence***

**Nancy Koven, Psychology, Advisor**

The neuropeptide oxytocin has been shown to play a prominent role in social cognition, the ability to perceive, attend to, and remember others. This study investigates oxytocin's role in modulating fluid intelligence, a cognitive domain involved in social cognition including the ability to form patterns from complexity or ambiguity. Fluid intelligence was assessed using the Wechsler Adult Intelligence Scale-III. Dopamine, known to interact with oxytocin in neural circuitry related to social cognition, and oxytocin were quantified using enzyme-linked immunosorbent assay from plasma. Oxytocin levels, individually and synergistically with dopamine levels, are expected to be positively correlated with fluid intelligence score.

**Spencer Goossens '15**

***Stabilizing Current for Use in Magnetic Trapping***

**Nathan Lundblad, Physics, Advisor**

Ultracold atomic physics experiments require precisely controlled electromagnets. A noisy current running through magnetic coils can cause extraneous heating, which impedes the cooling efforts. In order to eliminate this heating, we created a current stabilization circuit using different electrical components such as Hall-effect current sensors, differential amplifiers, integrators, and MOSFETs. We optimized the performance of the feedback circuit given the expected noise spectrum, and explored integrating the circuit into an existing Bose-Einstein condensate apparatus.

**Olivia Gregorius '15 – See Nicole Brill '15**

***Theory into Practice: Community-Engaged Research***  
**Darby Ray, Harvard Center for Community Partnerships, Advisor**

**Dacota Griffin '18 – see Alexandra Buonfiglio '18**

***The Springboks: A Symbol of Hope in Post-Apartheid South Africa***

**Elizabeth Eames, Anthropology, Advisor**

**Alexandra Hokusui '15**

***STED Laser Nanoscopy Using a Low Numerical Aperture Lens***

**Travis Gould, Physics, Advisor**

Stimulated emission depletion (STED) microscopy is a method of super-resolution imaging capable of nanoscale spatial resolution. Over the summer, a STED microscope was constructed and optimized to a point where it was able to image at nanoscopic scales. This year, the system has been adapted to function using a lower numerical aperture lens (.60 NA) in order to achieve a wider field of view. This lens achieves slightly lower resolution (theoretically 100 nm), but is useful in applications that do not require the 10 nm resolution of high numerical aperture lenses.

**Tully Hannan '15**

*The Career Stories of Elite Distance Runners: Stories of Redemption and Contamination*

**Michael Sargent, Psychology, Advisor**

The current study examines the career stories elite distance runners tell. The primary focus is on redemption and contamination stories. A redemptive story is one in which an individual suffers a low point in life and overcomes that situation. In contrast, a contamination story is one in which an individual experiences a positive event, but is overshadowed by a dark event. My goal is to look for themes that cut across multiple redemption and contamination stories. In addition, I will look at whether or not generativity predicts the number of redemption and contamination stories told by participants.

**Emily Hayes '15**

*Image Quality Metrics for Super-resolution STED Microscopy*

**Travis Gould, Physics, Advisor**

The combination of adaptive optics and STED microscopy can be used to image thick biological samples with nanometer resolution. To apply this technique requires identifying metrics for reliably assessing the quality of STED images. A careful study of such metrics has yet to be conducted. In this work, various metrics for correcting different aberrations in the sample were quantified. Using Zernike polynomials to represent optical aberrations, STED images were taken as a function of an applied bias aberration and subsequently analyzed. Here we present a comparison of select STED image quality metrics. These results should help expand the application range for STED imaging of thick tissue.

**Samuel Hersh '18 – See Ryan Chinn '18**

*First-Year Seminar Scanning Tunneling Microscope Construction Project: Computer Programming*

**Matthew Côté, Chemistry, Advisor**

**Kendall Hodges '15**

*Gestational Diabetes in Somali Women in Lewiston, ME: Developing A Diet Card to Improve Diet throughout Pregnancy*

**Karen Palin, Biology, Advisor**

Gestational diabetes mellitus (GDM) is prevalent among pregnant Somali women in Lewiston, ME. Proper management of GDM involves diet modification. Many patient educational resources on diet are available as printed handouts, but many local Somali women cannot read them, as they are not literate in either English or Somali. The purpose of this project is to develop a Diet Card as an accessible and culturally relevant GDM patient education resource.

**Julianne Hopkins '15**

*Literary Reading by Creative Thesis Writers*

**Robert Farnsworth, English, Advisor**

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

**Jocelyn Hoye '15 and Aliza Khurram '15 (with Natasha Kalra '15)**

*The Vigenère Cypher*

**Adriana Salerno, Mathematics, Advisor**

The Vigenère cipher is a probability-based polyalphabetic cipher that works by using different shift ciphers to encrypt different letters of the alphabet. Using the cipher, two parties can exchange a message that is kept secret from a potential third party. The message can be intercepted if an attacker knows the people exchanging messages and correctly guesses the keyword. However, even without lucky guesses, there are statistical methods that have been developed to break the cipher. Even though the Vigenère cipher is no longer used for secure communications because of its susceptibility to attacks, it is still studied today because it enables us to better understand the statistical tools used in cryptanalysis. There is also some evidence suggesting that the cipher can be useful for image encryption on mobile phones. This poster is one of four developed by students in MATH 495H, Elliptic Curve Cryptography.

**Ayse Ikizler '15 – see Linnea Brotz '15**

*Curating Contemporary Art: Internships at the Bates Museum of Art*

**Rebecca Corrie, Art and Visual Culture, Advisor**

**Gideon Ikpekaogu '17**

*Art, Trade and Social Justice: Exploring the Issues of Trade through an Artistic Perspective*

**Daniel Riera-Crichton, Economics, Advisor**

I explore the impact of trade policies on lesser developed countries using an artistic piece created by the Beehive Collective, a locally based art group in Maine. In this artistic creation, the consequences of harmful trade policies are depicted graphically. I seek to analyze the degree to which this painting accurately depicts the economic complexities of trade. Corporate colonialism, economic social movements, and potential theoretical gains from trade are important in understanding the complex issue of trade and its relationship to progress, underdevelopment, and economic injustice.

**Elena Jay '15**

*The Great Fire of Valparaíso, Chile: A Case Study of a Socially-Produced Disaster*

**Heidi Taylor, Sociology, Advisor**

The Great Fire of Valparaíso – a massive inferno beginning on April 12th, 2014 – was the worst fire in the port city's history. This contemporary event powerfully exemplifies the ways that a disaster produces disproportionate impacts for different people, and how the disaster itself is a consequence of historically based social, political, and economic inequalities. By conducting a mixed-method case study of a recent, under-studied event, this investigation contributes to a growing body of sociological literature which seeks to explain who is most impacted by a "natural" disaster and why.

**Frances Jennings '15**

*Experiencing Inequality as a Migrant Worker: A Comparative Look at Beijing and Shanghai*  
**Áslaug Ásgeirsdóttir, Politics, Advisor**

Inequality in China is a growing problem, felt both economically and socially across the rural and urban divide. Inequality is also on the rise in cities, where migrant workers and residents have distinct urban realities. Due to the *hukou* system of household registration, social services and housing continue to be tied to one's birthplace, thus it is difficult for rural migrants to establish a city life for themselves. They not only face lack of access to resources but also cultural difference and social segregation. This study aims to take a comparative look at how migrant workers experience the effect of inequality in Beijing and Shanghai, China's most popular migrant destinations.

**Hannah Johnson '18 – see Brian Carilli '15**

*Shell Oil in Nigeria: Clamming up over Environmental Issues*

**Elizabeth Eames, Anthropology, Advisor**

**Alexandra Jones '15**

*Synthesis of Disaccharide and Trisaccharide Phenylpropanoid Glycosides*

**Jennifer Koviach-Côté, Chemistry, Advisor**

Plants experience an array of stresses. To combat such stresses they employ naturally occurring compounds. One subdivision of these compounds are phenylpropanoid glycosides (PPGs). PPGs serve as antioxidants and scavenge free radicals. Free radicals in humans are associated with diseases such as cancer, HIV/AIDS, respiratory syncytial virus and neurological ailments including Alzheimer's. The purpose of this work is to synthesize disaccharide and trisaccharide PPGs for their antioxidative power to combat free radical excess and cure such illnesses. This work entails the synthesis of luteoside, a particular PPG containing an apiose substituent not previously synthesized for addition to the glucose core.

**Jameson Jones '15**

*Literary Reading by Creative Thesis Writers*

**Robert Farnsworth, English, Advisor**

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

**Robin Jones '15**

*Radical Buddhism: Sri Lanka's Bodu Bala Sena*  
**Steven Kemper, Anthropology, Advisor**

In recent years, Sri Lanka has seen the emergence of a radical organization of Buddhist monks known as the Bodu Bala Sena (BBS). Drawing upon a long history of politicized Buddhism in Sri Lanka, the group's stated goal is to protect the country's Sinhala Buddhist majority from external threats. However, the BBS is accused of inciting violence against religious minorities, particularly Muslims, who have become the target of a vicious hate campaign. Drawing on fieldwork conducted in Colombo, I discuss the impact of the BBS on ethnic and religious relations in Sri Lanka.

**Tyler Jones '15**

*Two World Wars and One World Cup: An Analysis of the Anglo-German Football Rivalry through Mass Media from 1960 to the Present*

**Caroline Shaw, History, Advisor**

England's and Germany's national football teams have played against each other twenty-nine times since 1930. These games are normally well-attended and there always seems to be a significant amount of hype and importance placed on the outcome, presumably a residual effect from the two world wars. My research intends to answer these questions: Is the Anglo-German football rivalry a representation of people's sentiments toward the rival country? Does the media draw on history and reignite old tensions? I believe that the media is a key player in perpetuating this rivalry, more specifically the British news outlets; they cannot seem to let "the War" go and have been using football matches to rekindle the animosity between the British and the Germans. I used primary sources to show how the British (and sometimes the Germans) poke fun at each other in the newspapers over football. As a contemporary comparison, I examine this past year's Formula 1 Drivers World Championship to offer an alternate example of Anglo-German rivalries in sports.

