Bates College

2013-2014

Honors Theses Abstracts
BATES COLLEGE  
2013-2014 HONORS RECIPIENTS

ANTHROPOLOGY  
Sabina E. Frizzell  
Devin M. Tatro

ENGLISH  
Alexandra M. Carley  
Kathryn A. Ailes  
Alexandra T. Sentner  
Rebecca H. Salzman-Fiske  
Sarah E. Streat*

ENVIRONMENTAL STUDIES  
Lucy L. Brennan  
Alex J. Hamilton

GEOLOGY  
Cameron A. Held  
Joshua T. Sturtevant

HISTORY  
Michaela E. Brady  
Nyle L. Rioux  
Rachel S. Spence  
Emma B. Perkinson  
Samuel A. Slattery

MATHEMATICS  
Alex W. Kowak

MUSIC  
Benjamin L. Vanasse

NEUROSCIENCE  
Abigail J. Alexander

PHILOSOPHY  
Stephanie J. Wesson

PHYSICS & ASTRONOMY  
Joanna C. Moody  
Saad J. Amsari  
Yang Guo  
Edward R. Moan

POLITICS  
Evan L. Binder  
Aung P. Myint

PSYCHOLOGY  
Mariya E. Manahova  
Mary Alice Millard  
Simone H. Schriger

SPANISH  
Hannah A. Miller

WOMEN AND GENDER STUDIES  
Sarah E. Streat*

*TWO MAJORS WITH ONE HONORS THESIS
ANTHROPOLOGY

Sabina E. Frizell
Advisor: Loring Danforth

The Anthropology of Think Tanks: Democracy Promotion in Egypt after the 2011 Uprisings

This thesis investigates the relationship between anthropological scholarship on democratization and the approach think tanks have adopted to promote democracy in Egypt following the 2011 uprisings. Think tanks, as bridges between academia and policy, have not previously been studied through an anthropological lens. This thesis first presents an ethnography of two think tanks, International Crisis Group (ICG) and the German Institute for International and Security Affairs (SWP), examining their institutional funding, internal organization, and stated goals. I dissect the think tanks’ reports on political transition in Egypt, analyzing them alongside the nascent body of anthropological literature on democratization. My analysis identifies where the reports’ approaches to democratization align with and diverge from anthropology’s focus on emic perspectives. Points of tension between think tank and anthropological conceptions of democratization include their treatment of the following questions: How is democracy defined? Does it consist of a single set of processes and institutions, or can there be multiple successful iterations that differ from a Western understanding and are shaped by local political cultures? How do the differing genre conventions and aims of anthropological scholarship as opposed to think tank reports dictate their respective notions of democracy? This thesis examines how think tanks may benefit from incorporating greater anthropological sensitivity in discussions of democratic institutions such as elections, political parties, and civil society. Conversely, the thesis considers how anthropological scholarship, while facilitating deeper and more nuanced understandings of democratic transitions, may not lend itself to pragmatic attempts at guiding democratization.

Devin M. Tatro
Advisor: Loring Danforth

Tribe (TM): An Investigation of Ethnic Agency in Sebei, Uganda

This thesis investigates the politics of representation, the construction of identity, and the marketing of ethnicity for the Sebei people in the Mt. Elgon Region of Eastern Uganda. Specifically, how have perceptions of a “traditional” tribal past changed for the Sebei in our contemporary world? Why are tourists, aid workers, religious leaders and many Sebei so concerned with preserving cultural tribal
heritage? I begin by discussing the scholarly discourse constructing “tribalism” and explain how the Sebei “tribe” becomes a “Tribe™” through “tribal trademarking,” describing a complex process of identity construction and commoditization within a “modernizing” African society. Drawing on my ethnographic work from two visits to Kapchorwa and the surrounding Bukwo, Kween, and Sipi Districts in October-December 2012, and May 2013, I examine a local pursuit to build a regional Sebei “Cultural Center.” This case frames my analysis of shared ethnic and cultural heritage as consumable product marketed to tourists and international aid organizations. My thesis questions the notion that ethnic commodification is necessarily debasing and that tourism is inherently destructive. I argue that the Sebei carry great agency within the process of “tribal trademarking,” motivated to market their own “peoplehood” as an ethnic brand. This work challenges historical anthropological literature based on evolutionist study of the Sebei, engaging in representation from a contemporary, relativist perspective.

**ENGLISH**

**Alexandra M. Carley**  
*Advisor: Sanford Freedman*

**Materiality and the Literary Letter**

This thesis examines the concepts of materiality and the literary letter. It traces the historical definitions of “material” in its most fundamental and abstract meanings within and without literature in an attempt to test how and where materiality occurs in the space created by the literary letter. The thesis next examines the conceptual boundaries of privacy surrounding letters that construct an intimate space often troubled by the physical instability of the letter. Next I investigate the relationship between bodies and letters, exploring how desire for the physical presence of a correspondent can cause the physical warping of the letter itself. Multifaceted theories of public and private, of writing and the body, and of the letter as a culturally and socially conceived object are applied interpretively to different categories of the materialized literary letter. Works studied include Shakespeare’s *Twelfth Night, Othello, Two Gentlemen of Verona* and *King Lear*; Choderlos de Laclos’s *Les Liaisons dangereuses*; A. S. Byatt’s *Possession*; Henry James’s *The Aspern Papers*; and Carme Riera’s short story “A Matter of Self-Esteem.”

