

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 2019 Summit ~

The 2019 Mount David Summit, held on March 29, features the research, creative work, and performances of students from all Bates classes. It is organized into three afternoon sessions, with two arts events 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 Summit web page, bates.edu/summit.

The faculty believes that all Bates students are developing as scholars in their own right, and students are eager 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 completing their senior thesis, 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, sustained commitment 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, sophomores or juniors in the process of developing the skills and insights that will serve their thesis and capstone work in the future. The artists who participate in the Summit—the actors, directors, writers, dancers, musicians, filmmakers, 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 well-nurtured in a liberal arts environment.

The kind of individualized education celebrated at the Mount David Summit would not be possible without the unflagging dedication of faculty advisors. Bates faculty apply innovative pedagogical strategies in classrooms, labs, and studios, encouraging students to practice independent, inventive thinking. 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, learning associates, teaching assistants, 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)

▲ indicates a project focused on the arts: creative writing, dance, music, theater, or visual arts

Ross Ackerman '19

Evolution of Immune Response: A Taxonomic Analysis of Intestinal Parasites in the Leach's Storm-Petrel (Oceanodroma leucorhoa)

Don Dearborn, Biology, advisor

The Major Histocompatibility Complex (MHC) proteins facilitate immune response in vertebrate organisms and are a model to understand how genetic diversity is maintained within wild populations. MHC diversity can be especially important for the conservation of endangered species in the face of pathogens. This study utilizes a genetic taxonomical analysis to investigate the gastrointestinal parasites within the Leach's Storm-Petrel (*Oceanodroma leucorhoa*). Here we show that a common poultry gastrointestinal protozoan parasite, *Eimeria*, is prevalent in petrel feces. This sets the stage to look for correspondence between storm-petrel MHC genotypes and *Eimeria* parasitism, helping to more broadly understand host-pathogen co-evolution.

Academic Field: Biology

Owen Ahlborn '19

Analysis of Harmonics Produced through Electric Vehicle Charging

John Smedley, Physics and Astronomy, advisor

A potential side effect of the congregation of electric vehicle (EV) charging stations proposed by the Demonstration of Electric Vehicle Integration in Non-Residential Environments project at the Stanford Linear Accelerator Center (SLAC) is constructive interference in the harmonic signaling produced by individual stations. In order to better understand the produced harmonics, I constructed a MATLAB model of the AC-DC rectifier as well as a buck boost DC-DC converter used in EV charging in conjunction with some staff scientists at SLAC. An analysis of the individual components as well as the behavior of the model as a whole will be presented.

Academic Field: Physics

Zofia Ahmad '19

Persistence and Path Dependence along the Silk Roads

Luke Chicoine, Economics, advisor

I am studying the effect of past Silk Route locations on modern highway locations, levels of nighttime light intensity, and population density. Using GIS techniques and georeferenced maps of the Silk Roads, I am able to analyze the effect of route presence on a highly localized level. I find that the presence of a Silk Route 2,000 years ago is associated with higher levels of nighttime light intensity and population density today. Furthermore, regions that had a route in the past are more likely to have a highway today.

Academic Field: Economics

Zack Anderson '19

Increasing Immigrant Parent Involvement at Governor James B. Longley Elementary School: A Comparative Case Studies Approach

Emily Kane, Sociology, advisor

Parent engagement has been shown to have many positive impacts on children's educational achievement, social development, and cognitive development. This research examines the ways in which schools can engage immigrant and refugee parents in the educational process, with the goal of informing practices at Longley Elementary School in Lewiston, ME. A comparative case studies model is utilized to analyze current strategies being used to engage immigrant and refugee parents in other communities. The analysis of these case studies shows that both agency-based educational and alignment approaches are possible. These findings offer potential approaches to help create programs and resources to engage parents at Longley Elementary and more broadly across the Lewiston Public Schools.

Academic Field: Sociology

Chelsea Anglin '19

Re-branding China? The Swordplay Martial Arts Video Game, E-Sports, and Their Contributions to Chinese Soft Power ▲

Nathan Faries, Asian Studies, advisor

Like music and animation, video games are forms of art and snapshots of culture. Soft power is a measurement of understanding about a country by others. This presentation explores how the swordplay martial arts video game, coupled with the increasingly globalized E-sports industry, can challenge current gaming trends and spread awareness of traditional Chinese culture in the gaming world at large.

Academic Field: Chinese

Students in AVC 309, Advanced Video Production
Video Collaborations: Working on Video Productions with Community Organizations in Lewiston ▲

Carolina González Valencia, Art and Visual Culture, advisor

Students in Art and Visual Culture 309, Advanced Video Production, worked during the semester with four organizations in Lewiston conceptualizing, producing, and editing a video as a collaboration and in service to each of the organizations: Healthy Neighborhoods Network, Healthy Androscoggin, Androscoggin Literacy Volunteers, and Maine Community Integration. In this screening and discussion, students share their process as well as the final results of their collaborations.

Academic Field: Art and Visual Culture

Chirayu Baral '19

An Imperial Mirage in Sandstone: The British Commonwealth and the Making of Imperial Delhi
Senem Aslan, Politics, advisor

This thesis investigates the process behind the British Raj's puzzling decision to build a new "Indic"-looking capital in the early 20th century. After studying the existing literature on the relationship between colonialism and urban design such as Orientalism, Duality, and Hybridity, I argue that the unique architectural style of Imperial Delhi represented a shift in the state ideology of the British Empire. As the British Empire tried to redefine itself as a voluntary federation of dominions under the aegis of the Commonwealth, the fusion of Indian and Western architecture in the monumental buildings of Delhi allude to the distant promise of trusteeship and partnership between the Indians and the British in the future governance of the subcontinent.

Academic Field: Politics

Katie Barker '19

Analysis of the Origins of Ferroelectricity in Substituted Perovskites Using Neutron and X-ray Total Scattering Techniques

Geneva Laurita, Chemistry and Biochemistry, advisor

The polarization exhibited by ferroelectric materials such as PbTiO_3 are valuable for small device capacitors, sensors, and actuators. The d_0 electron configuration of Ti^{4+} gives rise to off-centering that works cooperatively with the Pb^{2+} 6s2 lone pair to further enhance polarization.

Understanding of the source of these distortions in PbTiO_3 , we prepare substituted perovskites with elements that have similar chemistry. Neutron and X-ray total scattering techniques were used to find local and crystallographic distortions among the perovskites we hypothesize to be ferroelectric. Success in understanding the structure-property relationship among substituted perovskites will aid in the discovery of high-performing, nontoxic alternatives.

Academic Field: Chemistry

Isabella Barrengos '19

Spirit Possession, Mediation, and Ambiguity in the Ancient Greek Worship of Dionysos

Loring Danforth, Anthropology, advisor

Dionysos, the ancient Greek god of wine, theater and madness, challenged oppositions and dissolved boundaries. Ancient Greeks used Dionysos as a method of grappling with socially constructed boundaries. Certain members of this society participated in secret rites as initiated members of the *orgia*, private religious groups dedicated to Dionysos. These rites involved spirit possession, an ecstatic form of worship in which Dionysos took over the souls of human participants. In these practices, the boundaries between human and divine, male and female, and life and death dissolved. In my honors anthropology thesis, I investigate how these categories were challenged, inverted, and questioned.

Academic Field: Anthropology

Students in the Bates Fall Semester Abroad Program in Chile

Public Health in Chile: Analyses and Reflections from the 2018 Bates Fall Semester Abroad

Claudia Aburto Guzmán, Spanish, and Glen Lawson, Chemistry and Biochemistry, advisor

The panel spotlights students' reflections on the objectives of the 2018 Bates Fall Semester Abroad Program in Chile, in which they exchange ideas and highlight experiences that have influenced their understanding of the interface between the sciences and the humanities. The fall semester program utilized the conceptual axes of human interests vs. human welfare in order to better observe the Chilean public health system. In this panel, students integrate their findings and reflections from their final research projects, which included observations of healthcare providers in multiple venues and interviews of providers and recipients of healthcare.

Academic Fields: Biochemistry, Spanish, Global Education

Rebecca Berger '19

Directing The Wolves: Process and Performance 

Tim Dugan, Theater, advisor

Directing an ensemble show of ten actors challenges the director to be spatially and emotionally aware of everything in the rehearsal room. In this presentation, I will discuss the intricacies of the directing process for *The Wolves*, including the design process, my approach to the text, and leading an ensemble of my peers.

Academic Field: Theater

Students in BIO 217 and 218, Human Anatomy and Physiology I and II

3D-Printed Human Organs: An Anatomy and Physiology Class Project

Bruno Salazar-Perea, Biology, advisor

3D-printing is a technology that continues to evolve and is becoming increasingly popular. Applications vary widely from manufacturing cars to printing medical devices and prosthetics. In Biology 217 and 218, Human Anatomy and Physiology I and II, students explored the medical applications of 3D printing. Students printed models of human organs, which help them better understand the complexities of the human body and enable them to share their knowledge with a larger audience.

Academic Field: Biology

Flannery Black-Ingersoll '19, Esme Goldfinger '21, Elisabeth Gwydir '20, and Claire Sickinger '19

Dance Research: Props, Politics, and Pedagogy 

Julie Fox, Dance, advisor

This panel includes dance students' work in thesis, capstone, and an independent study. Each student discusses their movement explorations and theoretical research and reflect on these projects as they near the end of their process. Research topics include political expression through personal narrative in dance, using props and unexpected relationships to evoke humor on stage, and learning the pedagogy of dance.

Academic Field: Dance

Moise Bonheur '19

Spatial Patterns of Gene Expression in the Mitral Cell Layer of the Main Olfactory Bulb

Jason Castro, Neuroscience, advisor

Recent studies have found that sensory inputs to the mouse olfactory bulb (OB) are partitioned into non-overlapping zones. An important and open question is whether these zones demarcate functionally and molecularly distinct subcircuits of the olfactory system. To address this, we have investigated large-scale patterns of gene expression in the olfactory bulb using in situ hybridization data made available by the Allen Brain Institute. Specifically, we are applying dimensionality reduction and clustering techniques to these data to test whether the OB's principal neurons—mitral cells—are molecularly heterogeneous and whether this heterogeneity is topographically organized.
Academic Field: Neuroscience

Emily Bowen '19

Gender Differences in Levels of Satisfaction with Online and Offline Relationships

Rebecca Fraser-Thill, Psychology, advisor

Online dating is one of the most common ways to meet people, especially on college campuses. This study examined the levels of satisfaction that men and women experience with online and offline interactions when finding a romantic partner. These levels of satisfaction were measured through two scales: the Online Dating Inventory (Blackhart et al., 2014) and the Online Dating Site Gratifications Measure (Clemens et al., 2015). I hypothesized that women would be more satisfied with offline interactions than men, and less satisfied with online interactions, compared with men.
Academic Field: Psychology

Stephen Bull '19

56 Surf Street: Sea Level Rise, Flood Risk, and Property Values

Lynne Lewis, Economics, advisor

Using a hedonic property value model, I estimate the impact of proximity to flood risk on property values using FEMA Storm Surge Flood Zone predictions. I use variables accounting for a variety of local real estate market characteristics such as overall housing supply, health of the real estate market, and seller's perceptions of risk related to recent catastrophic events as part of a new approach. Results of this research indicate that lack of complete information prevents the real estate market in three Maine communities, Biddeford, Saco, and Old Orchard Beach, from fully capturing the risk associated with owning coastal property.
Academic Field: Economics

Jacqueline Buonfiglio '19

Exploring the Use of Fecal Egg Floatation Methodology to Identify Avian Gastrointestinal Parasites

Don Dearborn, Biology, advisor

Parasitic infections can contribute to disease and death of infected host organisms, thus information about parasite compositions within hosts can be extremely valuable for the conservation of threatened and endangered species. The focus of this study was to explore the use of fecal egg flotation methodology to determine the composition of

gastrointestinal parasites within avian hosts. Chicken (*Gallus gallus domesticus*) fecal samples were utilized to test this method and determine its suitability for future use on other avian samples.