**Natasha Kalra '15**

*Numbers and Shapes: Is Math Learning Enhanced by a Fantastical Context?*

**Georgia Nigro, Psychology, Advisor**

A recent push for increased achievement in the younger years has led to a decline of play in school (e.g., Adams, 2011; Stipek, 2006). However, research illustrates the value of play, specifically in terms of how it may enhance learning and achievement (e.g., National Research Council et al., 2009; Weisberg et al., 2013). A recent study revealed that exposure to new vocabulary words in a fantastical context, as opposed to a realistic context, enhanced learning in preschoolers (Weisberg et al., 2015). The present study sought to determine if this finding is generalizable to mathematics. Preschoolers were taught mathematical concepts with either realistic or fantastical storybooks and toys, and the predicted findings include a significantly larger change in mathematical ability from pre- to post-test for children in the fantastical condition compared to children in the realistic condition and children in the control group, who received no intervention.

**Nicole Kanu '15, Brittany Reid '15, and Shanina van Gent '18**

*"The Great Debate!" Understanding Racial Quotas in South Africa*

**Elizabeth Eames, Anthropology, Advisor**

Although today's South Africa aspires to be a post-racial society, race continues to define various public and private spaces and a wide inequality gap actually makes South Africa one of the most unequal societies in the world. Those who are of the lower socioeconomic class are overwhelmingly Black. In an effort to combat this inequity, the government has chosen to institute racial quotas. Distinct from affirmative action, racial quotas serve as numerical requirements for hiring, promoting, and admitting members of a particular racial group. However,

in recent years, popular debates have challenged racial quotas. Some claim quotas are a form of racial discrimination, while others argue that racial quotas do not help the underprivileged Black citizens who suffered most under apartheid. As South Africa struggles to address the tensions bubbling on college campuses and cricket fields. We explore the popular debate by looking at the racial quota system in post-apartheid South Africa through academic institutions and sports. In the process, we tackle the larger question of the country's long process of post-apartheid unification.

**Eliza Kaplan '15 – see Adina Brinn '15**  
***Jewess Perspectives on Modern Judaism and Social Issues***  
**Cynthia Baker, Religious Studies, Advisor**

**Charles Kenyon '15**  
***State Terror during the Chilean Dictatorship, 1973-1990***  
**Karen Melvin, History, Advisor**

I examine state sanctioned terror in Pinochet's Chile. On September 11, 1973, a military coup in Chile overthrew the democratically elected president, Salvador Allende. For the next seventeen years, General Augusto Pinochet ruled the country of Chile, violently repressing leftists and anyone else opposed to his regime. His reign was characterized by the disappearance and torture of many political dissidents, assassinations of Chilean citizens abroad (including in Washington, D.C.), and political censorship. In 1988, a plebiscite voted to remove Pinochet from power and finally, in 1990, Chile returned to a democratic form of government.

**Caroline Kern '15**  
***Female Adolescent Leadership Skills Development***  
**Georgia Nigro, Psychology, Advisor**

Girls in rural and urban Maine face a hopeful future with the general acceptance women across the United States have received in the past decades. A recent report recommended that Maine invest more in girls and women in Maine. One recommendation was to create opportunities for girls to engage in leadership education. This research project examined the implementation and outcomes of a leadership, independence, and confidence development program, called SMART Girls, at the Boys and Girls Club in Auburn, Maine. Over the course of four months, I facilitated and evaluated the SMART Girls program. I hope the program will play a role in improving the lives of girls in Maine and orient them to a more positive path toward their futures.

**Aliza Khurram '15 – see Jocelyn Hoye '15**  
***The Vignère Cypher***  
**Adriana Salerno, Mathematics, Advisor**

**Song Kim '15**  
***Effects of 7,8-Dihydroxyflavone (DHF) on Hyperoxia Induced Respiratory Plasticity***  
**Ryan Bavis, Biology, Advisor**

Preterm infants experience bouts of hyperoxia by means of supplemental oxygen. Hyperoxia is found to modify the

development of the carotid body thus elicit a blunted hypoxic ventilatory response (HVR) (Bavis et al., 2013). It hypothesized that since hyperoxia decreases BDNF protein expression, BDNF causes changes in carotid body development (Dmietrieff et al., 2012). This study sought to confirm that changes in the HVR and carotid body morphology are linked with BDNF. In this study, neonatal rats were injected every day with 7,8-dihydroxyflavone (DHF), a drug involved in the BDNF pathway. Pups were exposed to hyperoxic (60% O<sub>2</sub>) or normoxic conditions (21% O<sub>2</sub>) until studied at age 6-7 days, which was when ventilation was measured and the carotid body was harvested for histology. There was no statistically significant difference in ventilation, but we are still working on carotid body histology. This indicates that BDNF may not directly be involved with changes in the development of the carotid body and the HVR.

**Kaylyn Kipper '16**  
***Trial or Execution: A Study of Catiline's Conspiracy***  
**Margaret Imber, Classical and Medieval Studies, Advisor**

Catiline's conspiracy and its attempt to overthrow the Roman Republic is a historical event surrounded by much scholarly debate. I focus on the paradox found within Catiline's situation when compared to that of his five associates. While Catiline, the leader of the conspiracy, was never tried for treason, his five associates were executed without trial. My question focuses on what caused this drastic outcome. I argue that these changes in respective punishments can be explained through political relationships or power positions of the time, and how these human relations created political limitations for those involved.

**Katherine Kirwin '15**  
***In vitro Analysis of Ubiquitin Ligases Arih1, Arih2, and DTX3L in Ubiquitylation Reactions with Picornaviral 3C Protease***

**T. Glen Lawson, Chemistry, Advisor**  
In infections by certain picornaviruses, such as hepatitis A (HAV) and encephalomyocarditis (EMCV), the cell's ubiquitylation-proteasome system functions to degrade the viral 3C protease. The ubiquitylation system requires three types of enzymes: ubiquitin-activating enzymes, ubiquitin-conjugating enzymes, and ubiquitin ligases, where the ligases are responsible for the specificity of tagging target proteins. By using mass spectrometry and activity assays, the ubiquitin ligases Arih1, Arih2, and DTX3L have been identified as being involved in tagging 3C protease with ubiquitin. We hypothesized that in vitro the ligases work in combination to tag protease. EMCV 3C protease is tagged for degradation by Arih1 and DTX3L, while HAV 3C protease is tagged for degradation by Arih1, Arih2, and DTX3L. The ligases are being expressed by cloning in *E. coli*. Using the expressed and purified ligases, we are able to run in vitro assays to determine activity in combination.



**Hannah Kogan '15**

*Treason Law from the Roman Republic into the Empire*

**Margaret Imber, Classical and Medieval Studies, Advisor**

This paper considers how the Roman law of treason was expanded under the Julio-Claudians and how this affected the Roman public and overall role of the emperor. In examining the evolution of *perduellio* to *maiestas* in the Roman Empire, I argue that such a change is evident and it becomes possible to imagine the corruption and fear so commonly underplayed during the Julio-Claudian reign.

**David Kohler '15**

*Gladiators: Admired Outcasts*

**Margaret Imber, Classical and Medieval Studies, Advisor**

The gladiator has captured people's imaginations for millennia. Even now, gladiators remain fixtures in popular culture. They have inspired popular movies and television shows for decades. This popularity was even more widespread in Ancient Rome. Though the gladiators had no legal rights and were social outcasts, they were nonetheless admired, lusted after, and emulated by the people of Rome. They even played a crucial role in maintaining the cult of the Emperors. This paper investigates the legal and social status of gladiators in Ancient Roman society, as well as their role in the social fabric of Rome.

**Emma Korein '15**

*When You Tell My Story: The Impact of Vicarious Perspective-Giving on Subordinate Group Members' Attitudes*

**Michael Sargent, Psychology, Advisor**

Previous research has found that perspective-giving, a type of intergroup contact where one participant shares his or her perspective with an outgroup member, can help improve positive outgroup attitudes for members of a subordinate group. No research has been identified that tests the effects of vicarious perspective-giving, which the current study defines as witnessing another ingroup member give their perspective to an outgroup member. The current study compares the effects of direct perspective-giving and vicarious perspective-giving on the outgroup attitudes of subordinate group members.

**Drew Korn '18 – see Thomas Endean '18**

*First-Year Seminar Scanning Tunneling Microscope Construction Project: Mechanical Design*

**Matthew Côté, Chemistry, Advisor**

**Detmer Kremer '16**

*Learning How to Fly: The Intersectionality of Religion, Culture, and Gender of the Samoan Baha'i Community*

**Joshua Rubin, American Cultural Studies & African American Studies, Advisor**

The Samoan Baha'i community balances multiple identities in a society where they are a minority. Their cultural, religious, and gender identities are all essential to their expressions as human beings, and this research aims to explore how Samoan Baha'i reconcile their multiplicity of identities. An expansion of the notion of intersectionality in

a Pacific context contributes to a more comprehensive understanding of cultural change, globalization, and social justice and elaborates on the complex paradoxes of identity.

**Juergen Kritschgau '16**

*Categorization through Environmental Interaction: A Study in Artificial Intelligence*

**William Seeley, Philosophy, Advisor**

Traditionally, categorization in artificial intelligence has relied on performing computations on incoming data. However, studies using robots have shown that data can be made more transparent by adjusting the robot's morphology and control system to allow it to interact with its environment in recognizably different ways. Once this is achieved the robot can monitor its own movement rather than changes in the environment to reliably categorize objects in its environment. My goal has been to build and program a Lego robot capable of replicating these results by using a comparable strategy.

**Eileen Lam '15**

*Asian American Political Participation: The Paradox and the Factors*

**Stephen Engel, Politics, Advisor**

A longstanding literature in American politics suggests that socioeconomic status and education levels are strong predictors of political participation. Individuals with higher socioeconomic status and greater educational attainment are more likely to vote. Although Asian Americans, on average, enjoy higher socioeconomic status and higher education attainment, they have demonstrated lower levels of political participation. Asian Americans have not participated in politics at expected levels because they were historically not mobilized by elected officials or their surrogates. This lack of attention reflects, in part, legacies of racism, evident in immigration restrictions, which illustrate a broad lack of acceptance in American society. Analysis of the National Asian American Survey of 2008 reveals factors that may potentially increase Asian Americans' political participation with different rates of success.

**Anna Lanoue '15 – see Tomisha Edwards '15**

*Building a Dance Thesis: Winter Semester Senior Dance Majors*

**Carol Dilley, Dance, Advisor**

**Megan Lapp '15**

*Peer and Self-Perceptions of Learning Differences*

**Rebecca Fraser-Thill, Psychology, Advisor**

In order to explore peer and self-perceptions of learning differences at Bates, a two-phase study was conducted. Study 1 consisted of focus groups with students with and without learning differences to better understand perceived stigma on campus, and whether some learning differences and accommodations are more legitimized than others. Study 2 utilized two Go/No-Go Association Tasks (GNATs) to test implicit bias against learning differences: an affective GNAT that tested whether participants associated learning differences more with general positive

or negative words, and an evaluative GNAT that followed the same format but used positive and negative terms related to competency.