**Kathryn A. Ailes**  
*Advisor: Robert Farnsworth*

**Scottish Nostalgias: Evocations of Home in the 1990s Poetry of Carol Ann Duffy, Jackie Kay, and Kathleen Jamie**
This thesis examines nostalgia, memory, and displacement in the 1990s work of Scottish poets Carol Ann Duffy, Jackie Kay, and Kathleen Jamie. Each of these poets has emigrated from Scotland—Duffy and Kay permanently, Jamie temporarily—and consequently they associate Scotland with the past and childhood, and express displacement from a sense of cultural belonging. Their poetry presents Scotland dually, juxtaposing idealized, clichéd memories and traditions with the physical reality of Scotland’s geographical space and material artifacts. They negotiate the double estrangement of female Scottishness, partially due to their shared experience of maturing during the rise of feminism and the movement toward devolution culminating in the establishment of the Scottish Parliament in 1999. Their poems test the capacity of language(s), including English and Scots, to embody the intense experience of both personal and national nostalgias. Duffy, who moved to England in childhood, portrays Scotland—and the notion of “home” itself—as intangible, dreamlike, and lost. Kay’s genre-bending, autobiographically-generated work painfully grasps for biological, cultural, and national origins, and emphasizes the Othering power of racism. Jamie’s writing inquires whether Scottish culture should submit to nostalgia and hoard its relics, or cut tethers and dispose of outdated customs, traditions, and objects. Drawing from poetry collections as well as novels, essays, and memoirs, this thesis undertakes a comprehensive analysis of these writers’ meditations on Scotland as “home,” and provides a timely study of Scottish cultural identity given the current movement for Scottish national independence.

Alexandra T. Sentner
Advisor: Eden Osucha

Religion and the Postmodern in Contemporary North American Fiction

Broadly speaking, postmodernist thinking presumes the failure of traditional value systems and epistemologies, reacting to this crisis in truth and knowledge with radical skepticism. This perspective privileges relativity over objective truth, interpretation over meaning, an infinity of multiple perspectives over unified systems of thought and belief, and concrete principles over abstract expressions. As Western religion insists upon exclusive universalized truths and principles, the persistence and even resurgence of religion and religious fundamentalism in a contemporary historical moment otherwise characterized by the pervasive influence of postmodernist tenets in secular life presents a striking paradox. The novels examined all variously attempt to explain this apparent contradiction: how postmodern society seems to reject totalizing systems of knowledge and value, but encourages religion and its universalizing conceptions. In different ways, these novels frame religion as a pragmatic reaction to societal anxieties, rather than the result of divine revelation, emphasizing how beliefs morph in response to societal crises. They critique the concept of the religious grand narrative, demonstrating its susceptibility to change and its inability to provide a full story. Finally, these texts
address what happens when traditional religious beliefs fail according to postmodern logic, and suggest that people engage the secular to replace the system of belief religion once provided. These novels suggest a human tendency to yearn for systems of belief but simultaneously deny any credibility to an overarching narrative, affirming postmodern society's attraction to multiplicity while still perhaps allowing for the human need for systems of knowledge and value.

Rebecca H. Salzman-Fiske
Advisor: Sanford Freedman

How the Mind Refigures Memory: The Role of Social Construction and Fallibility in the Fictions of Faulkner, Woolf, and Nabokov

This thesis argues that some literary works of William Faulkner, Virginia Woolf, and Vladimir Nabokov both engage and represent fictional memory and support certain claims made by memorial studies that explain memories as coming into existence through a dynamic process, being transformed from their original state to incorporate knowledge learned at a time later than that of the memory's formation. The thesis examines how it is that the mind is socially conditioned into a predetermined notion of reality, maintained by collective memory. This conditioning takes place at the onset of memory formation and results in limiting the mind to a finite number of memories. Rather than continuously creating new memories, the mind compiles very few memories that conform to social reality. This aggregate effect creates the illusion that new memories are created throughout life whereas, the idea of a new memory is actually synonymous with a product of the imagination, a product that is limited in most after a certain point in development. Faulkner's As I Lay Dying and The Sound and the Fury exhibit the mnemonic processes of association. Memorial association, while helping to strengthen long-term memories, directly causes conflation; however, what these texts, along with Faulkner's Light in August and Nabokov's Speak, Memory, and Virginia Woolf's To the Lighthouse also demonstrate is a questioning of a learned notion of reality. I argue that this reality is an entirely subjective construct and one that prevents certain experiences from becoming memories.