Academic Field: Biology

Sara Buscher '19

Examining the Diagnosis, Care Pathway, and Clinical Characteristics of Pediatric Familial Hypercholesterolemia (FH) Patients

Heidi Taylor, Sociology, advisor

Familial hypercholesterolemia (FH) is a common genetic disorder characterized by lifelong elevated low-density lipoprotein cholesterol (LDL-C). Individuals with FH have a 20 times higher risk of developing premature coronary artery disease, and thus early detection and cholesterol-lowering treatment during childhood is recommended. However, FH remains extremely underdiagnosed in the pediatric population. Using data from the CASCADE-FH registry and Central Maine Medical Center (Lewiston, ME), the demographics and clinical features of pediatric FH patients are analyzed, as well as the barriers to diagnosis and treatment. These results inform potential improvements in screening, education, and treatment decision making for FH patients and their families.
Academic Fields: Biology, Sociology

Skye Cameron '19

The Intersection of Jazz and Hip Hop: Bebop and the Advent of Hip Hop ▲

Dale Chapman, Music, advisor

Bebop and hip hop were the expressions of marginalized communities of color in New York City. Bebop developed in jam sessions in Harlem's basement clubs the late 1930s and provided an alternate outlet of musical creativity from the popular swing band industry of the time. Hip hop came out the South Bronx in the 1970s, and provided a sense of community in the absence of any form of stability. I argue that, in both cases, it is disruption that defines the two genres' musical similarities, and it is disruption that characterized the environment from which the music was born.

Academic Field: Music

Coy Candelario '19

Identifying Latino Authenticity

Alex Borgella, Psychology, advisor

The purpose of the current study is to look at characteristics of Latino/Hispanic identity through skin tone and language, and examine these variables in correlation to perceived authenticity of Latinos by Bates College students. Using a Twitter profile, participants view different representations of Latino/Hispanic identity. From this, authenticity was prescribed to the targets and associations to Hispanic stereotypic values, and characteristics of these Twitter profiles were tested through a form of questions asked following being exposed to a Latino Twitter profile. Results are expected to show that dark-skinned targets are viewed more authentically Latino/Hispanic than light-skinned targets. Language is expected to have no effect on Latino/Hispanic authenticity, except when comparing the two light-skinned targets to one another. Discrimination of dark-skinned Latinos/Hispanics is expected to be higher

than light-skin Latinos/Hispanics, despite both targets being Latino/Hispanic as a whole. Finally, dark-skinned Latinos are expected to be prescribed more Hispanic stereotypical characteristics and values than light-skinned Latinos, regardless of language representation. These implications may reveal depictions of the Latino/Hispanic community and how people of Latino culture are viewed by both their perceived ingroup and outgroups.

Academic Field: Psychology

Lilly Carey '19 and Claire Sullivan '19

Winning the Truth Game: Media Framing, Credibility, and Brett Kavanaugh

Stephanie Kelley-Romano, Rhetoric, Film, and Screen Studies, advisor

On 18 September, 2018, the nation was captivated by the he said/she said testimony of Brett Kavanaugh and Christine Blasey-Ford. Multiple media outlets broadcast both participants and commented on the "compelling," "credible," and "convincing" testimonies. These papers interrogate the media framing of truth claims and the nature of evidence used to create truth in the public sphere.

Academic Field: Rhetoric, Film, and Screen Studies

Zoe Chamberlain '20 and Janika Ho '20

Off-Campus Study: Living Your Life in a Second Language

David Das, Center for Global Education, advisor

Mark Twain, describing his semester abroad, wrote: "In Paris they just simply opened their eyes and stared when we spoke to them in French! We never did succeed in making those idiots understand their own language." Are attempts at language immersion inevitably exercises in discomfort and miscomprehension? Or is there indeed hope for American innocents abroad? A panel of Bates faculty and students whose abroad experiences span forty years, from 1979 to 2018, discuss the pleasures and perils of living abroad in a second language.

Academic Fields: French, German, Global Education

Andrew Chen '19

Investigating Global and Local Functional Heterogeneity in the Mouse Olfactory Bulb

Jason Castro, Neuroscience, advisor

Many brain regions are comprised of circuits with a highly stereotyped columnar architecture. One longstanding question concerns the extent to which these basic columnar modules are functionally uniform vs. heterogeneous. Using large, genomic-scale data sets made publicly available by the Allen Brain Institute, we have begun investigating both global and local molecular heterogeneity in the mouse olfactory bulb—the first central nervous system structure devoted to odor processing. Our work is aimed at understanding possible anatomical subdivisions of the olfactory system that are difficult to observe using classical techniques.

Academic Field: Neuroscience

Emma Christman '22

Effects of Antibiotic Treatment on *A. forbesi*, *A. vulgaris* Infected with Sea Star Wasting Disease

Katie Dobkowski, Biology, advisor

Sea star wasting disease, which is likely linked to a virus, is

widespread on the Pacific coast of the United States and has been documented more recently on the Atlantic coast. Using two common sea star species that live on the Atlantic coast (genus *Asterias*), two different treatments (n=3 each) were tested utilizing a common antibiotic. We found no significant difference (p=0.597) between the groups and were not able to successfully treat the virus. Anecdotal evidence has previously suggested that this antibiotic might successfully treat seastar wasting disease; however this study did not show any beneficial effect.

Academic Field: Biology

Students in CM/HI 283, Rome and the East: Digitizing and Communicating History

Rome and the Near East: Digital Dura

Hamish Cameron, Classical and Medieval Studies, advisor

The Mesopotamian town of Dura-Europos on the Euphrates River was founded by a Seleucid king around 300 BCE. It was conquered by the Parthians ca. 113 BCE, then by the Romans ca. 165 CE, and finally destroyed by the Sasanians ca. 256 CE. In this interactive exhibition, students in Classical and Medieval Studies/History 283 present their virtual reality reconstruction of parts of this dynamic borderland city and use the city as a lens through which to view the rise of Roman power and the extensive cultural interactions that take place in provincial cities on the margins of the Roman world.

Academic Fields: Classical and Medieval Studies, History

Ashley Cleary '19

The Politicization of the Chicana Womb: Reproductive Justice and Resistance in Latinx Communities

Melinda Plastas, History, advisor

Women of color have been subjected to forced sterilization for centuries in the United States due to a number of political, institutional, and social factors. This thesis looks specifically at the case of *Madrigal v Quilligan*, a federal class-action lawsuit that addressed the forced sterilization of hundreds of Chicana women at hospitals in East Los Angeles County in the 1960s and 1970s. Additionally, I explore the rhetorical and artistic resistance surrounding reproductive justice of Latinx communities in the aftermath of this case. With this information, I attempt to analyze the historical roots of politicizing Latinx bodies and their impacts on the contemporary moment.

Academic Fields: Gender and Sexuality Studies, History

Kathryn Cleary '19

Expression Analysis of Phosphoinositide Transfer Proteins in Human Embryonic Kidney Cells

Martin Kruse, Biology and Neuroscience, advisor

Phosphoinositides are phospholipids that interact with many neuronal proteins, and are necessary for neuronal excitability, signal transduction, cytoskeleton anchoring, and membrane traffic. Plasma membrane phosphoinositides are derived from phosphatidylinositol, which is synthesized in the endoplasmic reticulum. This spatial separation requires the transfer of phosphatidylinositol to the plasma membrane by phosphoinositide transfer proteins (PITPs). Due to their critical physiological function, the role of PITPs as regulators of phosphoinositide synthesis is a rapidly advancing field of research. This study examines

the presence and function of the PITPs MRdgB beta, Nir2, Nir3, and PITPNB in human embryonic kidney cells.

Academic Field: Biology

Danielle Cohen '19

Women as the Satellite Signal: Female Participation on Hezbollah's al-Manar Television Network

Senem Aslan, Politics, advisor

Hezbollah works under a patriarchal framework that does not allow women equal representation in the public sphere. However, men and women are held on equal footing on Hezbollah's television network, al-Manar. What accounts for women's equal presence on al-Manar, given that the foundation of Hezbollah is built on a system of gender inequality? I argue that Hezbollah's decision to participate in Lebanese parliamentary elections led the organization to seek modes of legitimacy to gain support in the government and society, a mode of signaling Hezbollah's moderation to appeal to wider audiences and be conceived as less antagonizing to differing viewpoints.

Academic Field: Politics

Nicholas Coker '19

Quantification and Analysis of Molecular Heterogeneity of the Mitral Cell Layer in the Mouse Olfactory Bulb

Jason Castro, Neuroscience, advisor

Using large, publicly available datasets, we are investigating whether brain structures with columnar organization are homogenous modules "stacked" in parallel, or whether they exhibit molecular heterogeneity. In ongoing analyses, we are using in-situ hybridization data to quantify the spatial heterogeneity (i.e., "patchiness" and potential periodicity) of gene expression along the olfactory bulb's mitral cell layer (MCL). In follow-up analyses, we will perform immunohistochemical experiments to directly investigate the non-uniformity of target genes within the MCL. This analysis may reveal fundamental principles of how neural circuits are organized.

Academic Field: Neuroscience

Zach Collester '19

Regulation of Intracellular Ca²⁺ Signaling by Inositol 1,4,5-trisphosphate Receptor-binding Protein Released with Inositol 1,4,5-trisphosphate (IRBIT)

Martin Kruse, Biology and Neuroscience, advisor

Calcium ions play a pivotal role in numerous cellular signaling pathways and alterations of cytoplasmic calcium levels often have profound effects on cellular activity. Inositol 1,4,5- trisphosphate receptors (IP3R) in the membrane of the endoplasmic reticulum allow for the rapid release of large amounts of Ca²⁺, and inositol 1,4,5- trisphosphate receptor-binding protein released with inositol 1,4,5-trisphosphate (IRBIT) has recently been identified as a competitive antagonist of Ca²⁺ release by IP3Rs. This project aims to elucidate the role of IRBIT by analyzing protein expression levels using Western blot and confocal microscopy, and characterizing Ca²⁺ signaling patterns through calcium imaging.

Academic Field: Neuroscience

Community-Engaged Research Fellows

Ethical Dilemmas and Collaborative Change: Insights from Community-Engaged Research

Francis Eanes, Environmental Studies; Emily Kane, Sociology; and Darby Ray, Harvard Center for Community Partnerships, advisors

How can undergraduate research contribute to community well-being and social justice? What kinds of ethical dilemmas are typical of community-engaged research, and how can they be addressed in ways that honor the interests and insights of both the researcher and their community research partners? What are the unique challenges and joys of this kind of research? In this session, the 2019 Community-Engaged Research Fellows consider these and other questions in the context of projects exploring long-term motel residencies, Kennedy Park as a lever of community well-being, and the social justice potential of art therapy.

Academic Fields: Art and Visual Culture, Environmental Studies, Sociology, Community Engagement

Michael Cooper '20

Exploring the Possibility of Liquid Separation in the Ste. Dorothee Sill near Montréal, Québec

Geneviève Robert, Geology, advisor

Philpotts (1972) described silica-rich diapirs in the silica-poor Ste. Dorothee intrusion. I used petrological modeling to test whether liquid separation could have caused these diapirs. None of the conditions I tested yielded results that support this hypothesis. Liquid separation did occur in some tests, but the liquids did not have the expected composition. These results called for revising mechanisms such as separate magma injections or gas vesicles filled by a separate liquid. However, Philpotts had originally discarded these based on field evidence and we therefore may not yet have a viable mechanism of formation for the diapirs.