**Trang Le '15, Benjamin Lovitz '15, and Steven Staffa '15**

***The Discrete Log Problem for Elliptic Curves***

**Adriana Salerno, Mathematics, Advisor**

Elliptic curves over finite fields have been widely used for public key cryptography over the past decade. Generally, an elliptic curve is the set of solutions to the equation  $y^2 = x^3 + ax + b$ , where  $a$  and  $b$  are constants. The key feature is that over a finite field the set of solutions follows a Group Law. Elliptic curves are preferred over classical cryptographic systems because they require fewer bits for the same level of security. For example, it is estimated that a key size of 4096 bits for RSA gives the same level of security as 313 bits in an elliptic curve system. After providing foundations of the complex mathematics behind elliptic curves over finite fields, we focus on the following methods of elliptic curve cryptography: Diffie-Hellman Key Exchange, Massey-Omura Encryption, and ElGamal Public Key Encryption. This poster is one of four developed by students in MATH 495H, Elliptic Curve Cryptography.

**Morgan Lee '15 – see Andrew Briggs '15**  
***Linear Cryptanalysis: A Dualistic Approach***  
**Adriana Salerno, Mathematics, Advisor**

**Bryan Lehrer '15**

***Ancient Fuel Reignited: Discovering Biomass and the Future of Maine Energy***

**Misty Beck, Environmental Studies, Advisor**

While many wait upon future innovations to serve as the panacea for our increasing clean energy demands, few realize this solution might already exist in the form of biomass. Join me to learn more about this fascinating fuel as I recount the surprisingly humble story of a biomass plant located in Livermore Falls, ME.

**Xintao Li '16**

***Dynamics of Self-organized Student NGOs in Guangzhou, South China***

**James Richter, Politics, Advisor**

In this full-time summer research in 2014, I interviewed eleven student-led NGOs that are mostly campus based and three youth-led social organizations focusing respectively on LGBTQ issues, educational issues, and environmental advocacy. In order to delve deeper into what impact region could have on crafting the features of its social sector, I conducted a few interviews with several student-led NGOs in Wuhan, a region which is supposed to have more governmental restrictions or even oppression on the development of social sector. In my presentation, I discuss the dynamics of these organizations' formal networks and their informal social networks as well as features they share in common in organizational operation.

**Emma Kate Lindsay '15 – see Adina Brin '15**  
***Jewess Perspectives on Modern Judaism and Social Issues***  
**Cynthia Baker, Religious Studies, Advisor**

**Benjamin Lovitz '15 – see Trang Le '15**  
***The Discrete Log Problem for Elliptic Curves***  
**Adriana Salerno, Mathematics, Advisor**

**Emma Lutz '15**

***A Community-Based Biology Thesis: Surveying Children's Oral Health and Nutrition in Cusco, Peru and Lewiston, ME***

**Karen Palin, Biology, Advisor**

Tooth decay imposes a serious disease burden for 60-90% of the world's children. Early childhood caries, ECC, is the most common chronic infectious disease of childhood. The goals of this project, carried out at The Root Cellar in the Lewiston-Auburn community, were to measure the prevalence and severity of tooth decay and examine the contributing nutrition/oral hygiene factors. The knowledge and attitudes of parents and guardians about ECC were assessed via interviews in order to develop relevant education materials and resources. Findings from this study are compared with similar work conducted in communities around Cusco, Peru.

**Erick MacLean '15**

***Nasal Carriage of Staphylococcus aureus and Methicillin-Resistant Staphylococcus aureus (MRSA) among Students at Bates College: Epidemiology, Risk Factors, and Antibiotic Susceptibility Patterns***  
**Lee Abrahamsen, Biology, Advisor**

*Staphylococcus aureus* is a well-recognized pathogen in clinical medicine. The bacterium can cause a variety of health conditions ranging from moderate infections to serious disease. In recent decades, the emergence of strains of *S. aureus* resistant to methicillin and other antibiotics has become a major public health threat worldwide. Methicillin-resistant *S. aureus* (MRSA) infections occur in both hospitals and the community, and are difficult to treat with general antibiotics. A characteristic of *S. aureus* is its ability to colonize healthy individuals, who show no symptoms of infection. Individuals who consistently carry *S. aureus* are termed persistent carriers, and studies show they may pose a risk of infection to themselves and others. This study examined the prevalence of *S. aureus* colonization and persistent carriage, risk factors associated with carriage, and antibiotic susceptibility of *S. aureus* isolates. Nasal swabs were obtained from a subset of the Bates student population at two time points to determine the prevalence, carriage, and antibiotic susceptibility of *S. aureus* on campus.

**Elena Mandzhukova '15**

***Evolution and Polymorphism of Two Expressed Major Histocompatibility Complexes Class II B genes in Leach's Storm-petrel: Resolving Problems with Sequencing Failure***

**Donald Dearborn, Biology, Advisor**

Pathogens shape the health and evolution of most species. Genes at the major histocompatibility complex (MHC)

defend animals against pathogens and link natural selection with mate choice. Prior efforts at characterizing Mhc class II  $\beta$  genotypes in Leach's storm-petrel, *Oceanodroma leucorhoa*, have succeeded in some individuals and failed in others. In the current study, we tested competing hypotheses for why DNA sequencing failed. Preliminary data suggest that primers anneal in two sites of the outer PCR product, producing an unreadable combination of exon and intron sequences. Eventual success at characterizing these MHC loci will illuminate balancing selection and evolutionary ecology.

**Daniel Mansuri '15**

***Compulsory Licenses: Damaging to Firms in the Short Term?***

**James Hughes, Economics, Advisor**

Compulsory licensing, or the power for a government to allow a non-patent holder to produce a patented good, are a method employed by countries to counteract endemic and epidemic disease issues. However, some companies worry that these licenses have a negative effect on business. I examine whether these licenses have a statistically significant effect on the stock price of the companies and discuss the implications of these results.

**Edwin Mapfuwa '15**

***Structural Characterization of the Diiron Active Site of Alkane Monooxygenase from Alcanivorax borkumensis***

**Rachel Austin, Chemistry, Advisor**

Understanding the electronic structure of metalloenzymes will be one step further in the advancement of bioremediation and production of biomimetic catalysts. A range of metalloenzymes are known to catalyze challenging chemical reactions using cheap and abundant transition metals. The non-heme diiron metalloenzyme  $\omega$ -alkane hydroxylase (AlkB) is one such enzyme that activates and catalyses reactions of inert C-H bonds. This study focused on the electronic structure of the non-heme diiron active site of AlkB from the oil degrading marine bacterium, *Alcanivorax borkumensis*. Purification of active AlkB was optimized and spectroscopic methods were employed to understand the diiron site. This study also focused on crystallization of pure and active AlkB in order to get insight on the 3D structure of the enzyme and assist in exploring the chemistry of the diiron active site.

**Samuel Mark '16 and Julia Savage '16**

***The Use of the Marine Bivalve Arctica islandica in Paleoclimate Reconstruction***

**Michael Retelle, Geology, Advisor**

As global climate changes, paleoclimatic reconstructions provide increasingly relevant glimpses into future climate scenarios. Carbonate shells of the marine bivalve *Arctica islandica* archive records of the marine climatic conditions during their formation. These bivalves serve proxies for historical sea surface temperature and salinity. Analysis of *A. islandica* from the northern Norwegian islands of Rolvsøya and Ingøya may generate growth chronologies, and provide an improved understanding of climatic variability throughout mid-Holocene period. This will also likely contribute to the understanding of the historic role of regional persistent climatic phenomena such as the North

Atlantic Oscillation and the Atlantic Meridional Overturning Circulation.

**Talia Mason '15 and Regan Radulski '15**

***The Creation of a Dance Thesis: Adventures in Creativity***  
**Carol Dilley, Dance, Advisor**

P.D. Ouspensky notes, "The artist... must possess the power to make others see that which they do not themselves see, but which he does see." In their senior dance theses, Talia Mason and Regan Radulski explored the intricacies of kinesthetically portraying their perspectives on the world. Mason shared the story of a Rwandan genocide survivor in *Kwibuka (Remember)*. In *micro:MACRO*, Radulski interpreted the similarities between protein and human interactions. Mason and Radulski describe their choreographic and academic processes in the creation of the senior dance thesis.

**Claire McGlave '15**

***Examining the Implementation of the Affordable Care Act in Maine***

**Heidi Taylor, Sociology, Advisor**

The Affordable Care Act is a monumental change in health care policy in the United States, enabling 1.42 million Americans to secure health insurance in its first year of implementation. This study examines the implementation of the ACA in Maine, and aims to understand the challenges and accomplishments associated with enrolling citizens in health care plans. There is a dedicated and organized community that cares about Maine residents finding health insurance, and this investigation aims to provide that community with a comprehensive and applicable set of recommendations to facilitate more successful and efficient enrollments in the future.

**Kara McGowan '15 – see Nicole Brill '15**

***Theory into Practice: Community-Engaged Research***  
**Darby Ray, Harvard Center for Community Partnerships, Advisor**

**Matthew McLaughlin '16**

***Opening Doors and Playing an Important Role in the World Economy: The Role of Foreign Direct Investment and Exports in the Domestic Cuban Economy***

**Stephen Sawyer, Office of Off-Campus Study, Advisor**

For many, the Cuban economy has been a long hidden uncertainty behind the impermeable walls of the American embargo. My semester abroad included a course at the prestigious research institute, the Center for the Study of the Cuban Economy (CEEC), where I studied the island economy of Cuba. My essays focus on foreign investment in Cuba, the Cuban export economy, and potential for technology in Cuba. My presentation includes a perspective on new developments in Cuba-U.S. relations.

**Catherine Merton '18**

***Animals and Nature in Defoe's Robinson Crusoe***  
**Nicholas Valvo, English, Advisor**

In *Robinson Crusoe*, Defoe uses animals as a recurring motif to criticize the way society views nature and settlement. Defoe's literary goal is to convey how people see nature as something that is made to be used and

manipulated. He critiques the idea that nature is useless or has no meaning until man makes use of it, as well as the tendency of society in settlement to put their own convenience over nature and life on earth. Defoe's use of animals in the story, specifically Crusoe's treatment of wild versus domesticated animals, conveys Crusoe's attitude toward civilization and nature.