Sarah E. Streat
Advisor: Eden Osucha

"Another Landscape, Another Tongue:" The Queer Language of Silence in Virginia Woolf's Fiction

Virginia Woolf destabilizes discourse and cultivates ambiguity by incorporating spaces of silence in her fiction, thus preserving that which is "unspeakable" within
her texts. In Woolf, silence functions as a kind of queer “language” that articulates the unspeakable and indicates the ineffable. This thesis examines Orlando, To the Lighthouse, and The Waves as particular examples of this, alongside theorists such as Judith Butler and Michel Foucault. Within their frameworks, language is an exclusionary structure, dictating legitimacy and legibility, as well as a limiting one. Though some tenets of feminist theory argue that silence is an apparatus of oppression, I suggest that rejecting language may be a means of subverting discursive regimes and reductive ontological categories. Therefore, to navigate this paradox—that political recognition is contingent on language, a primary instrument of exclusion—language must be reworked constantly, what it signifies postponed eternally. I argue that Woolf does this by using “silence” as a narrative tactic, establishing a lexicon in moments when words fail or speech is refused, in secret code, and in textual ruptures, such as ellipses and blanks. With silence, Woolf crafts poetic complexity and queer sensibility, grappling with notions of gender and sexual identity and proposing an understanding of the self unrestricted by linguistic taxonomies. Woolf’s fiction considers the process of translating experience into language, the liminality of this process, and its inevitable failure. Silence, in her fiction, becomes a language of queerness and truth—of that which we can articulate only to ourselves.

ENVIRONMENTAL STUDIES

Lucy L. Brennan
Advisor: Jennifer Adair

Why Haiti?: A Case Study of Human Processes in a "Natural" Disaster

This thesis problematizes geophysical disasters by examining the human processes that affect the extent of damage incurred by these “natural” events. Using the incredible aftermath of the 7.0-magnitude earthquake in Haiti on 12 January 2010 as a case study, this thesis explores how foreign intervention in its various forms permeated the country from independence to the present day and respectively impacted the scale of devastation. In particular, this lens of foreign activity renders visible historical vulnerabilities and fallacies of aid that have since left the country destroyed and dependent. A critical analysis of Haitian history followed by a comprehensive assessment of various facets of the relief effort illuminate the human implications in the devastation that succeeded the earthquake. Ultimately, this devastation can be used to suggest that the past and present reliance on foreign actors to rebuild and redefine the nation largely failed to recognize local agency, hindering the development of Haitian sovereignty, capacity, and independence. Nonetheless, despite a critical assessment of the relief effort, a point of hope remains for future models of aid provision incorporating local agency and downward
accountability. Thus, through a synthesis of historical, environmental, economic, and political fields of study it becomes apparent that foreign intervention has long dictated the course of Haitian state building, and as such, that human processes are implicated in environmental issues.

Alex J. Hamilton  
*Adviser: David Cummiskey*

**Assessing the Landscape: In Search of a Coherent Value Theory for Environmental Ethics**

Environmental ethics is concerned with developing a set of moral duties toward the natural world based upon a value theory, or a conception of what bears value. However, many environmental ethicists concern themselves primarily with the former and are lacking in the latter. This work surveys several prominent environmental ethicists and assesses their value theories, dividing them into two main schools, Kantian/individualist and holist. Both are problematic in their articulation of a value theory. I propose a distinct value theory with a basis in the Buddhist metaphysical doctrine of codependent origination. In accepting this metaphysic, we are led to a conception of value in which there is a rational requirement to value both individuals and systems, but which is not susceptible to the problems of individualism or holism. I conclude by suggesting that my value theory, which I call “constitutive holism,” can provide a basis for a coherent environmental ethic.

**GEOLOGY**

Cameron A. Held  
*Adviser: J. Dykstra Eusden*

**Using LiDAR to Map the Geomorphology of the Swift River Region of the White Mountain National Forest, New Hampshire**

Recently, geomorphologic mapping techniques have undergone rapid developments as high-resolution ortho-imagery and digital elevation models augment traditional field-based surveying methods. Utilizing 2011-2012 LiDAR data, this project maps and classifies the geomorphology of the Swift River region of the White Mountains of New Hampshire. LiDAR Hillshade maps with illuminations/elevations of 315/45 and 45/45 produced the best images to view the complexities of the landscape. Analysis of the bare ground LiDAR has allowed new landscape units to be recognized and mapped, including 1) depositional and erosional floodplain fluvial
features (approximately 15% of the study area); 2) stream incision features on slopes (average grade of 18° - 40°); 3) glacially streamlined features (310° azimuth of orientation); 4) other glacial landforms such as glacial lake terraces; 5) and stoss and lee bedrock features (with dominant fracture orientations of 5°, 40°, and 130°) among others. There is no variation in the lineament analysis of the Jurassic bedrock using the methodology of Mabee et al. (1994), but a strong correlation to the field-measured joints in those units from Pangaeaan rifting. Further analysis of the landscape geomorphology focused on where the polygons overlapped, creating areas of mixed landscape units (e.g., overlap of glacial depositional and fluvial erosional polygons or of fractured bedrock and glacial depositional regions). This study shows that LiDAR can be successfully used to map the bedrock and surficial landscape geomorphology of large, remote regions of land that were previously unable to be viewed due to the dense tree canopy.