Academic Field: Geology

Haley Crim '19

Distributed Energy, Sustainable Heat, and the City of the Future

John Smedley, Physics and Astronomy, advisor

Cities demand massive amounts of both heat and electricity, and traditional methods of creating this energy pollute the atmosphere and accelerate climate change. Hybrid distributed renewable energy systems can meet a city's energy needs within the urban framework to produce low-carbon energy onsite while lowering energy costs and reducing reliance on energy monopolies. This project models a hybrid distributed renewable energy network in Lewiston, ME, composed of 6 different types of energy generators, all located within city limits. The model proves that powering a city, reducing energy prices, and fighting climate change is possible with currently available technology.

Academic Field: Environmental Studies

Jo Cunningham '19

"Miss Rosebud": Creative Writing Thesis ▲

Jessica Anthony, English, advisor

"Miss Rosebud" is one of five short stories in a collection titled *Love and Other Accidents*. All five stories take place in a particular, uncomfortable moment in time. The characters in these stories make up an unusual community of people who are connected in their judgments, their distrust, their eccentricities, and their wish to love or be loved.

Academic Field: English

Isabella Del Priore '19

Analysis of MHC Class II Alpha and Beta Gene Lineages and Heterodimer Assembly in Leach's Storm-Petrel, Oceanodroma leucorhoa

Don Dearborn, Biology, advisor

The major histocompatibility complex (MHC) plays an essential role in vertebrate immune system pathogen recognition. MHC class II consists of two subunits, alpha and beta, which exist in multiple versions in different bird species. My research tests hypotheses about subunit assembly in Leach's storm-petrel, *Oceanodroma leucorhoa*. The "all-possible-pairs" hypothesis suggests that any alpha can pair with any beta, while the "coevolved partners" model proposes that each alpha pairs specifically with a certain beta. Storm-petrel DNA analysis and comparison to avian MHC evolutionary histories support the coevolved partners model, implying that particular alpha and beta subunits coevolved to work together.

Academic Field: Biology

Michael Driscoll '19

Creating an Online Intervention that Utilizes Psychological Distance for LGB - People of Color

Joshua Goodman, Psychology, advisor

There has been a great deal of research on queer peoples' and people of color's mental health and well-being. However, there has not been much of a focus on these groups from an intersectional standpoint. The goal of this study is to address some of the psychological concerns faced by queer people of color (stigmatization, affect, self-esteem) through the use of an online intervention. The online intervention will be created to address internalized stigmas for both identities, and will be conducted through the use of psychological distance in order to mitigate negative attitudes.

Academic Field: Psychology

Adelae Durand '19

Endogenous Brain-derived Neurotrophin Factor and Its Relationship to Cognitive and Affective Flexibility

Nancy Koven, Neuroscience, advisor

There is increasing evidence that brain-derived neurotrophin factor (BDNF) assists in regulating mental functions such as cognitive and affective flexibility. Individual differences and dysfunctions in cognitive and affective flexibility have clinically relevant implications for disorders such as borderline personality disorder (BPD). The degree to which an individual is cognitively or affectively flexible could prove maladaptive for behavioral expression and manifestation. This study explores how BDNF predicts individual differences in cognitive and

affective flexibility and its projections for clinically relevant constructs. Participants completed a collection of self-report questionnaires, neuropsychological testing, and provided a urine sample for quantification of BDNF and creatinine.

Academic Field: Neuroscience

Students EDUC 450, Seminar in Educational Studies
Experiential Engagement and Reflective Examination: Guiding Us toward a Deeper Understanding

Patti Buck, Education, advisor

Last semester, members of Education 450, Seminar in Educational Studies, led a capstone project with students enrolled in a new alternative high school in Lewiston. Over the course of the semester, we met weekly to share stories about our educational backgrounds and explore inequalities within school systems. Simultaneously, seminar members reflected on whether the capstone project, in particular, and the education minor curriculum, more generally, approaches and/or should approach what Mitchell (2008) refers to as Critical Service-Learning ideals. In this presentation, we discuss how the experiential engagement with local youth and reflective examination of our journey through the education minor have guided us toward a deeper understanding of social identity, privilege, and social inequality.

Academic Field: Education

Amanda Engelbrekt '19

Investigating Development and Sexual Dimorphism of Accessory Olfactory Bulb Microcircuits in C57/B16 Mice
Jason Castro, Neuroscience, advisor

Many sexually dimorphic behaviors in rodents are elicited by activation of the accessory olfactory bulb (AOB)—an early brain structure involved in detecting non-volatile ligands that signal social threats and opportunities. Surprisingly, very little work has investigated possible circuit dimorphism in the AOB. To study this, we have performed in vitro whole cell patch-clamp recordings from AOB mitral cells of male and female mice, and are investigating potential differences in intrinsic properties and recurrent synaptic activity elicited by direct stimulation.

Academic Field: Neuroscience

Students in ENG 152, American Writers since 1900: Multiethnic Science Fiction

Radical Collaboration as World-Building in Science Fiction

Tiffany Salter, English, advisor

This demonstration and discussion is the result of a class collaboration in English 152, American Writers since 1900: Multiethnic Science Fiction. The students examine themes of collaboration and world-building as activism in the course texts and then work together, implementing some strategies of collaboration from the texts, to imagine a SciFi future city block based on a collaboratively constructed story. Using 3D-rendering software to create buildings and then loading those 3D files into a virtual reality program, students imagine and give life to a miniature cityscape, reflecting on the relationships between building a fictional world and imagining change in the real world.

Academic Field: English

Students in ENVR 308, Urban and Regional Food Systems

Conducting an Audit of Food Policies and Programs in Auburn, ME

Francis Eanes, Environmental Studies, advisor

The Good Food Council of Lewiston-Auburn (GFCLA) seeks to make strategic improvements to the food system of the Lewiston-Auburn community to achieve good food access for all and a thriving economy, in part by evaluating and influencing policy. As such, GFCLA would like to know more about current landscape of food-related policies, practices, and programs in Auburn. Drawing on interviews with key staff and food system practitioners in Auburn, students in Environmental Studies 308, Urban and Regional Food Systems, aim to provide the GFCLA with a systematic understanding of existing food policy and program strengths and gaps so that they can proactively advocate for a more robust municipal food policy agenda in Auburn.

Academic Field: Environmental Studies

Oliver Farnum '19

The Arc of Ethics: From Bio to Tech

Susan Stark, Philosophy, advisor

Practical ethics as a field of study has developed greatly over the last several decades. The exponentially accelerating field of "technology," represented in large part by massive, multifaceted corporations in Silicon Valley, CA, presents a series of new challenges to ethicists. *Principles of Bioethics*, a core text in the field of bioethics, provides frames of reference (and possible solutions) for tech-centric ethics issues, beyond the scope within which Beauchamp and Childress originally focused. Questions of ethics in technology are broad, but for the purpose of my thesis, I focused on personal data privacy and development ethics issues associated with autonomous vehicles.

Academic Field: Philosophy

Lucy Faust '19

The Real Price to Pay for Waterfront Property: The Impact of Flood Zones and Spatial Proximity to Water on Property Prices in York County, ME

Lynne Lewis, Economics, advisor

I employ a log-linear hedonic property price method to examine the effects of flood risk and spatial proximity to water on coastal property values. I use data from over 3,000 single-family home sales from 2010-2018 in York County, ME. Results establish three main findings. Homes a half-mile from the ocean have a price premium (estimated at 7.6 % in our model). Homes a half-mile closer to the river have a negative price premium, and homes in the flood zone are capturing an estimate price premium ranging from 27.1 to 66.2 % in our models. Whereas most studies analyze flood risk after a major flooding event, this study explores perceived risk before a major flood. Future action is necessary to better inform homeowners and homebuyers of the flood risk in their community.

Academic Field: Economics

Reed Feldman '19

Nationality and Social Networks

Carrie Diaz Eaton, Digital and Computational Studies, advisor

Never before has the question of immigration seemed so ubiquitous in our political and social discourse. The issue of immigration is not only relevant on the national level but also is an issue in the Lewiston-Auburn area. While there is recent concern over Somali presence in Lewiston, the process of immigration is nothing new to this city. In fact, Lewiston and Auburn have a long history of immigration dating back to the cities' industrial dominance in the late 19th and early 20th centuries. Using a set of interviews from mill workers in the early 20th century obtained through Museum L/A, I employed social network analysis (SNA) to determine if there was a connection between a worker's nationality and social presence. Specifically, I became interested in determining whether or not a worker born outside the United States was more likely to have less social influence than a native-born mill worker.

Additionally, how does this influence change over time? Does being a first- vs. a second-generation American affect how central someone is to a network of people? Through social network analysis and data visualization techniques, I found that first-generation and immigrant workers were more peripherally connected to the Lewiston-Auburn community than their second-generation (and subsequent) counterparts.

Academic Field: Digital and Computational Studies

Daniel Fichmann '19

The Golden Gates to Citizenship: Explaining the Existence of Immigrant Investor Programs

Senem Aslan, Politics, advisor

In 1984, St. Kitts and Nevis became one of the first countries to officially sell its citizenship to foreigners. Since then, an increasing number of nation-states around the world have implemented Immigrant Investor Programs (IIPs)—legal processes through which wealthy individuals can purchase residency, or in some cases, even citizenship. The objective of my research is to discover the causal factors that lead countries to implement these programs and explain why some states have IIPs and others do not. I argue that IIPs are a restrictive immigration policy and a product of political backlash to globalization that is intensified by poor economic conditions and volatile elections.

Academic Field: Politics

Perla Figueroa '21

Theater in Process: On and Off Stage in Winter 2019 Productions 

Tim Dugan, Theater, advisor

Actors, directors, and stage managers break the fourth wall to discuss the creation of two Bates theatrical productions, *We Are Proud to Present* and *The Wolves*, staged in winter 2019.

Academic Field: Theater

Sarah Fink '19

Sea Stars ▲

Myronn Hardy, English, advisor

This creative poetry thesis is the speaker's reflection on her younger self and an attempt to understand how she became the self she is at the moment of writing. This development pivots on the influence of the speaker's parents. Thus, the collection incorporates a departure away from naïveté and towards a less appealing yet more realistic apprehension of life, as well as the speaker's self and parents. The collection is deeply rooted in place, Narragansett, RI. This thesis has become both a "star" and "beach" collection, which refers to the recurrent imagery that propels the collection forward. The thesis is a coming-of-age novel in the form of poetry. Academic Field: English

George Fiske '19

Nationalism, Capitalism, and Trap Drums: A Study of the Manifestation of Hip Hop in China ▲

Shuhui Yang, Chinese, advisor

iQiyi's 2017 hit reality show, *The Rap of China*, marks the official presentation of hip hop to mainstream audiences on the mainland. Viewed by over 1.3 billion people, the scale and magnitude of the movement can no longer be ignored. I argue that Chinese hip hop is defined by the complex navigation of political and economic forces, cultural negotiation, and the process of the interpreting the Chinese experience through the medium of rap. Academic Field: Chinese

Victor Fitzek '19

Observing Large-scale Quantum Behavior Using an Optical Lattice to Trap Ultracold Atoms

Nathan Lundblad, Physics and Astronomy, advisor

Bose-Einstein condensates (BECs) are atom clouds cooled to the tens of nanokelvin whose behavior can be modeled with quantum mechanics. Optical lattices are traps for ultracold atoms created by the induced dipole moment from the interactions between electromagnetic waves of light and the BEC cloud. A one-dimensional optical lattice can be formed by retro-reflecting a laser beam across the BEC cloud, making it possible to form an array of potential wells that provide a parameterized environment to observe quantum changes in the cloud over tens of micrometers. Academic Field: Physics

Nate Frederick '19

Development of Novel Tissue-type Plasminogen Activator-binding RNA Aptamer

Paula Schlax, Chemistry and Biochemistry, advisor

Tissue Plasminogen Activator (tPA) is a protein associated with endothelial fibrinolysis and is cited as a potential biomarker for several disorders including colorectal cancers. Through a procedure known as selective evolution of ligands by exponential enrichment (SELEX), a sequence of RNA can be isolated that tightly and specifically binds the tPA protein. This RNA strand can be sequenced, and secondary structure analyzed to gain insight into its interaction with the protein. Since RNA aptamers are increasingly being developed as indicators and inhibitory drugs of proteins in several diseases, this research can improve our understanding of the physiological role of tPA. Academic Field: Biochemistry