**Meredith Miles '15**

***Vocal Performance in the Chipping Sparrow: Can a Bird Change His Song?***

**Donald Dearborn, Biology, Advisor**

Bird song is a novel animal signal that serves as the primary method of mate attraction in most songbirds, a group that accounts for the majority of bird species worldwide. While it has been established that there is a wide range in song quality among individuals, and that high-quality vocal performance tends to attract more mates, less is known about the effects of differing vocal performance on the behavior of other competing males. Furthermore, it has not been established whether individual birds can alter their own vocal performance quality in response to different situations. In some birds that sing a trilled vocalization, it is possible to quantitatively define the vocal skill required to produce a given song. Over the course of a single breeding season, chipping sparrows were captured, color-banded, and recorded as they sang spontaneously. In a playback experiment simulating territorial intrusions by both high- and low-quality males, tested birds did not modulate any song characteristics with changing intruder quality, except for two cases of marginal insignificance in bandwidth and vocal deviation. These results suggest that chipping sparrows may be reacting aggressively to intruders by changing their behavior outside of vocal performance, which is possibly locked in place by physical constraints.

**Alexandra Millstrom '15**

***Counteractive Effects of Intermittent Hypercapnic Hypoxia and Intermittent Hyperoxia on Respiratory Control***

**Ryan Bavis, Biology, Advisor**

In clinical situations, intermittent hyperoxia usually alternates with hypercapnic hypoxia. In this study, rats were exposed for the first two postnatal weeks to one of three treatments: normoxia (control), intermittent hypercapnic hypoxia (I21/10), or intermittent hyperoxia + hypercapnic hypoxia (I30/10). I30/10 rats expressed a slightly higher baseline ventilation than controls immediately after treatment, which corresponds to their elevated resting metabolic rate; this trend continued into adulthood. Hypoxic and hypercapnic ventilatory responses were not different between I30/10 rats and controls, suggesting that intermittent hypercapnic hypoxia counteracts the effects of intermittent hyperoxia on respiratory control development.

**Lydia Mitchell '15 – see Nicole Brill '15**

***Theory into Practice: Community-Engaged Research***  
**Darby Ray, Harvard Center for Community Partnerships, Advisor**

**Mahad Mohamed '17 and Adam Rintell '17**

***Roots and Ramifications of the Somali Civil War***

**Elizabeth Eames, Anthropology, Advisor**

Education can be an aspirational foundation for democracy. A working educational infrastructure can be a vessel for a developing nation, bringing it closer to political, economic, and social stability. We are interested in the historical roots of the current educational and security situation in Somalia. Our goal is to establish a working background knowledge about the past 100 years in Somalia. We are especially interested in the impact of colonialism on the education system today, as well as the effects of Western involvement on Somalia's current political systems.

**Asha Mohamud '15**

***Tuberculosis: Refuge and Immigrant Population in Lewiston, ME***

**Lee Abrahamsen, Biology, Advisor**

Latent Tuberculosis (LTB) is a widespread, and potentially serious infectious disease that can reactivate to its contagious form. Although LTB can be cured by regular intake of antibiotics, it continues to be a global public health problem. While the incidence of active and latent TB infection in the United States has continued to decline, its prevalence among foreign-born individuals is increasing. The side effects of the antibiotics used to treat LTB, common misconceptions about the disease, and language and other communication issues surrounding treatment all affect drug regimen compliance. The goal of my work is to use a community-based approach to attempt to improve LTB drug compliance in the immigrant population in Lewiston.

**Cira Mollings Puentes '16 – see Alison Dowey '15**

***Cationic Cyclodextrins as Chiral NMR Solvating Agents***  
**Thomas Wenzel, Chemistry, Advisor**

**Alyssa Morgosh '15**

***Improving Healthy Concussion Reporting Behaviors in Student Athletes***

**Susan Langdon, Psychology, Advisor**

Between 1.6 and 3.8 million sports-related traumatic brain injuries occur in the United States every year, resulting in psychosomatic symptoms that have negative athletic, academic, and social implications, and sometimes prolonged functional impairment (Gavett, Stern, & McGee, 2011). Despite the need for good medical intervention, primarily rest, many athletes do not report concussions or they underreport symptoms. This study addresses the reporting deficit by looking more closely at barriers to reporting as well the factors that led to honest and accurate reporting in college student athletes. An intervention is presented based on these measures.

**Kathleen Morrill '15**

***Genetic Diversity and the 2013 Decline of Eelgrass (*Z. marina*) Populations in the Frenchman Bay, ME***

**Larissa Williams, Biology, Advisor**

Eelgrass beds serve a vital marine role, providing estuaries for young fish and shellfish, invaluable to commercial supplies of seafood in Maine. Since 1996, the coverage of eelgrass in the Frenchman Bay, ME, reduced from 3,000 to

200 acres; in 2013, major restoration areas disappeared. Invasive green crabs, which voraciously target young shellfish and clip through eelgrass, may be contributing to loss. Genetic diversity of eelgrass may explain differences in survival between populations, imparting more resistance to disturbance. Genetic diversity of six populations across Mount Desert Island was quantified with microsatellite data analysis and correlated with loss susceptibility.

**Jacob Nemeroff '16**

***The Final Voices of a Generation: Oral Accounts of First-Generation Tibetan Exiles and Their Experiences in Pre-Occupied Tibet***

**Stephen Sawyer, Office of Off-Campus Study, Advisor**

This presentation focuses on oral histories of first-generation Tibetan exiles and, specifically, their experiences in a pre-occupied Tibet. Oral history is an integral way to preserve Tibetan culture and establish a collective Tibetan identity. The exiles' stories can inform outsiders of Tibet's rich culture and the dynamic narrative of exiles' struggles against the People's Republic of China. The oral accounts were provided by Tibetan refugees residing in refugee settlements in Pokhara, Nepal.

**Mickoy Nichol '18 – see Thomas Endean '18**

***First-Year Seminar Scanning Tunneling Microscope Construction Project: Mechanical Design***

**Matthew Côté, Chemistry, Advisor**

**Jessica Nichols '15 – see Nicole Brill '15**

***Theory into Practice: Community-Engaged Research***  
**Darby Ray, Harvard Center for Community Partnerships, Advisor**

**Aaron Nickelsberg '15 and Daniel Willsey '18**

***The Problem of Non-Interference: China's Involvement in South Sudan***

**Elizabeth Eames, Anthropology, Advisor**

Chinese direct investment in Africa now plays a central role in shaping African nations' economies. Spurred by an interest in natural resource extraction, China couples generous aid packages with a non-interference policy to enable economic cooperation regardless of the presence of possible human rights abuses. This study takes a multi-perspective approach to analyze Chinese direct investment in South Sudan. Currently, South Sudan exports two-thirds of its oil to China, accounting, however, for less than one percent of Chinese oil imports. Through analysis of Chinese, Sudanese, and Western scholars, as well as a variety of media outlets, we argue that China's non-interference policy allows the Chinese to leverage their economic position to exploit South Sudan's natural resources without enabling quality of life improvements for the South Sudanese.

**Rebecca Norman '15 – see Lila Chalabi '15**

***Lattices and Cryptography***

**Adriana Salerno, Mathematics, Advisor**

**Akachukwu Obi '15**

***Nonlinear Optical Behavior in Plasmonic Gold Nanoparticles***

**Matthew Côté, Chemistry, Advisor**

Interaction of light with metal nanoparticles results in strong electric field confinement due to localized surface plasmons (LSPs), which can be harnessed for cancer therapy, bioimaging, and photonics. Due to LSPs, gold nanoparticles are capable of optical harmonic generation such that they can emit photons with twice or thrice the frequency of light they are excited with. I studied such nonlinear optical behavior using total internal reflection dark field imaging, pulsed infrared laser nonlinear spectroscopy, Fourier plane imaging microscopy, and computational electrodynamics. I also employed scanning electron microscopy to study morphology of gold nanoparticle assemblies responsible for the observed optical signals.

**Julia Ofman '15 – see Adina Brin '15**

***Jewess Perspectives on Modern Judaism and Social Issues***

**Cynthia Baker, Religious Studies, Advisor**

**Rebecca O'Neill '15**

***Haunting Faces from the Desert of Juarez***

**Claudia Aburto Guzmán, Spanish, Advisor**

My presentation uses Roberto Bolaño's novel *2666* to propose that fiction can raise public consciousness of current social horrors. I explain how Bolaño's desensitized depiction of the murders in Juarez (through the fictional city of Santa Teresa) reveals society's passivity to the repetition of the twenty-year phenomenon and lack of state protection. The presentation connects the murders in the book to actuality through a collage of actual murder victims and images of Juarez, overlaid with text from the novel to demonstrate that fiction contextualizes real horrors, raising social awareness, and prohibiting the reader from escaping the disturbing reality.

**Jacqueline Ordemann '15**

***The Role of Lead in the Etiology of Mental Illness***

**Rachel Austin, Chemistry, Advisor**

Lead poisoning during child development has been implicated as a cause of mental illnesses including autism, schizophrenia, and Alzheimer's. Here in Lewiston, 2.2% of children aged 0 to 71 months have elevated blood lead, about three times the state average. Even with its importance to human health in our community and others worldwide, the mechanism of lead poisoning is still unknown. Lead has been shown to prevent transcription factors containing zinc finger motifs from binding to DNA. In this study, the possibility that the replacement of zinc in these proteins with lead causes the negative mental health effects of lead poisoning is reviewed.

**Graham Oxman '15**

***Petrogenesis and Paleostress Analysis of Mesozoic Intrusions in the Mount Dartmouth 7.5' Quadrangle, NH***

**J. Dykstra Eusden, Geology, Advisor**

Field work done during summer 2014 in the Mount Dartmouth 7.5' Quadrangle, NH, revealed a 100 meter

wide, 7.8 kilometer long zone containing multiple mafic dikes at the junction of NH Rt. 115 and Cherry Mountain road. The largest dike is approximately 25 meters in width, comparable in size to the largest dikes mapped in the Northeast. Alteration of minerals and cataclasis of the grains indicate hydrothermal alteration during faulting. The Mill Brook Dike Zone is likely younger than the Late Cretaceous New England-Quebec igneous province and records a significant period of basaltic magmatism during E-W extension in the Cretaceous.