Joshua T. Sturtevant
Advisor: J. Dykstra Eusden

LiDAR as a Tool for Lineament Mapping and the Reevaluation of Bedrock and Glacial Geology: Examples from the Mount Moosilauke Region of the White Mountain National Forest, New Hampshire

The increased availability and reliability of meter and sub-meter resolution LiDAR has provided unprecedented opportunities to map geologic features in the last decade. Using ArcGIS and 2010/2012 1-meter resolution LiDAR data provided by the Natural Resources Conservation Service (DeKett et al., 2013), this study explored the use of LiDAR as a tool in bedrock and glacial geology by 1) comparing field-based fracture measurements with LiDAR-based remote lineament measurements, 2) delineating bedrock-controlled and glacially-controlled regions through landscape mapping, 3) reevaluating the distribution and character of previously mapped bedrock units by Billings et al. (1935a), Lyons et al. (1997) and others, and 4) mapping glacial erosional and depositional features, all within the Mount Moosilauke region of the White Mountain National Forest, New Hampshire. The major bedrock units and the statistically significant joint sets, as measured at single, extensive, outcrops during the field-based portion of this study, include 1) the Littleton Formation with three joint sets trending NNW to SSE, N to S, and NE to SW; 2) the Bethlehem Granodiorite with one joint set trending NE to SW; 3) the Kinsman Granodiorite with two joint sets trending NE to SW and ESE to WNW; 4) the Oliverian Plutonic Suite with two joint sets trending N to S and ENE to WSW; and 5) the Ammonoosuc Volcanics with one joint set trending ENE to WSW. Paleostress reconstructions identified tensile-compressive environments from two distinct events: NW to SE extension and N to S extension believed to be related to earlier and later stages of the Mesozoic rifting of Pangaea. These joint sets were compared to 1,145 coincident lineaments identified through the Mabee et al. (1994) analyses of LiDAR-derived hillshade images within the Mount Moosilauke 7.5°
Quadrangle. Correlations between the field measured joint sets and remotely measured lineament sets were moderate, although these correlations appear to be moderate to strong when considering factors such as sample size and field site location. Through fracture and lineament analyses, bedrock units were determined to have unique bedrock fracture signatures. By further analyzing bedrock-controlled regions as identified during the landscape mapping portion of this study, these bedrock fracture patterns were used in combination with generations of bedrock geologic maps and eventually incorporated into interpretations of LiDAR hillshade images to produce a revised bedrock geologic map with revised geologic contacts and faults as well as newly mapped mega-lineaments. Lastly, LiDAR-based mapping within glacial erosional and depositional feature-controlled regions was conducted in an effort to map glacial deposits and landforms including esker systems, ridges interpreted as De Geer moraines, meltwater channels, ice flow indicators, and stoss and lee topography. LiDAR has proved to be an extremely effective tool to study bedrock and glacial features, contributing to the increased accuracy and efficiency of geologic mapping. Future work will be needed, however, to ground truth remote interpretations with targeted fieldwork.

**HISTORY**

Michaela E. Brady  
*Advisor: Caroline Shaw*

**Scotland within Empire: The Quest for Independence with or without Union**

Since Union in 1707, Scotland has moved from armed insurrections against the British state—first in 1715 and again in 1745—to public assertions of equality within the British Empire. As Scotland moves for referendum in 2014, scholarly debate is lively, questioning the terms of Scottish involvement in Union and debating why Scotland should or should not continue its partnership. This thesis focuses on the ambiguities surrounding these two paradoxical worlds of sovereignty and equality within empire. I seek to understand how Scottish involvement in empire developed from initial discussions for union in the late seventeenth century through the early twentieth century. Other scholars have sought to explain why Scotland entered union but fail to address how these ambiguities are framed in a broader Scottish history that allowed for this continued debate since the end of open rebellion in 1745. In examining this core paradox, I find calls for independence transformed following the '15 Rebellion. Scotland ceased to exist in that moment as a singular nation and formally divided between Highland and Lowland, a divide allowing for the Highlands to participate in the '45 Rebellion and the Lowlands to participate as a partner in the Anglo-Empire. The chapters follow this divide in
critical areas of contestation tracing that dramatic transition and discussing the themes central to union debates: economy, religion, cultural assimilation, and the position of women.

Nyle L. Rioux
Advisor: Jennifer Adair

The Reign of "King Henequen": The Rise and Fall of Yucatán's Export Crop from the Pre-Columbian Era through 1930

This thesis examines the massive impact of henequen on the state of Yucatán, Mexico, specifically focusing on the time period from the mid-nineteenth century until 1930. Henequen is a fibrous plant native to the Yucatán peninsula; it was a useful tool in pre-Columbian Maya civilization. The Spanish arrival in Mexico brought elites who eventually began to see the plant's potential for profit. Henequen became a major export crop of Mexico and revenue flowed into Yucatán. In less than a half-century, from the late 1800s to early 1900s, Yucatán became one of the richest states in Mexico. This thesis discusses the original uses of the henequen plant in Mayan society and shows how the industry evolved as a result of a great demand for henequen fiber in the United States, especially during the late nineteenth and early twentieth centuries. It will examine how the henequen industry revolutionized Yucatecan society. Social classes became more defined between the millionaire elites of Mérida and the impoverished hacienda laborers who were treated like slaves. In addition, society was "modernized" with new railroads, ports, and amenities. Finally, the thesis considers the downfall of the henequen industry and how the policies of the Mexican Revolution and the dependence on an individual crop eventually led to disaster for the state.