Olivia Fried '19

Testimony and Truth Telling: Women and Healing in Chile

Jacob Longaker, Politics, advisor

This project focuses on the ways in which transitional justice processes that use testimony and truth telling can heal trauma and negative emotions after violent state conflict. Using Chile as a case example, I examine the ways in which official mechanisms of transitional justice, such as truth and reconciliation commissions (TRCs), as well as alternative unofficial methods, such as women's embroidery and weaving groups, reconcile and heal women's personal losses and traumas after the dictatorship. By examining group healing mechanisms employed by women to resist violence during the dictatorship, I focus on the impact of *Las Arpilleras* and *Las Bordadoras de Memoria* as they transform emotional pain into political solutions after the dissolution of the regime. This project challenges what we consider official and effective transitional justice methods and who we consider to be the political actors in charge. As such, I make a case for women as leaders of unconventional modes of truth telling and testimony that heal traumas and subjective emotional pain in ways that TRCs cannot structurally accomplish. Academic Field: Politics

Emma Futamura '19

Categorization in Scientific Knowledge: An Analysis of Paradigms in Anterior Cruciate Ligament Research

Glen Lawson, Chemistry and Biochemistry, advisor

Scientists researching differences in anterior cruciate ligaments (ACLs) produce knowledge that sustains biological categories and binaries, thus abusing these differences in identities to explain socially constructed categories and binaries. Looking beyond the underrepresentation of minority groups in biomedical research, I critically thought about categorization in research. As I explored PubMed ACL studies through an analysis lens of feminist science theories, I found that subjective paradigms in ACL research are built upon sociocultural beliefs that scientists incorporate, whether intentionally or not. Socially constructed categories from the cultural world can influence how scientists describe their observations and interpretations of the natural world. Academic Field: Biochemistry

Sebastian Gallegos '19

The Synthesis of GalNAc for O-Mannosylated Glycans

Jennifer Koviach-Côté, Chemistry and Biochemistry, advisor
My presentation is on the synthesis of the monomer sugar GalNAc, which is a building block for the M3 glycan core found in O-mannosylated glycans. This core was just recently found in 2016, so the structure, function, and the effect that this M3 glycan core may have on other cells is of great interest to the glyco-chemical and glyco-biological community. My specific role in this research thesis is to differentiate the 3 carbon position of the GalNAc sugar, via various de-protecting and protecting organic chemical techniques and reagents, from all other positions on the sugar monomer in order to specifically allow an ether linkage with an integral phosphate group. Academic Field: Chemistry

Brandon Galloway '19

The Purification and Expression of E3 Ubiquitin Protein Ligase from Clone Genes

Glen Lawson, Chemistry and Biochemistry, advisor

Protein degradation is a mechanism that regulates the specific protein concentration within a cell. The ubiquitin proteasome pathway (UPP) works by degrading proteins through a tagging mechanism using a small protein called ubiquitin. Ligases are enzymes that function to tag proteins that are targeted for degradation. Our lab is expressing and purifying ubiquitin-protein ligases from cloned genes. We will express the ubiquitin-protein ligase DTX3L in *E. coli* cells. Additionally, we want to know the extent in which DTX3L functions with other ligases to catalyze polyubiquitylation of the encephalomyocarditis virus 3C protease. We hypothesize that we can purify DTX3L through the expression of the GST-DTX3L fusion protein and affinity chromatography.

Academic Field: Biochemistry

Emily Gibson '19

Taking the Lead on Lead Poisoning: Identifying Culturally Competent Initiatives to Increase Awareness of this Pervasive Toxin

Karen Palin, Biology, advisor

Public health initiatives have targeted lead poisoning for decades, yet it still remains a huge threat to our communities. Despite a lack of clinical symptoms in most cases, no amount of lead exposure is considered safe. This thesis examines historical regulations on lead use and past public health campaigns to increase awareness of the toxin. The aim of this project is to evaluate these initiatives and identify suitable methods for educating and raising awareness of lead poisoning in a culturally appropriate manner. These methods will be used in a recommendation for Healthy Androscoggin to implement in Lewiston and Auburn homes.

Academic Field: Biology

Matt Glasgow '19

Healthcare Provider Perceptions of Barriers to Compliance among African Immigrant Populations in Lewiston, ME

Heidi Taylor, Sociology, advisor

Healthcare providers in Lewiston, ME, might overestimate or misunderstand the effect ethnicity has on treatment planning for African immigrant patients. This lack of understanding leaves room for providers to prescribe culturally incompetent treatment plans, diminishing patient compliance. The purpose of this study was to assess medical translator and other providers perceptions of cultural and structural barriers to compliance experienced by African immigrant patients. I conducted qualitative interviews of providers at the Lewiston clinic to assess cultural competency and brokerage, provider-immigrant patient relationships, and provider perceptions of barriers to immigrant patient compliance.

Academic Field: Sociology

Claudia Glickman '19

An Analysis of Intercultural Depictions in German Children's Literature

Raluca Cernahoschi, German, advisor

This project analyzes modern German children's books to uncover the ways in which they depict (or don't depict) intercultural environments and interactions. Starting from the history of children's literature and the emergence of intercultural communication as its own subgenre, I develop a criteria for analysis to look more closely at a collection of popular contemporary books. The children's books are compared and contrasted for their approach to the topic of interculturality, as well as for the messages they send to their audience about the diversity of German culture.

Academic Field: German

Max Gold '19

Analysis of Cold Atom Laboratory Bose-Einstein Condensates in Conventional and Radio-frequency Dressed Magnetic Potentials

Nathan Lundblad, Physics and Astronomy, advisor

With the recent production of Bose-Einstein condensates aboard the International Space Station using NASA's Cold Atom Laboratory (CAL), research is underway focusing on new condensate geometries made available by a microgravity environment. I report fitting analysis and trap frequency characterization of imaging data from condensates in both conventional and rf-dressed magnetic potentials. This information will be used for calibration and design of future experiments with CAL examining ellipsoidal shell condensate geometries.

Academic Field: Physics

Esme Goldfinger '21 – see Flannery Black-Ingersoll '19
***Dance Research: Props, Politics, and Pedagogy* ▲**

Julie Fox, Dance, advisor

Emma Gomez-Rivas '19

The Synthesis of Linderofrucoside A

Jennifer Koviach-Côté, Chemistry and Biochemistry, advisor

There is currently interest in developing efficient synthesis pathways for secondary plant metabolites from the plant genus *Lindera* in order to study their pharmacological benefits. Extracts from these plants have shown to be medicinally beneficial when utilized in traditional medicine. Linderofrucoside A is a large cyclic secondary metabolite that has been isolated from the *Lindera fruticosa* shrub. This study is focused on developing an efficient chemical synthesis pathway to derive Linderofrucoside A in order to utilize it in pharmacological studies. Several synthesis pathways were attempted in order to reveal the most optimal pathway to our final product.

Academic Field: Biochemistry

Hugh Gorman '19

Plasmon Enhanced Nonlinear Optical Harmonic Generation

Matthew Côté, Chemistry and Biochemistry, advisor

This project is centered around the nonlinear optical

harmonic generation that occurs when an infrared laser beam is focused onto a gold microplate. This oscillating electric field excites a propagating charge density wave or surface plasmon polariton on the surface of the gold and enhances the emission of second and third optical harmonic photons. A periodically poled lithium niobate doubling crystal was used to generate 780 nm light to elucidate the mechanism underlying the delocalized emission of second harmonic photons. The role of the incident angle of the infrared photons in optical harmonic generation was studied by adjusting the effective numerical aperture of the lens focusing the light.

Academic Field: Chemistry

Ali Greene '20

Stage Managing The Wolves ▲

Tim Dugan, Theater, advisor

In this presentation I discuss my experience as the stage manager for *The Wolves*, a performance presented by the Department of Theater and Dance. I discuss the duties of a stage manager, which is an often overlooked position in the theater world. The presentation includes details about the preparation and process of the show. Additionally, I discuss the unique challenges that arose in the production of this play that might not typically occur with other scripts and how the director and I worked to solve them.

Academic Field: Theater

Sarah Gutch '19

Ventilatory Acclimatization to Hypoxia in Adult Rats

Ryan Bavis, Biology, advisor

My thesis examines ventilatory acclimatization to hypoxia (VAH) in adult rats. When exposed to chronic hypoxia, the typical response observed is an increase in normoxic ventilation and an increase in what is called the hypoxic ventilatory response (HVR). In previous experiments done in the Bavis lab, the increase in ventilation has been observed but the augmented HVR has not. My study focused on two possible explanations: an increased carbon dioxide sensitivity and insufficient exposure time to chronic hypoxia. Through techniques such as surgery and whole-body plethysmography, we were able to test a cohort of rats and are currently analyzing the results.

Academic Field: Biology

Elisabeth Gwydir '20 – see Flannery Black-Ingersoll '19

Dance Research: Props, Politics, and Pedagogy ▲

Julie Fox, Dance, advisor

Dylan Gyauch-Lewis '21

A Sharper Image: The Role of Obsidian in Pre-Columbian Mesoamerican Society

Gerald Bigelow, History, advisor

Obsidian played a vital, multifaceted role in pre-Columbian Mesoamerica. Civilizations in this region and period had no metal casting technology. Lithics were the only viable means of tool production available. Obsidian has a number of qualities that made it particularly useful: it is extremely sharp, not terribly heavy (relative to granite or other hard stones), and fairly abundant throughout Mesoamerica. In a

world with no steel, iron, or bronze, obsidian was the choice material for tools. However, there is also significant evidence suggesting that the role of obsidian was complicated by its symbolic uses. Moreover, some types of obsidian could have been used to practice conspicuous consumption (wealth signaling/displays). Obsidian was at once valuable as matter of utility and prized as a symbol of religion or power.

Academic Field: History

Ken Hale '19

Amplifying Zebrafish (Danio rerio) alas2 Gene to Evaluate Its Role in Hypochromic Nfe2 Knockout Embryos

Larissa Williams, Biology, advisor

Nuclear Factor Erythroid, 2 (Nfe2) is a transcription factor responsible for the regulation of erythropoiesis and oxidative stress in vertebrates. Erythroid-specific-aminolevulinic synthase (*alas2*) gene initiates heme biosynthesis in vertebrates during erythropoiesis. Zebrafish embryos that have Nfe2 knocked out, experience a downregulation of *alas2* expression (hypochromia). To understand the role of Nfe2 and *alas2* in the genetic pathway for blood development in zebrafish, I will attempt a gain of function assay by microinjecting zebrafish with Nfe2 knocked with mRNA coding for *alas2*. If a normal phenotype is observed, *alas2* would be implicated as the cause of the hypochromia in zebrafish.

Academic Field: Biology

Alexa Harrison '19

Temporal Negative Priming: Visual and Auditory

Todd Kahan, Psychology, advisor

Recently Kahan, Slowiaczek, and Altschuler (2017) report a new form of negative priming, termed temporal negative priming. The purpose of the current study was to first replicate this effect using a slightly altered methodology, and then to examine the mechanisms that contribute to this and extent to which this effect might generalize across modalities. By requiring participants to attend to both the distractor and target stimuli, the first experiment found robust temporal negative priming effects. The second study explored whether temporal negative priming is in part caused by difficulty binding features of a target with a temporal position that was previously associated with features of a distractor (Park & Kanwisher, 1994). Analysis showed that feature mismatch theory may not be the causal mechanism behind this effect. In addition, the data support memory-based over inhibition-based theories, but additional research is needed to fully determine the mechanisms responsible for temporal negative priming. The final study looked to determine if temporal negative priming can be replicated within the auditory modality. Approximately 50 individuals participated in each experiment. Similar to other negative priming studies, participants were shown prime-probe trial pairs. However, in all of the studies reported here prime-probe trial pairs were shown at different time sequences to help separate the effects of temporal location and response.