**Daniel Oyolu '15**

***Jewish Law vs. Roman Law in the Gospel of Luke***  
**Margaret Imber, Classical and Medieval Studies, Advisor**

Both Jesus Christ and the Apostle Paul must engage the Roman legal system at multiple points in their lives and act as defendants against accusations from Jewish religious leaders and teachers of the law. The Gospel writer Luke (who wrote both the Gospel of Luke and the Book of Acts of the Biblical New Testament) expresses an implicit preference for the Roman system of law over the Jewish alternative.

**Molly Paillet '15**

***Czech Secularism and Spirituality, Glimpses through a Shattered Stained-Glass Past: Contemporary National and Personal Identity***

**Jakub Kazecki, German, Advisor**

After a history of religious wars, movements, and suppressed religious activity during Communism, the Czech Republic continues to secularize. How do Czechs understand themselves, individually and nationally, within this secular context and how can the secularity of the Czech Republic be explained? A vital source of information for my thesis came from the interviews and surveys that I conducted while on a Barlow-funded research trip in the Czech Republic this December. I lead listeners through the activities and interview methodology I used so that they could better understand how I went about collecting the material that I use to explore my questions. I want listeners to place themselves in the shoes of my interviewees to gain a sense of how they conceptualize their own ideas about their identity in relation to spirituality, religion, and nationality.

**Jia-Ahn Pan '16**

***The Nonlinear Optical Properties of Various Plasmonic Gold Nanoparticle Arrangements***

**Matthew Côté, Chemistry, Advisor**

Localized surface plasmons, which are quantized oscillations of conduction electrons in nanoparticles, are able to physically concentrate light into subwavelength volumes. This effect amplifies the electric field and nonlinear optical signal, making it potentially useful in the probing of electric fields, single-molecule spectroscopy, and nanoscale chemistry. We measured the nonlinear optical response of various plasmonic gold nanoparticle arrangements excited by femtosecond infrared laser pulses. To identify the features of each optical source, we used a scanning electron microscope and a lab-built total internal

reflection darkfield imaging system coupled to an imaging spectrometer.

**Courtney Parsons '15**

***The Distribution of Metabotropic Glutamate Receptors in the Central Nervous System of the Pond Snail, Helisoma trivolvis***

**Nancy Kleckner, Biology, Advisor**

Metabotropic glutamate receptors (mGluRs) play a major role in triggering the inhibitory functions within the three phases of the feeding system of the pond snail, *Helisoma trivolvis*. The distribution of mGluRs has yet to be localized. Immunocytochemistry was used to determine whether mGluRs exist in *Helisoma* CNS. Two antibodies to vertebrate mGluR2 sequences were tested, followed by fluorescent secondary antibodies observed with fluorescence microscopy. The antibodies did not selectively bind to CNS tissue. These results suggest that either the specific antibodies used did not work for this species or that mGluR2-like receptors are not present in the feeding system.

**Tara Patel '15**

***An Investigation into the Use of Traditional Medicine and Remedies in the African Immigrant Population in Lewiston, ME***

**Karen Palin, Biology, Advisor**

Traditional medicines and remedies are commonly used in many sub-saharan African countries. This study aims to evaluate and investigate the use of similar remedies in the new American population of African refugees and asylum seekers in Lewiston, ME. Data was collected from community health and warming centers in downtown Lewiston through interviews and surveys with participants. Many of the traditional remedies and medications used contain ingredients similar to those found in Western medicines. Some traditional medicines and remedies used by the new American population were similar to those used in some Asian countries.

**William Patton '15**

***Organic-soluble Chiral Resorcinarenes as NMR Solvating Agents***

**Thomas Wenzel, Chemistry, Advisor**

We are preparing a series of organic-soluble, bridged resorcinarenes that will be evaluated as chiral NMR solvating agents. The bridging reaction between the hydroxyl groups of adjacent resorcinol rings locks the cone configuration into place. Methyl resorcinarene is prepared using acetaldehyde and 2-methylresorcinol. Adjacent hydroxyl groups are then bridged using bromochloromethane. The aryl methyl group of the bridged methylresorcinarene is then brominated. Finally, enantiomerically pure primary or secondary amines can be attached to provide organic-soluble chiral resorcinarenes. Our efforts to prepare and evaluate the organic-soluble resorcinarenes as chiral NMR solvating agents will be described.

**Sophia Pellegrini '15** – see **Nicole Brill '15**  
*Theory into Practice: Community-Engaged Research*  
**Darby Ray, Harvard Center for Community Partnerships, Advisor**

**Christopher Pelz '16, Jonathan Pelz '16, and Ariscell Tavarez '17**

*Japanese Calligraphy*

**Keiko Ofuji, Japanese, Advisor**

Calligraphy is a traditional art form practiced in Japan. It is a meditative activity that requires concentration, controlled breathing, and relaxed arm movements. One of the goals for calligraphers is to try and create balance between the strokes of the symbol and the perimeter of the paper. While many strive to create perfect symbols, the actual beauty and finesse of calligraphy comes from the subtle imperfections that the artist might create. Faded ink lines are not mistakes that show mediocrity, but instead they give the symbol a personal characteristic.

**Jonathan Pelz '16** – see **Christopher Pelz '16**

*Japanese Calligraphy*

**Keiko Ofuji, Japanese, Advisor**

**Theodore Pender '18** – see **Thomas Endean '18**

*First-year Seminar Scanning Tunneling Microscope Construction Project: Mechanical Design*

**Matthew Côté, Chemistry, Advisor**

**Jillian Pengeroth '15**

*Film Reviews and the Negativity Bias vs. Positivity Effect across Generations*

**Katherine Mathis, Psychology, Advisor**

Film is a major industry in the United States that brings in billions of dollars in revenue each year. Among many other factors, critical reviews can be persuasive when considering whether to go see a movie. Research has shown that negative reviews have more of an effect than positive reviews. It has also been found that the negativity bias is less prevalent in older adults, who instead tend to show a positive effect. Differences in age were examined in order to determine whether individuals are more prone to the negativity bias as younger adults and whether older individuals tend to show a positive effect. I expected that younger individuals would be less interested in movies that received negative reviews than older individuals, and that older individuals would show more interest in films that received positive reviews than younger individuals. Participants were recruited through Amazon's Mechanical Turk and were asked to read fabricated movie reviews that were either neutral, positive, or negative. They then responded to questions about their interest in each specific film. While there was a significant main effect of review type and age group, there was no interaction between the two variables. Older individuals were significantly more positive in general, and also were significantly more affected by negative reviews than positive reviews, whereas younger individuals were equally affected by positive and negative reviews.

**Justin Pertierra '17** – see **Gabriella Chua '18**

*"This Disease is Un-African!" The Culturally Destructive Implications of Ebola in Western Africa*  
**Elizabeth Eames, Anthropology, Advisor**

**Emmett Peterson '17** – see **Gabriella Chua '18**

*"This Disease is Un-African!" The Culturally Destructive Implications of Ebola in Western Africa*  
**Elizabeth Eames, Anthropology, Advisor**

**M. Lane Peterson '15**

*Lewiston, Munich, Hausach, Places of Intercultural Experience: Approaches to the Poetry of José F. A. Oliver.*

**Raluca Cernahoschi, German, Advisor**

My German studies thesis engages place-based poetry in German and the United States. Split into three chapters, the thesis includes literary analysis and translation of Spanish-German poet José F. A. Oliver as well as my personal writing. In doing so, it showcases the ability to connect far-away and culturally distinct places through the human experience of difference. Whether in countries, cafés, or the forest, Oliver's perception of himself and his sense of identity and home is reflected in his writing; regardless of background, these concepts transcend language.

**Michelle Pham '15**

*Deconstructing Lingerie: Under the Garments*

**Emily Kane, Sociology, Advisor**

My sociology thesis research is an analysis of interviews with lingerie start-up founders (Dear Kates) and lingerie designers from major shareholders in the market (Cosabella, Victoria's Secret) as well as data extrapolated from focus groups and surveys. My goal is to shape an understanding of consumer behavior and women's relationships with lingerie focusing on the 18-34 age demographic. Using sociological theory and fashion history, I explored the evolution of women's shapewear and undergarments to the contemporary bra-pantie set. Is lingerie itself inherently a constraining and restrictive concept or is it a form of self-expression, sexuality, and liberation? What growth is expected in the industry with technological advances? How can women spearhead a new movement in lingerie that is more representative and empowering?

**Minh-Tam Pham '15**

*Investigating the Transcriptional Regulation of the Nuclear Factor erythroid-2 related factor (nrf) Family by the Aryl Hydrocarbon Receptor-1b (Ahr1b), through Chromatin Immunoprecipitation in Danio rerio Embryos during Early Development*

**Larissa Williams, Biology, Advisor**

Bulky chemicals can interfere with genetic fidelity by causing DNA adducts. Two gene families that encode transcription factors, that of the Nuclear factor erythroid 2-related factor (Nrf) and the Aryl hydrocarbon receptor (Ahr), regulate genes involved in chemical metabolism. There is evidence for crosstalk between Ahr and Nrf, demonstrated by the reduction of Nrf expression upon Ahr knockout in developing zebrafish. This thesis aims to

explore the cis-regulatory mechanism between the two transcription factors using chromatin immunoprecipitation (ChIP) in zebrafish embryos. ChIP will determine if there is an interaction between the Ahr-1b protein and the regulatory region of Nrf genes.

**Lauren Piccirillo '15**

***The Relationship between Women's Color Choices and Their 2D:4D Ratio***

**Georgia Nigro, Psychology, Advisor**

Research has shown that prenatal androgen exposure in adults can be measured by looking at 2D:4D ratios of the hands. Studies have also suggested that adult drawing behaviors may be correlated with levels of androgen exposure during prenatal development in women. The current study explored drawing behaviors, specifically color choice, in adult women's drawings in relation to 2D:4D ratios. There were 79 participants in this study, all of whom were female undergraduates ages 17-22. All of the participants in this study performed a coloring task and had their second and fourth digits on both their left and right hands measured. Correlational analyses revealed a positive relationship between coolness of colors and ratios, such that the use of cool colors corresponded to higher, more feminine, 2D:4D ratios,  $r(77) = .321$ ,  $p = .004$ . These findings inform the ongoing debate over 2D:4D ratio, early androgen exposure, and its effects on adult women's behavior.

**Amanda Pierog '15**

***Do Military Benefits Include Hiring Premiums? A Post-Military Employment Audit Study***

**Margaret Maurer-Fazio, Economics, Advisor**

This resume audit study explores how young veterans fare in the hiring processes of civilian labor markets. In the summer of 2014, we submitted 5,600 paired civilian and veteran resumes of fictitious white, black, and Hispanic candidates to job openings posted on Internet job boards and carefully tracked their callbacks. We found that veterans were neither advantaged nor disadvantaged in obtaining callbacks in comparison to civilians. When examining firm callback patterns, we found that the types of firms with the highest propensity to call back both candidates had the lowest propensity to only call back a veteran when calling a single candidate.