Rachel S. Spence
Advisor: Caroline Shaw

Sex Scandals in Victorian Britain: Moral Codes and National Reputation in Crisis

In the Victorian era, sexual scandals threatened the sense of superior morality integral to British national character. This paper uses scandals involving sexual transgressions as a way to study social norms, values, and the impact of their disruption on members of the upper class, whose position in society made them especially vulnerable to public disgrace. Court reporting made secrecy impossible; newspapers pounced on the sordid evidence from trials involving sexual transgression, specifically adultery and homosexuality, and circulated it. Previous scholarship has dealt with either divorce trials and their disruption of public and
private spheres or homosexuality scandals and their threat to masculinity. My thesis brings this scholarship together to question the broader impact of scandals on society. By examining editorials about these trials, I explore how scandals necessitated punishment of transgressors in order to protect vulnerable moral codes.

Emma B. Perkinson  
Adviser: Melinda Plastas

The Biopolitics of Marriage and Motherhood: Understanding the Transformative Role of White Middle-Class Women in the American Eugenics Movement, 1900-1930

Eugenics, the deplorable crusade to “strengthen” family and “save civilized America” from “race suicide” through the regulation of motherhood, emerged in the United States as a cohesive movement in the early twentieth century. The eugenics movement and the coinciding development of eugenic feminism have been studied extensively. Where analysis is lacking, however, is the influential role of women who were unattached to the official, organized groups in early twentieth-century America. How did these women participate in the establishment of eugenic ideas as a popular social and cultural norm in the period from 1900 to 1930? This thesis examines of how white middle-class women’s engagement and navigation of eugenic discourses in their daily lives helps us to understand their influential role in the American eugenics movement. These women gained power as citizens by acting “morally” and reproducing “intelligently” according to eugenic standards of race betterment. Analyzing eugenic engagement in five popular women’s journals, two major newspapers and at state fairs helps us imagine the role middle-class white women played in establishing a national engagement with the ideas and conversations of eugenics in America. The work of women who ascribed to gender roles constructed by eugenic biopower reinforced the notion that the female’s worth as a citizen in the United States was predicated by her performance as a eugenic producer and a guardian to America’s future generations. The many different types of white middle-class women from different parts of the movement made connections with each other to expand eugenic circuits of knowledge. Through these informal channels of communication, the biopolitics of eugenics became both normalized and popularized throughout the nation. As the primary actors within Better Babies and Fitter Families contests, women helped to obscure the perceived division between what was public and what was private in American society as they exhibited their families and themselves to the world in order to establish their important, intimate value to the state as moral, fit, and reproducing fertile bodies.
Samuel A. Slattery  
*Advisor: Michael Jones*

**The Politics of the Gate: Byzantine City Walls and the Urban Negotiation of Imperial Authority**

This thesis argues that Byzantine city walls were political arenas in which rulers and communities contested their allegiances and interests. Modern scholars often assume that fortification walls are inherently divisive, oppressive, and detrimental to political liberty, but in the Byzantine Empire—a premodern monarchy—the strength of their walls gave beleaguered cities the breathing room to protect their own interests and sometimes even a say in who their ruler might be. Historians have tended to partition amicable and hostile interactions at walls into different historical categories, putting triumphal, ritualized entrances by rulers into the category of ceremonial, political history while placing the violent confrontations of siege warfare into the domain of military history. A more synthetic analysis shows, however, that cities' hospitable welcomes and defiant rejections of rulers were actually two sides of the same coin. Walls gave communities a basic choice: to open the gates or shut them. The capacity of walls to allow or deny a ruler access to the area he claimed to rule made a community's allegiance collectively binding in a way that is difficult to comprehend in the modern, unwalled world. The same political dynamic was at play in all engagements at walls: the ruler's attempt to perform and prove to the community his legitimacy, authority and power. Whether he sought to prove this by rhetoric, ceremony, intimidation, negotiation or simply brute force, both his message and his audience were the same.

---

**MATHEMATICS**

Alex W. Kowak  
*Advisor: Catherine Buell*

**The Tropical Eigenvalue-Vector Problem from Algebraic, Graphical, and Computational Perspectives**

Tropical mathematics describes both the max-plus and min-plus algebras. In the former, we understand addition to be the component-wise maximum function, while the minimum function represents addition in the latter. For example, 1 plus 2 is equivalent to max{1, 2} = 2 in the max-plus framework, whereas in min-plus algebra 1 plus 2 equals min{1, 2} = 1. In both algebras, we multiply elements by performing standard addition; hence, 1 times 2 yields 1+2 = 3. This seemingly fanciful arithmetic actually provides a language through which we elegantly describe everyday phenomena such as the long-term behavior of discrete event systems (assembly lines, computer networks, train schedules, etc). Extending the notion of
tropical algebra to matrices and vectors, we find that determining eigenvalues and associated eigenvectors, allows us to construct event systems that behave predictably and stably. First, we explore the graph theoretic underpinnings of the tropical eigenvalue and associated eigenspaces so that we may better understand how they are computed. Considering two classes of tropical matrices, irreducible and reducible, we then look at how Karp's Algorithm computes eigenvalues of the former and what its output when given a reducible system can tell us about long-term behavior.