Academic Field: Psychology

Sanah Hasan '19

Effects of Ego-Depletion on Controlled Responses during the Shooter Bias Game

Helen Boucher, Psychology, advisor

The purpose of this study is to examine how ego-depletion affects participants' responses to the shooter bias video game using Muslim and non-Muslim targets. In the study, we adopt a component process theory approach to ego-depletion, so we distinguish between automatic and controlled processes (Jacoby, 1991). We aim to enroll 80 participants. Participants are randomly assigned into an ego-depletion and a control condition. In the shooter bias game, participants are asked to shoot armed targets and to not shoot unarmed targets (Correll, Park, Judd & Wittenbrink, 2002). Targets in the game either wear Muslim headwear and outfits (turban/thobe) or no Muslim headwear and outfits. The shooter bias video game assesses participants' religious biases. We predict that ego-depletion will only affect participants' controlled responses to shoot Muslim targets compared to non-Muslim targets. We also predict that ego-depletion will have no effect on participants' automatic responses to shoot Muslim targets compared to non-Muslim targets. This study could further research on how mental exhaustion could impact individuals' abilities to act on stereotypes.

Academic Field: Psychology

Xavier Hayden '19

Markov Chain Monte Carlo Simulation in Cryptography
Adriana Salerno, Mathematics, advisor

What rules define a language? As one of the original motivations for studying Markov Chains, mathematician Andrey Markov tried to model letter patterns in a new way. In this project, I look to apply Markov Chain Monte Carlo (MCMC) simulation to decrypt different types of poly-alphabetical ciphers. By studying the state changes in subsequent letters of a particular language, one can program a computer to take exceptionally "smart" guesses as to what an encrypted message actually decrypts to. My project looks to see the applications of MCMC in both Latin and non-Latin alphabets by using a small sample of such languages and determining solutions to poly-alphabetical ciphers.

Academic Field: Mathematics

Students in HIST 399: Historical Methods

Paradoxes of the Past: Bates College and the Legacies of Abolitionism and Slavery

Joseph Hall, History, advisor

Bates College was founded by abolitionists and was financed by money made from slave-grown cotton. How does the college live with this paradox? Students in History 399 took this question into the archives in search of two things. First, we wanted to learn how Oren Cheney and other founders talked about (or avoided talking about) what it meant to oppose slavery on the one hand and to develop close relations with textile manufacturer Benjamin Bates on the other. In addition, we wanted to see how the college has talked about (or avoided talking about) this paradox in its own historical and promotional materials. Our answers—though provisional—highlight just how deeply the country

and the college are connected to old racist patterns. They also highlight how difficult and important it is to address them.

Academic Field: History

Janika Ho '20 – see Zoe Chamberlain '20

Off-Campus Study: Living Your Life in a Second Language

David Das, Center for Global Education, advisor

Sara Hollenberg '19

Contemporary Applications of Common Cryptosystems
Adriana Salerno, Mathematics, advisor

In today's digital age, humans regularly rely on electronic interactions. We depend on our phones and computers to communicate with one another, make purchases, and manage our finances. Cryptography allows us to retain confidence in the applications that enable these digital interactions. My research analyses two of the most commonly used cryptosystems, RSA and AES, addressing how and where they are utilized and employed.

Academic Field: Mathematics

Becca Howard '19

Ambiguities of Interpretation: Abdunasser Gharem's Ricochet 

Marcus Bruce, Religious Studies, advisor

How do we interpret art? There's such a thing as contemporary Saudi art? My study considers the importance of context and exterior information when forming a complete understanding and interpretation of a piece of art. Used as the focal point for this study is *Ricochet*, created in 2015 by the artist Abdunasser Gharem. This study examines the way the interpretive analysis of a piece of art can change depending on the context in which it is both created and viewed, as well as how the information available to the audience about the piece influences the way in which the piece is experienced and received. It also examines the larger theoretical concerns evident in the piece regarding the way contemporary art and religion interact in current artistic production and in scholarship about art.

Academic Field: Art and Visual Culture

Max Huang '19

Dynamics of Quantum Dot Lasers Subject to Optical Feedback and Current Modulation

Hong Lin, Physics and Astronomy, advisor

The dynamics of a quantum dot laser (QDL) subject to both optical feedback and current modulation has been investigated experimentally. The control parameters include modulation amplitude, modulation frequency, polarization of the feedback beam and length of external cavity. For isotropic optical feedback, suppression of feedback dynamics has been achieved when the modulation frequency equals to the resonance frequency of the external cavity. The investigation of dynamics of the QDL with both polarization-rotated feedback and current modulation is in progress.

Academic Field: Physics

Alexis Hudes '20

Chromatin Distribution in Sorted HL-60/S4 Cells

Travis Gould, Physics and Astronomy, advisor

During interphase of the cell cycle leading up to mitosis all components of a cell are duplicated, including chromosomes. Therefore, in G1 (at the beginning of interphase), one would expect to find half of the amount of DNA as in G2 (toward the end). This project analyzes images of HL-60/S4 (human leukemia) cells taken using fluorescent microscopy in order to recognize whether one can identify which phase a cell is in based on how bright a DAPI tagged image of the cell is. Sorted cells are then analyzed for spatial correlations in chromatin distribution. Academic Field: Physics

Edward James '19

The Context of Juuling on a College Campus

Rebecca Fraser-Thill, Psychology, advisor

Within this study, I have examined the rise of the Juul, a popular e-cigarette. Although there are many e-cigarette products, none have caught on in quite the same capacity as Juul. Within this exploratory study, I hope to shed light on why people use the Juul, what type of people (gender, age, etc.) are using the Juul in college, in what settings, and how much. Additionally, through the use of nicotine addiction scales, I have looked at the level of addiction associated with the Juul and how it compares to cigarette addiction. Academic Field: Psychology

Alexander Jiang '21

Modeling Bose-Einstein Condensates Confined by Atom-chip Magnetic Traps

Nathan Lundblad, Physics and Astronomy, advisor

NASA's Cold Atom Laboratory (CAL) conducts experiments on Bose-Einstein condensates (BECs) on the International Space Station using micro-electromagnets (atom chips). Over the summer I modeled the properties of the magnetic field generated by the atom chips, which confine BECs. My modeling elucidate certain features (e.g., shape and location) of the BEC in the magnetic field. The modeling software is created using the Mathematica language with a generalized design, so that users with different experimental goals or those who are unfamiliar with Mathematica can use it. We plan to use this model to aid the creation of bubble-geometry BECs aboard CAL. Academic Field: Physics

Eric Jordan '19

Loci of Synaptic Plasticity in Accessory Olfactory Bulb Circuits

Jason Castro, Neuroscience, advisor

Recent work has studied both associative and non-associative forms of "social plasticity" within the accessory olfactory bulb (AOB)—a chemosensory brain area that is critical for assessing threats and opportunities. To investigate potential synaptic loci of AOB plasticity, we are using variance-mean analysis to determine whether odor-evoked changes in synapse strength are mediated by changes in the number of release sites (N), their probability of release (p), and/or the quantal content of the synapse (q).

In ongoing work, we are investigating whether glutamate release from AOB principal neurons is well-described by classical binomial statistics.

Academic Field: Neuroscience

Tala Kasih '19

Household Water Consumption: Drought and Revenue Instability

Lynne Lewis, Economics, advisor

Water scarcity has led water utilities and governments to implement conservation programs and restrictions to incentivize consumers to reduce water consumption. As a consequence of such restrictions, water utilities have struggled to maintain financial solvency or revenue stability since a large portion of their costs are related to infrastructure (fixed costs). I utilize monthly water usage data along with household characteristics data from three different cities and neighborhoods in Los Angeles County to explore the effectiveness of switching from the current pricing mechanism used in Los Angeles County, increasing block-rate, to either a) consumption-based fixed rate, b) budget-based rates, or c) PeakSet base pricing model. I explore each price structure's ability to remain equitable and fair, incentivize users to reduce consumption, and provide the utility with stable revenue.

Academic Field: Environmental Studies

Seamus Kelley '19

NMR Determination of the Preferred Conformation of Tetrahydro-2H-pyran-2,3,4,5-tetraol

Jennifer Koviach- Côté, Chemistry and Biochemistry, advisor

Xylose is an important carbohydrate building block, but the preferred conformation of the structure is not presently known. By performing different glycosylation reactions on xylose at the anomeric carbon position I have created a library of xylose derivatives. Studying the H1-NMR and COSY spectra, I have determined the coupling constants of each proton which tells us which conformation the compound is in. The program Spartan was used to simulate other xylose derivatives. This study has led to a better understanding of the preferences of xylose.

Academic Field: Chemistry

Lily Kip '19

"A History of One's Identifications": The Body as Site of Subjectivity in Two Women's Coming-of-Age Novels

Sue Houchins, African American Studies, advisor

This presentation employs Diana Fuss's identification theory (*Identification Papers*, 1995) as a manner of analyzing the body in modern women's coming-of-age fiction. Working with repurposed Freudian theory, Fuss examines identification, rather than identity, as a methodology of character subjectivity. I undertake a comparative analysis on the body's role in identification in Sylvia Plath's *The Bell Jar* and Toni Morrison's *Sula*. By placing texts of differing social, cultural, and racial representations into conversation with one another, I hope to engage in an intersectional discourse on the body as site of subjectivity in contemporary women's fiction. Academic Field: English

Samuel Kroger '19

The Fourier Transform and Financial Information

Katy Ott, Mathematics, advisor

We explore the notion of Fourier series and the Fourier transform in order to understand ways we can better find cyclic information in financial data. First we study the abstract math that explains why we would expect results with Fourier Analysis. Then we will discuss various other utilities of Fourier analysis. We conclude by learning about different methods we can use to implement the Fourier transform, and discover how to find patterns in the stock market.

Academic Field: Mathematics

Ceria Kurtz '19

Implicit Bias Awareness in the First Person Shooter Task

Michael Sargent, Psychology, advisor

The First Person Shooter Task (FPST) is a simulation that mimics police decision making in shoot/don't shoot decisions by recording reaction times and errors in participants' decisions to shoot/not shoot Black or White targets. In past work, completing multiple rounds of the FPST reduced decisional biases; researchers deem this a training effect. We hypothesize that awareness of one's own implicit bias, due to internalizing feedback on one's errors, could be an alternative explanation for this bias reduction. The present study examines whether taking a race Implicit Association Test (IAT) will be sufficient to induce a similar kind of attenuation.

Academic Field: Psychology

Sarah Lamie '19

How Bates Students Are Thinking about Variables in a Calculus Context

Adriana Salerno, Mathematics, advisor

What is a variable? This poster presents the work of my year-long senior thesis, which centers on understanding student conceptions of variables in the context of calculus problems. I also showcase my use of student interviews and qualitative data analysis, and how I have combined skills from the fields of mathematics and education to reach conclusions and help others interested in mathematics education.

Academic Field: Mathematics

Maddy LeClair '19

Mono-ubiquitination of 3C Protease in

Encephalomyocarditis Virus

Glen Lawson, Chemistry and Biochemistry, advisor

EMCV is a single-stranded RNA virus that is capable of causing myocarditis, encephalitis, and neurological diseases. This virus produces a protease (3Cpro), which cleaves the viral polypeptide into mature proteins which have both structural and non-structural functions. In normal antiviral defense systems, 3Cpro is polyubiquitinated through a cascade of E1, E2, and E3 enzymes, which targets the protein for degradation. One E3, the ubiquitin protein ligase (E6AP), is in one of several 3Cpro ubiquitination pathways that favors monoubiquitination to polyubiquitination. We hypothesize that monoubiquitination functions to reduce 3Cpro activity. We

are currently monoubiquitinating 3C protease using E6AP and isolating it using Ni-NTA affinity chromatography, then testing the activity.