**Austin Portal '15**

***Bioinformatics and RNA Secondary Structure***

**Paula Schlax, Chemistry, Advisor**

RNA secondary structure plays a significant role in protein regulation. RNA molecules that are important to particular functions within an organism tend to have conserved structures which can be modeled with bioinformatic tools. When a specific RNA structure is compared across several species or families, conserved regions can be found and postulations about which regions are necessary for gene function can be made. This project uses the genetic sequences of species within the spirochaete phylum, bioinformatic tools, and custom software in order to learn more about RNA structures that encode proteins related to Lyme disease.

**Nicholas Pray '15 and Nabil Saleem '15**

***Role of Nfe2 in the Oxidative Stress Response across Development in Zebrafish Embryos***

**Larissa Williams, Biology, Advisor**

Oxidative stress leads to free radicals that can steal electrons from proteins, lipids, and nucleic acids. Mechanisms of oxidative stress regulation at the embryonic stage are not well known. The transcription factor Nfe2 may be a key oxidative stress regulator influencing antioxidant gene expression during embryonic development of *Danio rerio*. Affected genes include quinone reductases and glutathione synthesis genes, such as nqo1, gclc, and gsr. To clarify Nfe2's role, zebrafish embryos with and without the Nfe2 protein are exposed to pro-oxidant chemicals at three distinct developmental time points and qPCR is used to determine candidate gene expression patterns.

**Noah Prince '15**

***The Effect of Hyperbaric Oxygen Treatment on the Growth of Bacteria in Chronic Wound Biofilms***

**Lee Abrahamsen, Biology, Advisor**

The high morbidity, mortality, and cost of chronic wounds are significant public health problems in the United States. Treatment of chronic wounds is often hampered by the presence of bacterial biofilms, communities of bacteria that stick to the tissues of wounds and increase resistance to antibiotics. Hyperbaric oxygen (HBO) offers an alternative treatment that can improve wound healing. To develop a better understanding of how HBO affects the growth of these biofilms, I used an in vitro model that compared HBO treated and untreated biofilms by monitoring the rates of synthesis of certain growth-related proteins using molecular biology techniques.

**Naima Qambi '15**

***The Effect of Closeness in Relationship to Parents on the Perceived Experience of Emerging Adulthood:***

***A Cross-Cultural Study***

**Helen Boucher, Psychology, Advisor**

American ideals stress the importance of independence and freedom, which are communicated to youth of different ages. For emerging adults (ages 18-25), research by Arnett (2000) and others has found that there are three main ways emerging adulthood differs from adolescence and young adulthood: demographically, subjectively, and in terms of identity exploration. The current study seeks to explore these theories within the context of Somali emerging adults, and compares their feelings of emerging adulthood to their American-born counterparts. The implications of this study will add to the study of culturally based definitions of stages of development, especially in terms of emerging adulthood, and also add to the literature for research targeting a minority group living within the larger U.S. context.

**Julia Rabin '15**

***A Cross-Cultural Analysis of Political Motivations***

**Amy Douglass, Psychology, Advisor**

The purpose of this study is to measure qualitatively and empirically how political motivations differ cross-culturally among emerging adults. Using a total of 100 participants



between the ages of 18 and 23, data were collected in Chile, from students who attended Pontificia Universidad Católica de Valparaíso between January 2, 2015 and January 12, 2015. The interviews collected qualitative data on how the participants defined the phase of life they were in, as well as their political motivations and how these motivations related to their peers, family, and national culture. The survey empirically measured emerging adulthood, dialectical thinking, and political activism. Similar data were collected from Bates College students during winter semester 2015. It can be predicted that Bates College students will score significantly higher than Chilean students on the dialectical thinking section of the survey, while Chilean students will score significantly higher on the political activism portions.

**Regan Radulski '15 – see Talia Mason '15**  
*The Creation of a Dance Thesis: Adventures in Creativity*  
Carol Dilley, Dance, Advisor

**Chloe Read '15**  
*Endogenous Brain-Derived Neurotrophic Factor and Its Relationship with Affective Flexibility and Mood Disorders*

**Nancy Koven, Psychology, Advisor**  
Affective flexibility involves adaptation to varying emotional situations, a skill that can predict a person's tendency toward ruminative depression. The aim of this study is determine if urinary BDNF concentration is correlated with affective flexibility and whether low BDNF and insufficient affective flexibility, in turn, predict higher rates of self-reported emotion dysregulation. Subjects were administered psychiatric questionnaires and given a behavioral affective flexibility task. BDNF concentration was determined via enzyme-linked immunosorbent assay. The study advances our knowledge of the biological basis for affective rigidity common in depression and other mood disorders.

**Emily Regan '15 – see Kathryn Davis '15**  
*Reward Sensitivity and Attention in Orthorexia Nervosa*  
Nancy Koven, Psychology, Advisor

**Brittany Reid '15 – see Nicole Kanu '15**  
*"The Great Debate!" Understanding Racial Quotas in South Africa*  
Elizabeth Eames, Anthropology, Advisor

**Students in Rhetoric 120, Introduction to Screen Studies, and Rhetoric 240, Film Theory**  
*Exploring Film and Identity through the Video Essay*  
Jonathan Cavallero, Rhetoric, Advisor

In both Introduction to Screen Studies (RHET 120) and Film Theory (RHET 240), students work in teams to complete a video essay assignment. The videos they produce work to convey the content of a more traditional paper in a video format. Students learn to grab clips, work with video editing software like Final Cut Pro, and familiarize themselves with techniques for recording voice-over narrations. The videos in Introduction to Screen Studies offer formal analyses of individual scenes in order to understand how cinematography, editing, sound, and

mise-en-scène work to convey thematic content. In their video, Matthew Kahn and Eva Goldstein focus on Francis Ford Coppola's *The Conversation* and its interest in paranoia and the unknown. Meanwhile, Michaela Britt, Caroline Mitchell, and Rosy DePaul's video looks at how the main character of *(500) Days of Summer* works to reconcile his expectations of a relationship with reality. In Film Theory, students create videos that investigate issues of identity and representation. Nora Kenny, Rosy DePaul, and Gerald Nelson's essay investigates the representation of sexuality in *Brokeback Mountain*. Cece Carey-Snow, Whitney Lees, and Michael Britt look at gender representations in *Dallas Buyers Club*. Amanda San Roman and Audrey Burns consider issues of gender in *Do the Right Thing*. Ultimately, these videos frame students not just as media consumers but also media producers who create media that recognizes the artistry of film and comments on important representational issues.

**Isaiah Rice '15 – see Tomisha Edwards '15**  
*Building a Dance Thesis: Winter Semester Senior Dance Majors*  
Carol Dilley, Dance, Advisor

**Adam Rintell '17 – see Mahad Mohamed '17**  
*Roots and Ramifications of the Somali Civil War*  
Elizabeth Eames, Anthropology, Advisor

**Yolanda Rodriguez '15 – see Tayla Duarte '17**  
*Chiral NMR Differentiation of Primary Amines with (18-crown-6)-2,3,11,12-Tetracarboxylic Acid*  
Thomas Wenzel, Chemistry, Advisor

**Benjamin Roop '18 – see Hanna De Bruyn '18**  
*First-Year Seminar Scanning Tunneling Microscope Construction Project: Electronics*  
Matthew Côté, Chemistry, Advisor

**Santiago Rozas '18 – see Thomas Endean '18**  
*First-Year Seminar Scanning Tunneling Microscope Construction Project: Mechanical Design*  
Matthew Côté, Chemistry, Advisor

**Sophia Salas '15**  
*Role of Nfe2 in the Oxidative Stress Response in Zebrafish, Danio rerio, across Development*  
Larissa Williams, Biology, Advisor  
During development, organisms are extremely sensitive to stressors, including pro-oxidants, chemicals that generate reactive oxygen species. The Nfe2-related factor (Nrf) family of proteins regulates the response to pro-oxidants. To study the role of one Nrf protein, Nfe2, in this response, the zebrafish was used because our genomes are 80% alike, allowing for the extrapolation of results. In the presence and absence of Nfe2, fish were dosed with the pro-oxidant tert-butyl hydroquinone (tBHQ), a food preservative, at key developmental time points. Changes in the expression of genes thought to be involved in the response to pro-oxidants were determined through qPCR.

**Nabil Saleem '15** – see **Nicholas Pray '15**  
*Role of Nfe2 in the Oxidative Stress Response in Zebrafish, Danio rerio, across Development*  
**Larissa Williams, Biology, Advisor**

**Julia Savage '16** – see **Samuel Mark '16**  
*The Use of the Marine Bivalve Arctica islandica in Paleoclimate Reconstruction*  
**Michael Retelle, Geology, Advisor**

**Martha Schnee '15** – see **Nicole Brill '15**  
*Theory into Practice: Community-Engaged Research*  
**Darby Ray, Harvard Center for Community Partnerships, Advisor**

**Anne Schwarzwaldner '15**  
*Quantifying Ribonuclease mRNA Levels in Borrelia burgdorferi*  
**Paula Schlax, Chemistry, Advisor**  
*Borrelia burgdorferi*, the bacterial agent of Lyme disease, must undergo key changes in gene expression to navigate its transition between insect and mammalian hosts during its natural life cycle. Ribonuclease-mediated mRNA degradation is one facet of gene regulation essential to such transitions. Previous work has shown that *B. burgdorferi* harbors a unique set of ribonucleases, suggesting that the mechanisms of mRNA degradation in *B. burgdorferi* may differ from that of related organisms. The present experiment quantitates the presence of known ribonucleases in two strains of *B. burgdorferi* in order to assess which ribonucleases may be most important in facilitating mRNA degradation.