MUSIC

Benjamin L. Vanasse
Advisor: Dale Chapman

Giant in the Hillside: Hip Hop and Copyright Law

In the last forty years, hip hop has become one of the most dissected musical genres in popular culture. Continuing in the tradition of jazz and blues, hip hop combines numerous African diasporic traditions that create a rich culture and reinforce the collective identity of the musicians. Hip hop producers compose using music sampling, the compositional technique of taking pre-existing recorded material and remixing, reappropriating, and recontextualizing the samples to create a new track. Copyright law exists to protect the rights of the author of an original work. The point of difference between hip hop and copyright law is divergent opinions of what constitutes an original work, and the rights of the author of that work. Hip hop culture is primarily oral with a strong sense of community and collective authorship. Copyright law champions the image of the lone genius as the author of a work. During the 1990s, hip-hop artists were sued with increasing frequency for unlicensed sampling. This pattern has continued through today, but surprisingly the courts' decisions have become more restrictive. This thesis offers an overview of hip hop culture, identifying sampling ethics that hip hop musicians have created. The reasoning behind some of the more troubling aspects of copyright law are explored as well as case studies that illustrate the restrictive effect of copyright law on hip hop. Finally, this thesis suggests ways for copyright law to be improved by suggesting changes that could be made to the codified law.
NEUROSCIENCE

Abigail J. Alexander  
Advisor: Jason Castro  

Neuromodulatory Effects of Delta Opioid Receptors on Accessory Olfactory Bulb Processing

The opioids are a diverse set of neurotransmitters that potently modulate synaptic processing as a function of behavioral state. While most studies of opioids have investigated their synaptic actions in the context of analgesia and addiction, few have examined their role in sensory processing. This potential role is especially compelling in the olfactory system, where it was recently identified that there is a robust and unexpected expression of opioid receptors. This suggests that even the earliest steps of sensory olfactory processing may be powerfully modulated by opiodergergic inputs. To investigate the synaptic actions of opioids in olfactory processing, I obtained whole cell recordings from mitral cells of the accessory olfactory bulb (AOB), a brain region critical for detecting and discriminating non-volatile ligands derived from conspecifics. Previous research suggests that opiodergergic agonists decrease recurrent inhibitory activity. Contrary to these findings, I observed a marked effect of DADLE (a delta-opioid receptor agonist) on recurrent excitatory activity when inhibitory input was blocked. Analysis of the intrinsic and passive properties of the mitral cells demonstrated that this increase in recurrent excitation was the result of a synaptic change and not due to a global alteration in cellular excitability or passive properties. Furthermore, examination of spontaneous activity demonstrated a dramatic increase in the frequency of excitatory postsynaptic potentials with DADLE application. Taken together, these results demonstrate that opioids powerfully modulate recurrent excitation in the AOB through a presynaptic mechanism. These findings represent a novel mechanism for opiodergergic modulation.

PHILOSOPHY

Stephanie J. Wesson  
Advisor: David Cummiskey  

Control of Digital Information: Why Privacy Violations Reduce Our Freedom

Privacy often bears an assumed connection to political freedom, but the nature of that connection is underdeveloped. I take a control definition of privacy: to be in a
condition of privacy is to have control over who has access to your information. Violations on the distinctive right to privacy occur when one reneges on the social obligation to respect this condition in particular contexts. I argue that our intuitions are correct: such violations are essentially wrong because they are freedom-reducing. Philosophers of freedom debate whether a positive or negative conception of freedom is best, whether freedom is specific or "overall," and whether one's freedom can be measured. I defend a concept of negative, overall freedom that can be approximated and compared from person to person. Since under the negative conception one is free to the extent one lacks constraints on action, I then identify the constraints imposed by privacy violations in two contexts: commercial data collection and government surveillance. The nonconsensual nature of most digital information transactions marks a privacy violation, for the quantity of information exchanged is too great to be controlled and violators have incentives to uphold secrecy. These violations reduce our freedom by imposing constraints on individual control.

PHYSICS

Joanna C. Moody
Advisor: Nathan Lundblad

Critical Speed Analysis of Railcars and Wheelsets on Curved and Straight Track

The railway train running along a track is one of the most complex dynamic systems in engineering. Its operation has two main features: motion in a train of vehicles and guidance by adhesion with the track. Kinematic analysis of railway vehicles and wheelsets facilitates the evaluation of the relative motion between the many vehicles in the train and the motion between the train and the track. This thesis explores the kinematics of the dynamic system of the train running along a track using basic physical principles. Engineers can use this understanding to calculate speed limits for established rail lines and calculate angles and distances that are of fundamental interest in the design of new train components and track. This work presents the derivation of the kinematic behavior of railcars and railway wheelsets on both curved and straight track and looks at how these motions change on inclines, or grades. It then explores how the kinematic equations are affected by industrial parameters such as locomotive speed, tonnage, track geometry, and railcar dimensions, resulting in a more complete picture of how individual variables factor into the overall kinematics of a running locomotive. The work ultimately discusses how this parametric analysis of kinematic derivations can shed light on current industrial problems of traffic flow optimization.
Saad J. Ansari  
Advisor: Nathan Lundblad