Academic Field: Biochemistry

Britiny Lee '19

Using TRAP to Examine the Role of Nfe2 in Danio rerio Primitive Erythropoiesis

Larissa Williams, Biology, advisor

A translating ribosome affinity purification approach (TRAP) was used for efficient isolation of ribosome-associated mRNAs in developing erythrocytes. This included creating a transgenic zebrafish line first, then using a fluorescent tag to isolate only red blood cells from the various other genetic materials of other cell lineages. Gene expression studies on the mRNAs collected from the embryo will help explain the regulatory mechanism Nfe2 uses during the oxidative stress response.

Academic Field: Biology

James Lee '19

RNA Binding Proteins as Regulators of Gene Expression in Borrelia burgdorferi

Paula Schlax, Chemistry and Biochemistry, advisor

This project focuses on the role of mRNA leader region structures on expression of the flaB and BpuR genes in *Borrelia burgdorferi*, the causative agent of Lyme disease. We designed mRNA sequence variants that are predicted to influence binding of translational regulatory proteins. These constructs will be used to elucidate the effects of regulatory protein interactions on translational efficiency and mRNA decay to further our understanding of *B. burgdorferi*'s cyclic change between vector ticks and vertebrate hosts.

Academic Field: Biochemistry

Yesul Lee '19

IMF Effectiveness and the 2008 Global Crisis

Luke Chicoine, Economics, advisor

The International Monetary Fund (IMF) offers financial help to countries with huge debt or an unstable economy. My project is to investigate the effectiveness of IMF loan arrangements on the recipient countries of the 2008 global economic crisis. Did the country recover from the economic shock caused by the crisis with the IMF loan arrangements or have the loans actually worsened the country's economic situation?

Academic Field: Economics

Nico Lemus '19

Destroyer: A Reading of Short Fiction 

Jessica Anthony, English, advisor

Destroyer is my creative writing thesis, a collection of short fictions interested in mania, demise, and the supernatural.

Academic Field: English

Owen Lewis '19

Establishing the Structural Limitations of Fatty Acid Incorporation by Lipid Auxotrophic Corynebacteria with Potential for Petrolytic Bioremediation

Colleen O'Loughlin, Chemistry and Biochemistry, advisor

The genus *Corynebacteria* makes up one of the major

communities of the skin commensal bacteria which populate our outermost microbiome. Many coryneform species have evolved lipid auxotrophy; unable to synthesize their own fatty acids, they must take in exogenous lipids from their environment. This dependence provides lipid auxotrophic *Corynebacteria* with the metabolic benchmark for inducing potential crude oil-degrading bioremediators to break down our ecologically disruptive spills. Before any *Corynebacteria* can be adapted for environmental cleanup, we are working to characterize the limits of their ability to incorporate these hydrocarbons from sources of different size, saturation state, and complexity.

Academic Field: Biochemistry

Grace Link '19

Uncovering the Genetic Components of Early Animal Sensory Systems: Putative Sensory Gene Expression after Knockout of Primary Cilia Function in Freshwater Sponges

April Hill, Biology, advisor

Freshwater sponges do not have developed nervous or sensory systems. However, as some of the most basal organisms, they are used to study the development of sensory genes that led to the formation of synapses, neurons, and sensory structures in later organisms. In the freshwater sponge *Ephydatia muelleri*, the ciliated osculum is responsible for sensing chemical gradients and light to intake food particles through a contractile response. To study the role of sensory gene expression on sensory signaling within the oscula of *Ephydatia muelleri*, the expression of three sensory neural marker genes is being examined after primary cilia knockout.

Academic Field: Biochemistry

Nicky Longo '21

Theater in Process: On and Off Stage in Winter 2019 Productions 

Tim Dugan, Theater, advisor

Actors, directors, and stage managers break the fourth wall to discuss the creation of two Bates theatrical productions, *We Are Proud to Present* and *The Wolves*, both of which were staged in winter 2019: Rebecca Berger '19: Director, *The Wolves* (Honors Thesis); Ali Greene '20: Stage Manager, *The Wolves*; Nicholas Longo '21: Stage Manager, *We Are Proud to Present*; Patrick Reilly '21: Stage Manager, *We Are Proud to Present*; Jack Willis '19: Actor, *We Are Proud to Present* (Thesis); Ethan Winglass '19: Actor, *We Are Proud to Present* (Thesis).

Academic Field: Theater

Wanyi Lu '19

Depth of Processing of Visual Scenes Not Consciously Perceived

Michelle Greene, Neuroscience, advisor

This project examines the limitations of the visual system in consciously perceiving briefly presented images. Our visual system grants us a remarkable ability to appreciate the world both accurately and rapidly. However, imperfections in our visual system exist as characterized by effects such as attentional blink: the inability to detect one stimulus when attention was directed to a previously presented stimulus. However, we do not know whether the inability is perceptual or whether it comes from later

decision-making processes. Using neural decoding methods, we examine the extent to which these missed stimuli were processed by the brain.

Academic Field: Neuroscience

Nick Lynch '19

Explaining the Global Interest Rate Decline

Julieta Yung, Economics, advisor

Interest rates are the main driver of the global economy: asset valuations are discounted by the risk-free rate and consumers depend on interest rates for mortgages or student loans. Across advanced and most emerging economies, long-term interest rates have been trending lower since the 1980s. In this thesis, I decompose yields into the expectations component and the term premium or risk component using a term structure model across 24 countries. I then investigate whether the decline in term premia—and hence long-term yields—is global or country-specific and whether this phenomenon can be attributed to structural forces or temporary factors.

Academic Field: Economics

Brendan Mackey '19

Linking Terpenes and the Microbiome: A Novel Mode of Therapeutic Intervention

Colleen O'Loughlin, Chemistry and Biochemistry, advisor

In recognizing the plasticity of the human microbiome, it becomes apparent that beneficial microbiota, termed probiotics, may serve as an accessible target for therapeutic intervention in microbial-driven maladies. In developing a novel treatment for acne vulgaris, the terpene class of natural products has been similarly considered for its potential to reduce inflammation and modulate bacterial growth dynamics. Information generated by analyzing the terpene-microbe response will employ consideration of future experiments in which metabolic engineering will allow for in vivo synthesis of these products for use in dermatological disease states.

Academic Field: Biochemistry

Shelbie McCormack '19

Troy: A Mirrored City and a Culture Not Forgotten

Laurie O'Higgins, Classical and Medieval Studies, advisor

In Homer's *Iliad*, the city of Troy represented wealth, innovation, and spirit. Troy's walls, while formidable, were more than a defensive structure; they enshrined the legacy and history of the Trojan people. Troy's walls were a meeting place, a viewing platform for the drama below, and a place of transition between civilian life and the battlefield. In Book VII, the Greeks constructed a corresponding walled city on the beach to defend their ships. Together, the facing structures variously communicated human ingenuity and ambition together with the power of time and fate to threaten all human projects.

Academic Field: Classical and Medieval Studies

Wendy Memishian '19

The Effect of Hypoxia on Ventilation in Embryonic Coturnix Quail

Ryan Bavis, Biology, advisor

The effect of low oxygen (hypoxia) has been studied

thoroughly in mammals. Newborn mammals have shown a biphasic response to hypoxia: an initial increase in breathing followed by a decrease back to baseline or below. Avian species have been studied to test for this same response, but embryonic Coturnix quail have not yet been shown to have this response. Using a barometric technique developed in lab, embryonic birds were tested in acute hypoxia and the response will be shown in this presentation.

Academic Field: Biology

Niamh Micklewhite '19

The Hydraulic Architecture of Cycads: A Three-Dimensional Analysis of Vascular Networks

Brett Huggett, Biology, advisor

Rachis of the order *Cycadales*, also known as cycads, have been shown to display a distinct vascular arrangement that resembles the inverted Greek letter omega. This detailed and unique arrangement provides useful information to paleobotanists interested in plant identification and classification. Little is known on how the omega-shaped vascular network supplies water uniformly to leaflets. Building upon previous studies on *Cycas revoluta* (Tomlinson et al. 2018), this research aims to complete a thorough analysis of the three-dimensional vascular arrangement across the order *Cycadales*. One species from ten genera was sequentially sectioned, photographed with a digital camera under a microscope, stacked and aligned in Adobe Photoshop, and converted to cinematic format. These images yield a three-dimensional analysis of the vascular network. The hydraulic architecture can be used to explore evolutionary trends and possible links between hydraulic limitations and geographic distribution of particular genera.

Academic Field: Environmental Studies

Andrew Mikula '19

The Effect of State Environmental Regulations on Housing Production

Michael Murray, Economics, advisor

Building on the work of Glaeser & Kahn (2010), this project seeks to determine whether there is a measurable effect of state environmental regulation (such as the California Environmental Quality Act) on the number of housing units added after its passage. The presentation includes case studies of several state environmental policy acts, including those of Washington, Minnesota, New York, and Massachusetts. The quantitative analysis is aggregated on the county level, fostering a comparison between counties that straddle the state line in high-regulation and low-regulation jurisdictions.

Academic Field: Economics

Tess Miller '19

Investigation of the pzn Gene Cluster and Its Role in Staphylococcus epidermidis

Colleen O'Loughlin, Chemistry and Biochemistry, advisor

The pzn gene cluster was recently found to produce compounds required for *Staphylococcus aureus* virulence. While the pzn gene cluster is conserved among

Staphylococcus species, no efforts have been made to understand the role of the cluster in commensal bacteria. This study aims to 1) identify the products of the pzn gene cluster and 2) elucidate their role in the commensal and ubiquitous bacteria, *Staphylococcus epidermidis*.

Academic Field: Biochemistry

Rebecca Minsley '21

Galaxy Data Modeling in 3D: Studying Outflowing Gas Using MaNGA Data

Aleks Diamond-Stanic, Physics and Astronomy, advisor

This project examines extraplanar gas outflows of nearby galaxies in order to further understand the structure and evolution of galaxies. The research specifically considered the gas outflows of nearby galaxies using a recently released data set from the MaNGA sky survey. The data investigated kinematic anomalies to try get a better understanding of galactic outflows.

Academic Field: Astronomy

Luis David Molina Rueda '20 and Maddy Shmalo '19

Beyond Borders: Bringing 1980s Spain to Black Box Theater 🚩

Tim Dugan, Theater, advisor

Paloma Pedrero's plays examine contemporary Spanish society through a feminist lens. Many of her themes appear familiar to broader Western audiences, as questions of queerness, female power, and identity resonate through her work. Informed by his experiences growing up queer in Spain and his research into 1980s Spain, Molina Rueda directed Pedrero's 1985 play, *Lauren's Call* (1985) as part of an independent study in directing. As an actor, Shmalo's involvement with the play required extensive research, communication, and self-reflection. Attempting to separate her own values and beliefs from that of her character challenged her to consider this complex historical period and how sexual identity was explored by people during this time. During the course of project, the actors and director had to find the universal and contemporary in the piece, transcending the national, sexual identity-based, and cultural borders among us.

Academic Field: Theater

Hawley Moore '19

Like Night and Day? Determinants of Fine Art Auction Prices in Afternoon and Evening Sales

Nathan Tefft, Economics, advisor

Contemporary and postwar art represents roughly a third of fine art auction turnover. As these two movements continue to grow, prices are rising rapidly, and works are being circulated at an increasing pace at auction. At most major auction houses, art sales are split into day and evening sales, where the audience, length, and work sold differs greatly. Through the analysis of auction data from postwar and contemporary art auctions, this presentation seeks to test industry assumptions regarding sale prices at auction and determine the differences in trends at day and evening sales.