**Andrew Seaton '15** – see **Andrew Briggs '15**  
*Linear Cryptanalysis: A Dualistic Approach*  
**Adriana Salerno, Mathematics, Advisor**

**Adnan Shami Shah '15**  
*Lead Binding to Metallothionein-3: Implications in Human Lead Toxicity*  
**Rachel Austin, Chemistry, Advisor**  
Metallothionein-3 (MT-3), a brain-specific, low molecular-weight protein with two metal-thiolate clusters, contains 20-cysteines capable of binding 7-divalent or 12-monovalent cations. The binding of  $Pb^{2+}$  with MT-3, and the displacement of  $Zn^{2+}$  in MT-3 by  $Pb^{2+}$  using isothermal titration calorimetry (ITC) was studied. Displacement experiments showed a mono-phasic process of metal binding and displacement. EDTA chelation experiments in Zn7MT-3 and Pb7MT-3 indicated a multiphasic process of metal removal suggesting protein rearrangements in the process. Thermodynamic data suggests a favorable and strong Pb-MT-3 interaction, useful to elucidate lead biochemistry and the molecular mechanism of lead poisoning in biological systems in vivo.

**Benjamin Smiley '15** – see **Lila Chalabi '15**  
*Lattices and Cryptography*  
**Adriana Salerno, Mathematics, Advisor**

**Rebecca Smith '16**  
*Synthesizing CO<sub>2</sub>-Bearing Glasses in the SiO<sub>2</sub>-NaAlSiO<sub>4</sub>-KAlSiO<sub>4</sub> System*

**Geneviève Robert, Geology, Advisor**  
Melt viscosity is one of the most significant factors influencing volcanic processes. Previous studies indicate that H<sub>2</sub>O as a volatile always decreases melt viscosity. The goal of this study is to measure the effect of CO<sub>2</sub> as a volatile on melt viscosity. I am developing a method to synthesize CO<sub>2</sub>-bearing glasses in the SiO<sub>2</sub>-NaAlSiO<sub>4</sub>-KAlSiO<sub>4</sub> system. Previous studies suggest that the effects of CO<sub>2</sub> on viscosity are more apparent in potassic-rich melts, making the system of this study ideal for viscosity measurements. In order to synthesize glasses with different concentration of CO<sub>2</sub> at atmospheric pressure, I will utilize a technique of incomplete decarbonation of several carbonate-oxide powder mixtures. These powders will then be melted at 1600°C and quenched to glass. The glasses will be used in viscosity experiments to determine the effects of CO<sub>2</sub> and the Na/K ratio on melt viscosity.

**Quincy Snellings '15**  
*Is Whiteness Privileged? A Study of Bates Students' Racial Awareness*

**Emily Kane, Sociology, Advisor**  
Since its founding in 1855, Bates' doors have been open to women and people of color. As a predominantly white, yet historically inclusive institution, Bates is a particularly compelling study of a "white campus." This presentation investigates Bates students' awareness of whiteness and its impact on their college experience. I examine students' awareness of white privilege in four "clusters:" social privilege, institutional privilege, cultural privilege, and academic privilege. From this vantage point, I propose that white students, although aware that race may impact their college experience, are hesitant to fully acknowledge the extent to which whiteness works to privilege them.

**Juwon Song '15**  
*Literary Reading by Creative Thesis Writers*  
**Robert Farnsworth, English, Advisor**

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

**Steven Staffa '15** – see **Trang Le '15**  
*The Discrete Log Problem for Elliptic Curves*  
**Adriana Salerno, Mathematics, Advisor**

**Jason Stephansky '15**  
*Analysis of Carbon Storage Regulator A (CsrAB) in Borrelia burgdorferi*

**Paula Schlax, Chemistry, Advisor**  
Lyme disease has become major form of vector-borne diseases in the United States. *Borrelia burgdorferi*, the agent of Lyme disease, must utilize rapid gene expression regulation for survival and virulence throughout its enzootic cycle. As such, *B. burgdorferi* uses the RNA-binding protein carbon storage regulator A (CsrA), a key regulatory protein in many bacterial species. In *Borrelia*,

CsrA inhibits the production of proteins required for virulence. By identifying and analyzing CsrA binding sites in *Borrelia*, we hope to gain further insight into the proteins function. Through further understanding the proteins involved in *B. burgdorferi* virulence, potential treatments for Lyme disease arise.

**Nicholas Steverson '15**

*Legal Charges against Paul and the Early Christians under Imperium*

**Margaret Imber, Classical and Medieval Studies, Advisor**

The religious context of Rome differed from the current American context in that there was no declared separation of church and state: political, economic, and other important decisions were often made on the bases of religious practices. Christian refusal to participate in Roman religious ceremony was interpreted as antisocial behavior that could harm the state. While institutionalized persecution did not come until later in the Empire and "being Christian" itself was not a crime early on, early Christians could still face specific legal charges that attacked their religious practice. This talk uses Paul as an example to understand these charges.

**Christina Stiles '15**

*Optimization of the Purification and Crystallization of Alkane Monooxygenase (AlkB) Enzyme from Alkanovorans borkumensis*

**Rachel Austin, Chemistry, Advisor**

With the recent increase in large oil spills, it has become important to understand at the molecular level the mechanism by which organisms such as *Alkanovorans borkumensis* are able to oxidize alkanes. Alkane monooxygenase (AlkB) is an enzyme that catalyzes the oxidation of medium-length carbon chains (C5-C32). This membrane spanning protein is part of a multiprotein alkane oxidizing system, along with rubredoxin and reductase. It is known to have a histidine-rich diiron active site but aside from that, not much is known about its tertiary structure. To better understand how AlkB functions, we must first understand its structure by successfully purifying and crystallizing the protein. This research focuses on the use of affinity tags to improve the purification and crystallization process. AlkB has not yet been successfully crystallized but the purification results show promising progress.

**Shelby Sullivan '15**

*Literary Reading by Creative Thesis Writers*

**Robert Farnsworth, English, Advisor**

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

**Christian Sundstrom '15**

*Synthesis of Ashitabaol A*

**Jennifer Koviach-Côté, Chemistry, Advisor**

Ashitabaol A, a naturally occurring compound extracted from the Japanese ashitaba plant (*A. keiskei*), has been shown to act as a strong antioxidant and exhibit free radical scavenging activity. Free radicals have the ability to react with and alter biologically important molecules in the body

such as DNA and proteins, which can lead to diseases such as cancer. Efficient synthesis of this compound in a laboratory setting can allow for further testing regarding its antioxidant activity and hopeful eventual implementation into certain medicinal products on a mass scale.

**Deeping Syangtan '18 – see Hanna De Bruyn**

*First-Year Seminar Scanning Tunneling Microscope Construction Project: Electronics*

**Matthew Côté, Chemistry, Advisor**

**Ariscell Tavarez '17 – see Christopher Pelz '16**

*Japanese Calligraphy*

**Keiko Ofuji, Japanese, Advisor**

**Lily Taylor '18 – see Alexandra Buonfiglio '18**

*The Springboks: A Symbol of Hope in Post-Apartheid South Africa*

**Elizabeth Eames, Anthropology, Advisor**

**Samantha Thomas '15**

*Warsaw and Kraków: The Musealization of Polish Jewish History*

**Jakub Kazecki, German, Advisor**

On the 70th anniversary of the liquidation of the Warsaw Ghetto, an unfinished museum was opened on land of the former ghetto. The POLIN Museum of the History of Polish Jews commemorates Jewish Poland over the last 1,000 years and its prosperity and destruction. The core exhibition opened to the public in October 2014. After interning at the Galicia Jewish Museum in Kraków and traveling back to Poland to visit both sites I consider these two museums as case studies on the importance of Jewish museums versus Holocaust museums and their cultural contexts in Poland.

**Hillary Throckmorton '15**

*Female Athletes' Competing Identities: Balancing Gender Expectations and Athletic Demands to Garner Social Acceptance*

**Heidi Taylor, Sociology, Advisor**

This study investigates a possible gender role conflict between female athletes of various sports. Women who compete in masculine-coded sports (basketball/softball) seem to be more in tune to differing societal attitudes between sports more often than women involved in feminine-coded sports (lacrosse/volleyball). Some women seem more aware of social realities than others depending on their particular sport. This study examines potentially competing demands of athletic and gender performance to garner social acceptance for female athletes as well as the idea of gender-coded sports and women's ambivalence.

**Patrick Tolosky '15**

*Globalization in Peru: The Effect of Industry and Tourism on Peruvian Culture*

**Claudia Aburto Guzmán, Spanish, Advisor**

Foreign influence and globalization have both positive and negative effects on a country's culture. This project investigates how U.S. companies and the tourism industry change the landscape of Peruvian society with regard to economic patterns, social norms, poverty, worldview, and

other facets of the culture in Peru. This topic is explored through interviews that were conducted firsthand during my study abroad in Peru, photography that illuminates a changing culture, literature analysis, and theoretical exploration. How much influence can one country have on another's culture? Is this change desirable?

**Michael Tomaino '15**

*The Effect of Mindfulness on Athletic Performance*

**Rebecca Fraser-Thill, Psychology, Advisor**

Research strongly supports that mindfulness exercises can help people with different aspects of their life such as health, stress, and attention. This current study evaluates the effect that mindfulness meditation has on athletic performance. In this study, participants were placed in three different groups: a control, an imagery, and a mindfulness group. Members of the meditation group were taught simple meditation that has been used throughout Zen Buddhist meditation tradition, the counting method. In this method, the participant is asked to sit with a straight back and count their own breaths from one to ten, and then back to one, repetitively. If the participant loses focus, they are asked to return back to one and repeat the process. Participants in the imagery group are asked to imagine themselves putting a golf ball for five minutes. Finally, members of the control group let five minutes pass without meditation or imagery. Participants are then shown a video lesson on how to properly putt a golf ball into a hole. Participants then complete the task of putting golf balls for one minute and thirty seconds and the amount of putts made are recorded. It is hypothesized that the meditation group will make the most putts.

**Emmanuel Toroitich '15**

*Mechanism and Kinetic Study of Phenylpropanoid Glycosides (PPGs)*

**Jennifer Koviach-Côté, Chemistry, Advisor**

Phenylpropanoid glycosides (PPGs) are antioxidants naturally found in most plants. PPGs include a glucose core with one or more caffeic acid groups attached to the sugar through an ester linkage. PPGs scavenge free radicals in two distinct steps, an initial rapid step followed by a much slower step. The hydroxyl groups in PPGs has been shown to be the moiety responsible for the antioxidant activity, because the PPGs antioxidant activity increase with increased OH groups and quinone is formed as one of the intermediates.