**An Investigation of Quantum Dynamics in a Three-Level Bose-Einstein Condensate System**

Bose-Einstein condensates present to us the opportunity to probe into the atomic interactions that govern a macroscopic quantum mechanical system. The degenerate hyperfine manifold in the bosonic atoms splits in the presence of an external B-field; radio-frequency–induced coupling releases experimentally attainable knowledge about the Zeeman manifold in 87Rb. The purpose of this study is to investigate quantum dynamics in two and three-component Bose-Einstein condensate (BEC) systems. We start with a theoretical analysis of Josephson tunneling dynamics between identical BECs trapped in a double potential well, paying particular attention to the non-linear self-trapping effect observed as a consequence of the intra-well interaction. We present a model for the non-equilibrium dynamics in a two-level system and introduce the Rabi oscillations. This is followed by a numerical and experimental investigation of Rabi oscillations in a three-level 87Rb BEC between the F = 1 hyperfine level spin states mF = {1, 0, 1}. The relation between the observed total Rabi frequency and the detuning, along with its effect on the BEC population dynamics is explored. Finally, we explore the possible suspects for the shift of the resonance at strong Rabi frequencies.

Yang Guo  
Advisor: Nathan Lundblad

**A Study of Matter-Wave Diffraction in Bose-Einstein Condensates for Atom Interferometry Applications**

Atom interferometers detect inertial effects with considerably larger sensitivity than that of traditional light wave interferometers. They utilize the relative small group velocity of coherent matter waves for more precise measurements, which is crucial for possible next-generation inertial navigation systems. In a hybrid optical dipole and magnetic trap system we generate Bose-Einstein condensates to be used as the source of matter waves for atom interferometry. We use tailored light pulse sequences to induce Kapitza-Dirac diffraction in the condensates, splitting them into multiple parts at discrete momentum orders. Numerical simulation and experimental realization is given for novel pulse sequences that splits ±4 k momentum orders.
Edward R. Moan  
*Advisor: Nathan Lundblad*

**Design and Construction of Multi-dimensional Optical Lattices for 87 Rb Bose-Einstein Condensates**

In recent years, ultracold atomic gases have been used as tools to study strongly correlated systems reminiscent of interesting systems from solid-state physics. At temperatures just above absolute zero, particles with integer quantum spin ("bosons") begin to congregate in the ground state of the trapping potential. As the temperature of the system falls below a critical temperature $T_c$ (in this experiment near 200 nK), it undergoes a phase transition called Bose-Einstein condensation. A Bose-Einstein condensate is often described as a macroscopic quantum body, and due to its phase coherence (analogous to an "atom laser") can be used to simulate solid-state systems in a periodic potential called an optical lattice, which resembles that experienced by electrons in the periodic Coulomb potential of a solid-state crystal lattice. These optical lattices are formed by the interference pattern of multiple laser beams, and the associated spatially-dependent Stark shift, resulting in trapping potential for the BEC. The lattice analogs of simple atomic structures have been widely studied. In this thesis, we study the possibility of loading a BEC into multi-dimensional optical lattices. The crystallography of four-beam three-dimensional optical lattices is investigated, and an apparatus is constructed to produce two- to four-beam lattice geometries. We study the structure of the lattice through the technique of Kapitza-Dirac scattering.

**POLITICS**

Evan L. Binder  
*Advisor: John Baughman*

**Same-Sex Relationships and the Right to Intimate Association: Developing an Alternative Constitutional Framework in Support of Gay Rights**

Over the past five years, a multitude of cases that have made their ways through the U.S. judicial system dealing with the question of how to adjudicate laws discriminating against individuals based on their sexual orientation. The common theme among them is a reliance on the 14th Amendment’s Equal Protection Clause, which states that no state may “deny to any person within its jurisdiction the equal protection of the laws.” While discrimination of individuals based on their sexual orientation would appear to violate it, the way that the courts have interpreted the Equal Protection Clause has posed many problems in achieving both a clear legal doctrine and a wider expansion of gay rights. This thesis seeks to remedy the
constitutional quandary of how the courts should interpret laws discriminating against sexual orientation by finding an alternative constitutional justification for overturning said discrimination. My theory focuses on the well-established right to intimate association, which derives from analysis of the First Amendment rights to free speech and assembly and the 14th Amendment right to substantive due process. This right states that the government cannot, without a compelling and narrowly tailored purpose, infringe upon the right of individuals to form and cultivate meaningful intimate relationships. My goal in writing this thesis is to articulate a theory that can provide a clear model for how courts should interpret sexual orientation discrimination in future cases.

Aung P. Myint
Advisor: James Richter

Legal Hybridity: Rule of Law under Authoritarianism

My thesis develops the concept of "legal hybridity" to explain the paradoxical existence of rule of law within authoritarian polity. Legal hybridity is a situation in which law, while instrumentally used by a regime to strengthen its authoritarian power, imposes constraints on the regime's unlimited authoritarian power. Legal hybridity is where rule of law meets rule by law practices. The element of judicial empowerment by authoritarian regimes differentiates legal hybridity from mere authoritarian rule by law. The fusion of rule of law and rule by law under legal hybridity can be observed in the symbiosis of Weberian legal rationality dialectic and the dynamic of judicial hybridization, the simultaneous empowerment and containment of judicial independence. The evidence of legal hybridity is examined in the context of Singapore, in which authoritarian leadership instrumentally provides a rational legal framework for economic development without leading to political liberalization.