Academic Field: Economics

Hadley Moreau '19

Role of Nrf2a and Nfe2 in Modulating MEHP-induced Hepatosteatosis following Embryonic Exposure in Danio rerio

Larissa Williams, Biology, advisor

Phthalates are toxicants linked to oxidative stress and metabolic syndrome. Nrf2 is an inducible regulator of oxidative stress. In this study, zebrafish (wild type and mutant embryos from a Nrf2a mutant line) were exposed to phthalates during embryonic development. Juvenile fish were stained with Oil Red O to visualize adiposity. Developmental phthalate exposure significantly increased hepatosteatosis in both wild-type and Nrf2a mutant fish, an effect that was exacerbated in mutants. Our data suggest that toxicant-induced oxidative stress during embryonic development is a risk factor for hepatosteatosis in later life, and Nrf2 function is important for mitigating this stress and hepatosteatosis.

Academic Field: Biology

Ned Moreland '19

An Assessment of Current Japanese Government Policy's Support of Small- and Medium-sized Enterprise Growth in the Japanese Economy

Jiyoung Ko, Politics, advisor

Small and medium-sized enterprises (SMEs) in the Japanese economy comprise a large majority of employment and contribute to over 95% of Japan's GDP. Given that the Japanese economy is heavily dependent on the economic performance of SMEs, government policy should be able to adequately support, and expand, the business initiatives of SMEs. This presentation investigates current government policy, institutions, and their consequent impact on SME performance. In particular, this presentation focuses on fiscal policy and government subsidy programs tailored toward improving SME, rehabilitation, development, and growth. Finally, this presentation effectively assesses to what extent does current Japanese government policy support SMEs in the Japanese economy.

Academic Field: Politics

Robyn Moss '20

Independent Research Study of Hollandite and Honeycomb Crystal Structures for Cathode Oxide Materials

Geneva Laurita, Chemistry and Biochemistry, advisor

The reactivity of lithium and resulting safety risks of lithium ion batteries necessitates research on and development of alternative ion batteries. Sodium, potassium, and aluminum ions are viable options for lithium replacement due to their small size and low oxidation state. Oxide materials with hollandite and honeycomb crystal structures have attractive characteristics for battery cathodes with high capacity and conductivity. This work presents the synthesis and characterization of sodium, potassium, and aluminum cathode materials with hollandite and honeycomb crystal structures. This research offers new chemistries for safer and more sustainable battery technology.

Academic Field: Chemistry

Reilly Murphy '19

Who Is Using Self-Disparaging Weight Humor: Overweight, Low Self-Esteem, or Both?

Alex Borgella, Psychology, advisor

This study investigates using self-disparaging humor about weight. We looked at American adult women's body size and self-esteem compared to rates of using self-disparaging weight humor. We predicted rates of this humor will be high among women with low self-esteem across all weight categories, but will be higher among overweight individuals. Over 200 participants completed a survey via Amazon's Mechanical Turk that included Rosenberg's Self-Esteem Scale (1965), a modified version of Martin's (2003) Humor Styles Questionnaire, and self-reported BMI. Results supporting our hypothesis provide experimental support for something already understood in American society: people make fun of their own weights.

Academic Field: Psychology

Peter Nadel '19

Tremens ac Stupens: Bates Codex 1 and a Story of Medieval Knowledge

Anelise Shroud, Digital and Computational Studies, advisor

Bates Codex 1 is a late 14th-century paper manuscript, housed at Muskie Archives. Interested in questions of the practicality and ideology behind Medieval book production as central not just to historical understanding, but also to a conception of Medieval epistemic lineage, this presentation walks viewers through the extensive research that the book has undergone since September. Focusing on the digital resources that were designed for the manuscript this semester, this project is the meeting place of cutting-edge research in religious studies, classical and medieval studies, and the digital humanities.

Academic Fields: Classical and Medieval Studies, Digital and Computational Studies, Religious Studies

Daly Naughton '19

Neoteny 

Jessica Anthony, English, advisor

A selected reading from my creative writing thesis that explores the physical and aberrations of the body.

Academic Field: English

Miranda Padilla '19

Between Borderlands and The Last Generation

Melinda Plastas, History, advisor

My work is an autoethnographic and theoretical analysis of two Chicana feminist's autoethnographic texts: *Borderlands/La Frontera* by Gloria Anzaldua and *The Last Generation* by Cherrie Moraga. This thesis focuses on Anzaldua's and Moraga's different responses to homophobia and machismo norms by focusing on the ways they sought to reclaim and reform the Aztlán homeland; their use of indigenous imagery; and the various ways they construct and deconstruct their bodies, their partners' bodies, and their sexuality. I use these three themes to inform the creation of my own multi-modal autoethnography, which will take the forms of poetry and photography, in order to engage in the tradition of non-

normative forms of writing to which Chicana feminist literature has adhered.

Academic Field: Gender and Sexuality Studies

Felicia Page '19

Effects of Female Identity Salience on Athletic Performance

Su Langdon, Psychology, advisor

Based on the theories of stereotype threats and boosts impacting individual's performance, this study seeks to investigate the effects of gender identity salience on athletic performance in female athletes. This study looks at the way making a participant's identity as either a woman, student, or athlete salient can influence an individual's athletic performance. Social identities were made salient by randomly assigning participants to one identity salience condition and having participants list the pros and cons of that identity before attempting one academic task, and two athletic tasks. It is expected that participants who were primed for athletic identity salience will perform significantly better than those primed for female identity salience. Previous research has supported that individuals who possess one identity that is negatively stereotyped (female identity) and one identity that is positively stereotyped (strong athletic identity) in a domain can be influenced by making one of the identities more salient, and either improving or harming performance within the same individual.

Academic Field: Psychology

Caleb Perlman '19

Understanding Community in Restorative Justice

Michael Sargent, Psychology, advisor

In contrast to Western procedural justice, restorative justice aims to heal damaged relationships between wrongdoers and victims in light of their shared membership in communities that are responsible for their well-being and to which they are in turn responsible. Within restorative justice literature, there is an underdetermination and lack of consensus as to what constitutes community. This literature review 1) examines how community relates to the practices and philosophy of restorative justice, 2) reviews group relational theories such as entitativity and relational modeling, and 3) examines how the psychological theories relate to the use of community in restorative justice.

Academic Field: Psychology

Michaela Pinette '19

The Effect of Chronic Hyperoxia on Somatic Growth and Thermoregulation

Ryan Bavis, Biology, advisor

Perinatal hyperoxia induces phenotypic plasticity in the developing respiratory control system. This plasticity has been shown to elicit a characteristically "adult" hypoxic ventilatory response in newborn rats, suggesting stimulation of the maturational process. While our results indicate that the effects of perinatal hyperoxia seem to be specific to the respiratory control system, metabolic responses to low temperature, which normally strengthen with maturation, are weaker in hyperoxia rat pups compared to their age-matched controls at both ages tested. This finding suggests that supplemental oxygen treatment

given to preterm infants may delay or impair aspects of respiratory control development.

Academic Field: Biology

Jenna Powell '19

Dike in Hesiod's Theogony and Works and Days

Laurie O'Higgins, Classical and Medieval Studies, advisor

Hesiod's *Theogony* and *Works and Days* present two oppositional times, divine and human. Divine time, which is defined by monumental events, and human time, which occurs in cycles, define Hesiod's conception of justice. Through looking at three instances of justice and this understanding of time, justice is seen as the mediator between the oppositional times and establishes its importance in the mortal and divine realms.

Academic Field: Classical and Medieval Studies

Anas Reda '20

Anp32E Regulates H2A.Z Eviction and Memory Formation in the Hippocampus

Andrew Kennedy, Chemistry and Biochemistry, advisor

In response to fear conditioning, H2A.Z and its chaperone, Anp32E, are concurrently evicted from several H2A.Z-enriched genes in the mouse hippocampus. Moreover, we demonstrate that the AAV-mediated knockdown of Anp32E in the mouse hippocampus results in: 1) impaired memory, 2) a decrease in dendritic arborization, 3) altered accumulation of H2A.Z, and 4) altered gene expression of H2A.Z regulated genes. Surprisingly, the simultaneous knockdown of Anp32E and H2A.Z rescues memory formation, impaired dendritic arborization, and altered gene expression. These data suggest that Anp32E is a crucial element in the molecular mechanisms underlying H2A.Z eviction during learning.

Academic Field: Neuroscience

Patrick Reilly '21

Theater in Process: On and Off Stage in Winter 2019 Productions

Tim Dugan, Theater, advisor

Actors, directors and stage managers break the fourth wall to discuss the creation of two Bates theatrical productions, *We Are Proud to Present* and *The Wolves*, staged in winter 2019.

Academic Field: Theater

Sophia Rintell '19

"It's Not Just a Job for Me Anymore," Finding Strength in the Balance: How Double- and Triple-Duty CNAs Develop Resilience while Navigating Caregiving Demands of Home and Work

Heidi Taylor, Sociology, advisor

Despite being central to the care of society's growing elderly population, certified nursing assistants (CNAs) are largely invisible to the public and to social scientists. Double- and triple-duty CNAs, in particular, face physically, mentally, and emotionally challenging conditions in daily life. Through 19 qualitative interviews with double-duty and triple-duty CNAs, this study explores the major challenges subjects face balancing caregiving roles in their personal lives and professional caregiving at

work and identifies strategies used for self-care. The study finds that many double- and triple-duty CNAs find strength in the challenges they face, utilize strategies to care for themselves, and manage their responsibilities, finding motivation and purpose in the care that they provide for others.

Academic Field: Sociology

Jason Ross '19

Synthesis and Characterization of Ho-substituted Bismuth Pyrochlores

Geneva Laurita, Chemistry and Biochemistry, advisor

Recently, an attraction to pyrochlore oxides has grown significantly due to a wide range of physical properties, such as magnetism and nuclear waste disposal. Typically, pyrochlore materials ($A_2B_2O_7$) tend to exhibit geometrical frustration of dipoles due to the triangular arrangement of cations, which prevents the formation of a ferroelectric structure. An example of a frustrated pyrochlore is $Bi_2Ti_2O_7$. Herein we attempt to relieve this frustration through partial substitution of Bi^{3+} with rare earth metals (Ho). The ultimate goal of this study is to understand the origins of long-range order in pyrochlores to rationally design new polar pyrochlores for electronic applications.

Academic Field: Chemistry

Marcus Ross '19

Effect of Reduced Nfe2 Expression and Pro-oxidant Exposure (Diquat) in Zebrafish Inner Ear Development

Larissa Williams, Biology, advisor

The goal of this project is to look at the role of the transcription factor Nfe2 and its role in inner ear development. In order to study this question, we are taking advantage of using a zebrafish model. Zebrafish are great subjects for development studies because they are transparent during development, making it easy to make observations. In this particular study, we are utilizing transgenic zebrafish that express GFP in their inner ear in order to observe its development.

Academic Field: Biology

Jose Ruiz '19

Studying Fast Outflows from Extreme Galaxies at High Resolution

Aleks Diamond-Stanic, Physics and Astronomy, advisor

We have analyzed the absorption spectra of 14 compact starburst galaxies at redshift $z=0.4-0.8$ that exhibit outflows with velocities greater than 1000 km/s. These data were obtained by utilizing the 10-meter Keck telescope and High-Resolution Echelle Spectrometer (HIRES) from a parent sample of more than 103 galaxies. As a result, these observations allowed us to study the physical properties of this outflowing gas as traced by absorption from ionized magnesium and iron. Through careful analysis of these absorption-line profiles, we are able to learn about the physical process that drives gas out of galaxies and shut down star formation.

Academic Field: Physics

Joanna Schafer '19

The Effectiveness of Sexual Education in Maine: A Comparative Study of State-Regulated Sexual Education Courses

Melinda Plastas, History, advisor

There is no federal law that requires public schools to teach sex education and what is taught is under the jurisdiction of the states and individual schools. Thirty-four of the 50 states require medically accurate sexual education courses. Sexual education courses cover the anatomical and physiological aspects of sex along with the importance of healthy sexual relationships. How are states developing their sexual education courses to be more effective and accepting of contemporary sexual behavior and evolving norms? This research will explore the ways in which the State of Maine, compared to other states, fosters a healthy, useful, equal and accurate course.