**Shanina van Gent '18 – see Nicole Kanu '15**

*"The Great Debate!" Understanding Racial Quotas in South Africa*

**Elizabeth Eames, Anthropology, Advisor**

**Erica Van Sciver '15**

*Literary Reading by Creative Thesis Writers*

**Robert Farnsworth, English, Advisor**

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

**Barbara VanDerburgh '15**

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**Tessa Walther '15**

*Analysis of Sediment Traps in Linnévatnet, Svalbard, for Reconstruction of Annual Sediment Flux and Lacustrine Processes*

**Michael Retelle, Geology, Advisor**

This study reconstructs annual sedimentation in Linnévatnet, a high arctic glacier-fed lake in Svalbard, Norwegian arctic, utilizing sediment traps and instrumental measurements of watershed and climatic processes to interpret the response of the glacier-lake system to modern environmental processes. Analysis of sediment traps shows that sedimentation in 2013-2014 occurred in two major events: an unusual autumn rainstorm and annual spring snowmelt. Since glaciers play a vital role in the global climate system, it is necessary to understand how they respond to climate variation today and in the past in order to predict how they will react to future warming.

**Wesley Warner '15**

*Analysis of the Relationship between Peripheral Oxytocin Levels and Moral Reasoning*

**Nancy Koven, Psychology, Advisor**

It is posited that the neuropeptide oxytocin may play a role in human moral decision making due to its neurochemical influence on social cognition. Research suggests a relationship between moral disposition and intelligence, between social cognition and intelligence, and finally between oxytocin and social cognition, but the intersection among these components has yet to be addressed. The goal of this study was to determine the role of oxytocin in moral decision making while controlling for the potentially confounding effects of state mood and intelligence. The study examined this intersection in a sample of young adults, first with a self-report questionnaire of current mood (Profile of Mood States), then through a neuropsychological intelligence battery (Wechsler Adult Intelligence Scale, Third Edition), and finally through analysis of utilitarian judgments to fictitious morally-challenging scenarios. Basal salivary oxytocin levels were assessed via enzyme-linked immunosorbent assay. It was predicted that basal oxytocin level would be inversely associated with degree of utilitarian moral judgments after statistically controlling for intelligence and mood state.

**Kelly Wassarman '18 – see Thomas Endean '18**

*First-Year Seminar Scanning Tunneling Microscope Construction Project: Mechanical Design*

**Matthew Côté, Chemistry, Advisor**

**Hannah Weiss '15**

*Exploring the Relationships between Dissociation, Cognition, and Sleep*

**Kathryn Low, Psychology, Advisor**

Dissociative experiences are vaguely defined as cognitive lapses in otherwise normal minds. While most research

focuses on these experiences in traumatized individuals, little has been done to explain why these phenomena happen in the general population and why certain individuals are more prone to these experiences than others. Since dissociative events are marked by a lack of attending to the present, the current study explored the relationship of four types of attention with dissociative events. Additionally, as recent research has connected dissociative phenomenon with abnormal sleep experiences, this study explored the potential mediating effects of sleep on dissociation and cognition.

**Hannah Whitehead '15**  
*Reproductive Health Beliefs and Behaviors of HIV+ Women in New England and Nepal*

**Karen Palin, Biology, Advisor**  
Despite the effectiveness of antiretroviral drugs for preventing mother-to-child transmission (MTCT) of HIV, hundreds of thousands of infants are infected each year with the virus during pregnancy, delivery, or breastfeeding. Nepal and the United States have been affected differently by HIV/AIDS; Nepal's MTCT rate is over ten times that of the United States. Through in-person interviews with and online questionnaires distributed to HIV-infected women in Nepal and New England, this project aimed to carry out a cross-cultural investigation into what HIV+ women know, think, and do about MTCT and their reproductive health. Findings were examined to identify potential interventions to further reduce MTCT.

**Benjamin Wilentz '16 – see John Albanese '16**  
*Innocents Abroad? Americans and the European Political Climate*  
**David Das, Office of Off-Campus Study, Advisor**

**Amelia Wilhelm '18 – see Hanna De Bruyn '18**  
*First-Year Seminar Scanning Tunneling Microscope Construction Project: Electronics*  
**Matthew Côté, Chemistry, Advisor**

**Kevin Williams '15**  
*Rome's Influence on English Common Law: Conceptions of Private Property*  
**Margaret Imber, Classical and Medieval Studies, Advisor**

Roman law represented a fundamental pillar in the construction of future legal theory, especially in the Western world. The rapid expansion of Rome's empire across Europe allowed its influence to take root, even in places as far north as Britain. When the Roman Empire began to fade away this impact endured across the centuries. Britain developed into one of the many places where Roman law contributed significantly to the formation of a common legal system. The primary correlation between the two legal structures emerged in Britain's conception of private law.

**Daniel Willsey '18 – see Aaron Nickelsberg '15**  
*The Problem of Non-Interference: China's Involvement in South Sudan*  
**Elizabeth Eames, Anthropology, Advisor**

**Benjamin Wilson '18 – see Brian Carilli '15**  
*Shell Oil in Nigeria: Clamming up over Environmental Issues*  
**Elizabeth Eames, Anthropology, Advisor**

**Hiu Man Sylvia Wong '15**  
*Transcending the Discourse of Hero and Victim: Overseas Filipina Domestic Workers' Experiences in the Global Care Chain*

**Emily Kane, Sociology, Advisor**  
The globalization of the market economy has fueled the migration of human labor. In particular, the asymmetrical economic power among nations has created the phenomenon of the global care chain. As women from affluent countries are increasingly entering the workforce to perform productive labor, women from poorer countries are migrating to serve as live-in domestic helpers to perform reproductive labor, including household chores and caretaking of the elderly and youth. Comprising a "contemporary female labor diaspora" is a significant migration of Filipina women going to other Asian countries, the Middle East, and the United States to serve as domestic workers. In order to examine the media portrayal of these workers and their lived experiences, I conducted a content analysis of sixty newspaper articles from Filipino newspaper publications and ten interviews with Filipina domestic workers in Hong Kong. I found that the media reduces these women's identities to two dominant representations: the iconic "modern day hero" who financially supports her family and country through remittances, and the docile and powerless victim who is vulnerable to exploitation. However, the interviews reveal the complexity of these migrants' lived experiences, including their hybrid identities, different methods of managing family relations, and efforts to resist structural constraints.

**Grace Wright '16**  
*What to Do When Feeling Blue? Emotional Support Systems Available to Migrant Workers' Wives in Nepal, Palpa District*

**Peter Wong, Mathematics, Advisor**  
This study aimed to address the mental and emotional hardships that Nepali migrants' wives endure in Palpa district, and assess the coping mechanisms and support systems available to this population of women. Due to the lack of formal mental health services in Nepal and the rise in civil society groups in Nepali communities, this research tried to address what kinds of alternative forms of support are available to migrants' wives. With the use of semi-structured interviews and group discussions with migrants' wives in the municipality of Tansen and village of Madanpokhara, it was discovered that in Madanpokhara the women were more involved in community groups. Although there are formal counseling services available, none of the women identified utilizing them for support. Instead, women were more inclined to reach out to close friends or family, and in the case of Madanpokhara the mother's group was able to provide forms of emotional support for women. These differences in community

involvement could be indicative of how mental health issues can begin to become better addressed in Nepal through the local level of community groups.

**Amy Wyeth '15**

***Isotopic Analysis of the Role of the Cyanobacteria Gloeotrichia echinulata in the Nitrogen Cycle and Water Quality of Lake Auburn, ME***

**Holly Ewing, Environmental Studies, Advisor**

*Gloeotrichia echinulata* (Gloeo) is a nitrogen fixing cyanobacteria that is blooming in many oligotrophic lakes, including Lake Auburn, the drinking source for Lewiston and Auburn. Results from a nutrient-enrichment study show that Gloeo leak nitrogen in a form that is bioavailable to other organisms. In a nutrient-limited environment, an increase in nitrogen could trigger a shift in the overall biodiversity of the lake. The extent to which nutrient limitation affects N-fixation and the amount of nitrogen Gloeo leak is important in understanding the effects of Gloeo blooms on the water quality of Lake Auburn.

**Sarah Xiao '15**

***Bedrock Geology of the Mount Dartmouth 7.5' Quadrangle, NH***

**J. Dykstra Eusden, Geology, Advisor**

The Mount Dartmouth 7.5' Quadrangle, located in northern New Hampshire was last mapped at 1:62,500 by Billings et al., (1946). The quad was then reinterpreted by Lyons et al., (1997) as a part of the Bedrock Geologic Map of New Hampshire. When the Billings' map was integrated into the NH map, many finer details were lost due to the larger scale used. The purpose of this study was to produce an updated, more detailed bedrock map at a scale of 1:24,000 and a cross section of the quad. This study focuses on the assessment of the brittle and ductile structures that contributed to the deformation processes that shaped the quad, as well as defining and evaluating the igneous rock types and metamorphosed stratigraphy of the area.

**Madeleine Youniss '15**

***Dependence on Nerve Presence during Zebrafish Tail Fin Regeneration***

**Nancy Kleckner, Biology, Advisor**

Most species have the ability to regenerate certain body

parts. While most vertebrates have a particularly limited capacity, only being able to regrow smaller components such as skeletal muscle or bone tissue, some vertebrates such as zebrafish are able to regenerate larger organs, including their fins. Other vertebrates with regenerative abilities require input from sensory nerves to regrow their appendages, but this has not been studied in zebrafish. The current study explores whether this sensory nerve dependence is also required during the regeneration of zebrafish tail fins. The neural dependence of regeneration may highlight the limitations to human regeneration.

**Joshua Zimmer '15**

***Evaluation of the Ubiquitin-protein Ligases UBE3A and DTX3L as Mediators of EMCV 3C Protease Concentration***

**T. Glen Lawson, Chemistry, Advisor**

The concentration of the encephalomyocarditis virus 3C protease is important for efficient viral replication in infected cells and is known to be controlled by the ubiquitin proteasome system. Ubiquitin-protein ligases UBE3A and DTX3L tag 3C protease with polyubiquitin chains for degradation by the 26S proteasome. We examined their roles in maintaining 3C protease cellular concentrations both in the absence of and during picornavirus infection. DTX3L and UBE3A ubiquitin-protein ligase knockdown cell lines transfected with purified 3C protease showed an accumulation of the protease suggesting they are important for the normal degradation of 3C protease in vivo. UBE3A is exclusively located in the nucleus, but cellular fractionation and confocal imaging of cells infected with encephalomyocarditis virus showed that during infection a portion of the UBE3A is translocated out of the nucleus into the cytoplasm. These results indicate that not only are DTX3L and UBE3A important for the targeted degradation of 3C protease, but are used by the virus to control the 3C protease concentration to optimize the viral replication.

**Abigail Zwetchkenbaum '15**

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