PSYCHOLOGY

Mariya E. Manahova
Advisor: Todd Kahan

Do Reentrant Processes Facilitate Feature Binding?

This series of five experiments examined whether reentrant pathways in the visual system aid in the binding of visual features. The experiments studied the involvement of reentrant processes in the binding of color, orientation, shape, and motion. Experiment #1 (N = 24) demonstrated that reentrant processes were
necessary only when binding was required, while Experiment #2 (N = 26) showed that reentrant processes were necessary for binding but were also necessary when binding was not required. Experiment #3 (N = 20) and Experiment #4 (N = 21) demonstrated that reentrant processes were used when participants were required to respond to shapes. These data may indicate that binding is always needed when seeing shapes. Experiment #5 (N = 23) examined color and motion, but the results were inconclusive because participants did not perceive motion in the displays used. Together, the findings of these five experiments indicate that reentrant processes always enhanced performance when binding was required but also facilitated performance in some instances when binding of features was not required. Implications of this research and future directions are discussed.

Mary Alice Millard  
Advisor: Helen Boucher

The More the Merrier: Exploring the Efficacy of Foreign Supernatural Agents as Mechanisms of Compensatory Control

According to the compensatory control model, when individuals are in a state of "control threat" — that is, when they feel that they lack personal control over a situation — they are motivated to seek external or, compensatory sources of control. God is a particularly strong source of compensatory control. Thus, in moments of control threat, people are more likely to believe in the controlling power of God (Kay, Gaucher, Napier, Callan, & Laurin, 2008). This study examined whether foreign supernatural agents, agents that are outside of a person’s religious tradition, could also serve as sources of compensatory control. To explore this question, we conducted two experiments on undergraduate students at Bates College. In the first experiment we found support for our hypothesis in that participants in a state of control threat believed in the controlling power of the Buddha more than participants in a control condition. In the second experiment we found that when the Buddha is presented as more foreign and his order-providing nature is emphasized, religious participants believed in him more strongly when in a state of control threat while non-religious participants did not. Overall, this research suggests that when personal control is threatened, people may be willing to look to foreign supernatural agents to provide a source of compensatory control, especially if the order-providing nature of that agent is emphasized, and especially if the person is religious.
Simone H. Schriger  
*Advisor:* Georgia Nigro

**Chilean University Students' Understandings of Dating Violence: A Qualitative Study**

This exploratory study examined Chilean university students’ understandings of dating violence. In 2013, a law stipulating legal sanctioning of dating violence was proposed and, if passed, will be the first to achieve legal recognition of violence between non-cohabiting partners in Chile. Quantitative research suggests that dating violence is extremely prevalent in Chile, though statistics alone do not paint a full picture of this issue. In order to gain a multidimensional understanding of what dating violence means to Chilean university students, I used the qualitative approaches of focus groups and interviews. At five geographically diverse Chilean universities, I sought to gain a richer understanding of dating violence in Chile within the context of newly proposed legal changes. I used grounded theory to find major themes in participants’ understandings of this issue, allowing students’ own words to contextualize dating violence within contemporary Chile. Data analysis revealed the importance of *machismo*, jealousy, technology, and cultural norms to university students’ understandings of dating violence, and suggested that problems exist, including unrecognized victims and a lack of resources for survivors.

**SPANISH**

Hannah A. Miller  
*Advisor:* Claudia Aburto Guzmán

**El poder de la emoción en una marcha sin fin: Un diálogo con los académicos, la prensa internacional y las palabras de las Madres de la Plaza de Mayo**

In 1977 in Buenos Aires, Argentina the Madres of the Plaza de Mayo first stepped into the plaza to strike back against the disappearance of their children. Considerable literature analyzes the nonlinear path these women constructed as their organization evolved, but close readings of *their* words are rare. In my thesis, I take the academics’ arguments about politics, gender, feminism, and social change and incorporate them into a conversation about collective identity, solidarity, and the reactive and affective emotions that provoked their actions. The first chapter provides an introductory literature review of the dialogue among academics. In Chapter II, I consider questions about human rights discourse and the influence of the international press. In Chapter III, I conduct a close reading of the mothers’ personal words, using James Jasper’s theories on emotions and social protest, Darren Walhof’s interpretations of Hans-George Gadamer’s politics of solidarity,
and Pierre Nora's construction of place and memory to shape my analysis of the mothers' books and interviews. I conclude my thesis in Chapter IV by addressing the discussion of performance theory previously used to understand these women's use of motherhood. I reflect on the need to take into greater account the role of affective and reactive emotions as triggers for further decisions. Throughout I provide a model through which to re-examine what led to that sense of community, internal strength, and urgency that motivated the efforts of these women.

WOMEN AND GENDER STUDIES

Sarah E, Streat – See English