Academic Field: Politics

Anna Setzer '19

Reimagining Citizenship in the Era of Climate Change

James Richter, Politics, advisor

Climate change will force many to flee their homes and countries without hope of return, most notably citizens of small island states. These forced migrants would not fit under the designation of refugee set forth by the 1954 Convention on the Status of Refugees, and so would be deprived of asylum rights provided in that convention. This thesis asks how can these refugees gain recognition and rights? I contend that in the age of climate change, citizenship should be reimagined and could be justified using the principles of intergenerational justice and common but differentiated responsibilities.

Academic Field: Politics

Jillian Sheltra '19

Visualizing the Role of Phosphatidylinositol Transfer Protein Alpha in Lipid Transfer following Genetic Manipulation

Martin Kruse, Biology and Neuroscience, advisor

Phosphoinositides, a family of rare phospholipids, play an essential role for neuronal signaling at the plasma membrane. However, the precursor molecule for phosphoinositide synthesis resides in an intracellular compartment, and cannot easily diffuse throughout the cytoplasm. For this reason, a family of proteins called phosphatidylinositol transport proteins (PITPs) are used to shuttle this precursor. Techniques such as CRISPR-Cas9 gene-editing and siRNA-mediated knockdown of PITP α were utilized to study the role of PITP α for control of phosphoinositide synthesis and neuronal excitability. It was hypothesized that decreased levels of PITP α would slow phosphoinositide synthesis after activation of neurotransmitter receptors.

Academic Field: Neuroscience

Maddy Shmalo '19 – see Luis David Molina Rueda '22
Beyond Borders: Bringing 1980s Spain to Black Box Theater 

Tim Dugan, Theater, advisor

Gabriella Shpilsky '19

Purification, Characterization, and Activity of Ribonucleases on mRNA Degradation in Borrelia burgdorferi

Paula Schlax, Chemistry and Biochemistry, advisor

Lyme disease, caused by the bacterium *Borrelia burgdorferi*, is the most common vector born disease in the United States that cycles between tick and mammalian hosts, each with very different cellular environments. To maintain infection, *B. burgdorferi* must be able to rapidly alter its gene expression. We hypothesize that the majority of this alteration takes place post-transcriptionally through RNA decay by ribonucleases. *B. burgdorferi* has a limited subsets of ribonucleases, and subsequently, slow rates and variable patterns of RNA degradation. This study seeks to purify and characterize the five major ribonucleases in *B. burgdorferi* to understand activity and function.

Academic Field: Biochemistry

Claire Sickinger '19 – see Flannery Black-Ingersoll '19
Dance Research: Props, Politics, and Pedagogy ▲

Julie Fox, Dance, advisor

Jamie Siegart '21

Testing the Role of Recurrent Processing in Human Image Understanding

Michelle Greene, Neuroscience, advisor

We isolated 20 images with high deep convolutional neural networks (dCNN) performance and 20 images with low dCNN performance per 25 categories and observers viewed these images while performing a 2-AFC categorization task. We recorded 64-channel EEG. Behaviorally, observers were on average 100 ms faster to categorize images that were easier for the dCNNs. Decodable information for the easy images was available as early as 55 ms post-image onset, but information about hard images was not available until 130 ms. Together, this pattern is suggestive of the role of recurrent processing in biological scene perception.

Academic Field: Neuroscience

Hannah Smith '19

Reducing TET2 in the CA1 of the Hippocampus Enhances Spatial Memory

Andrew Kennedy, Chemistry and Biochemistry, advisor

Haploinsufficiency of transcription factor 4 (Tcf4) leads to the extremely rare learning disability known as Pitt-Hopkins Syndrome (PTHS). We have recently shown that Tcf4-deficient hippocampal tissue from a mouse model of PTHS has altered expression of critical plasticity-related genes. Importantly, these genes were overexpressed in Tcf4-deficient tissue, correlating with a significant decrease in DNA methylation at these loci. Thus, the hypomethylation of genes activated after learning may be a key molecular phenotype of PTHS. Here, we determine the genome-wide sites of altered DNA methylation in Tcf4 (+/-) mice, a mouse line we have already developed that exhibits deficits in learning and memory, social interaction, ultrasonic vocalizations, and have altered synaptic plasticity. Then we test the hypothesis that these

deficits can be ameliorated by increasing DNA methylation via the deletion of Tet1, a DNA demethylase that regulates learning and memory. These experiments test the overarching hypothesis that Tcf4 regulates synaptic plasticity, that its deficiency causes cognitive dysfunction, and that epigenetic mechanisms, specifically DNA methylation, can be utilized for the treatment of PTHS.
Academic Field: Neuroscience

Michael Somkuti '19

Digitizing a Feeling: Data Analysis, Privacy, and Visualization through Tinder

Anelise Shrout, Digital and Computational Studies, advisor

From product reviews to tweets, a multitude of relationships can be discovered through the analysis of massive quantities of text. This study includes insights into the mobile app Tinder, and how its user data can reveal sentiments around digitized romance. Additional topics addressed include privacy in the digital age, design decisions that affect user experience, and text analysis.
Academic Field: Digital and Computational Studies

Cara Starnbach '19

The Synthesis of Luteoside B as a Potential Therapeutic for Respiratory Syncytial Virus (RSV)

Jennifer Koviach-Côté, Chemistry and Biochemistry, advisor

Luteoside B is a trisaccharide phenylpropanoid glycoside compound that has been isolated from the medicinal plant *Markhamia lutea*. Luteoside B has been shown to have anti-viral properties against respiratory syncytial virus (RSV), therefore development of a novel synthesis pathway for this compound is of interest. The first synthesis of luteoside B will be presented, including incorporation of the unusual furanoside, D-apiose.

Academic Field: Chemistry

Katie Stone '19

"Clearly They're Gay": Establishing Harry Potter/Draco Malfoy Fanfiction as an Online Queer Community

Michael Rocque, Sociology, advisor

One of the largest fanfiction groups on the Internet are fans of the Harry Potter series, who largely helped shape modern fanfiction. My research explores the ways in which people who both create and consume fanfiction, also known as prosumers, they use fanfiction to challenge heteronormativity. Through both qualitative surveys with several Harry Potter/Draco Malfoy prosumers and a content analysis on fanfiction stories, this study finds that fanfiction operates as a queer space where people who identify as part of the LGBTQ+ umbrella can seek community, creative growth, happiness, and emotional release with other like-minded people.

Academic Field: Sociology

Claire Sullivan '19 – see Lilly Carey '19

Winning the Truth Game: Media Framing, Credibility, and Brett Kavanaugh

Stephanie Kelley-Romano, Rhetoric, Film, and Screen Studies, advisor

Priyanka Takle '19***The Role of Scene Function in Visual Scene Categorization*****Michelle Greene, Neuroscience, advisor**

This study investigates the ways in which the perception of a scene's functions (the possibilities for actions within a scene) contribute to scene categorization.

Electroencephalography (EEG) is recorded while participants classify scenes where either the function of the scene or a random part are obscured. Categorization accuracy and reaction time is used to determine the difficulty in categorizing scenes without function-related visual information, while EEG data is decoded to understand how this affects the time course of categorization. This study will provide insights into the temporal dynamics of the neural mechanisms involved in visual processing.

Academic Field: Neuroscience

Cristopher Thompson '19***Accurately Measuring the Radius of Galaxies with the Hubble Space Telescope*****Aleks Diamond-Stanic, Physics and Astronomy, advisor**

We present robust measurements of the half-light radius and spectral energy distribution for a dozen compact starburst galaxies with fast driven outflows. The data comes from the Hubble Space Telescope with filters that capture wavelengths in ultraviolet, optical, and infrared emission. We want to measure accurate sizes for nuclear regions of each galaxy to determine the central stellar density and escape velocity. To determine half-light radii of these galaxies we quantify uncertainties and calculate probability distributions for relevant parameters. Our current understanding is that these galaxies are rapidly consuming and expelling the small amount of interstellar gas they have left.

Academic Field: Physics

Mary Buford Turnage '19***Measuring Hypoxic and Hypercapnic Ventilatory Responses in *Anolis carolinensis******Ryan Bavis, Biology, advisor**

When exposed to hypoxia (low O₂) or hypercapnia (high CO₂) animals require various physiological or behavioral changes to continue to supply adequate oxygen (O₂) to their cells and tissues and expel carbon dioxide (CO₂). The purpose of this study was to measure ventilation in *Anolis carolinensis* in response to changes in inspired O₂ and CO₂ concentrations. Head-body plethysmography was used to measure ventilatory responses in anoles to 5, 7, and 9% O₂, and 7 and 5% CO₂ at 25°C and 35°C. This study will aid future exploration of development and evolution of the control of breathing and respiratory responses.

Academic Field: Biology

Carlyle Turner '19***The Influence of Videorecording Eyewitnesses on the Relationship between Confidence and Accuracy in Lineup Identifications*****Amy Douglass, Psychology, advisor**

The purpose of this study is to examine the relationship

between confidence and accuracy within the context of eyewitness identification decisions. Previous research indicates that witnesses who are told that the video record of their identification procedure is standard protocol produce a higher confidence-accuracy correlation (CAC) than do witnesses who are told the videorecording is being collected for evaluative purposes (Douglass et al., 2018). In phase one of the proposed research, half the participants will be told that they are being videorecorded as part of standard protocol. The other half will be told the purpose is evaluative. We expect, based on previous research, that the standard protocol condition will have a stronger CAC than the evaluative condition. In phase two, one week later, participants will be asked to re-report their confidence levels; half the participants will watch the videorecording of their initial identification decision before providing their confidence report. The other half will not watch their videorecording. We expect that witnesses who view the videorecording of their identification procedure will produce a stronger CAC than those participants who do not view the videorecording; we expect to replicate the stronger CAC among witnesses in the standard protocol condition compared with those in the evaluative condition.

Academic Field: Psychology

Amy Turtz '19***Processing Methods of Lead-free Titanate Perovskites***
Geneva Laurita, Chemistry and Biochemistry, advisor

Lead zirconate titanate (PZT) is an optimal piezoelectric material due to its high dielectric constant and high curie temperature. PZT is used in appliances. However, lead is toxic and can cause health and environmental hazards; thus research in alternative materials is critical. A promising alternative to PZT is sodium bismuth titanate (NBT). NBT is a perovskite material, with crystal formula ABO₃. Preparation methods of dielectric materials can effect the properties. The effect of different electrodes will be studied through glass additives and characterized using XRD and SEM. Dielectric characterization will be used to determine the effect on electrical properties.

Academic Field: Chemistry

King Valdez '19***Stellar Mass as a Function of Age and Dust in 12 Compact Starburst Galaxies with High Outflow Speeds***
Aleks Diamond-Stanic, Physics and Astronomy, advisor

We present stellar population modeling to quantify the stellar mass associated with 12 compact starburst galaxies with fast outflows speeds of $v > 1000$ km/s. The astrophysics community asks what shuts down star formation in galaxies. Many suggest that outflows shut down star formation, but what causes these fast outflows? Many theories and models suggest a negative feedback process: the formation of stars drives outflows, and these outflows could shut down star formation, although the physical process that dictates this negative feedback is not well understood. Here, we analyze the central stellar population in a sample of galaxies known to be driving fast outflows by using stellar population modeling to constrain physical densities.

Academic Field: Physics

Ruth van Kampen '19

Impact of Drought and Defoliation in Three New England Tree Species

Brett Huggett, Biology, advisor

Drought and defoliation of temperate forests are predicted to become more frequent and severe with climate change. The impacts of these stressors on the health of tree species native to New England are not well understood. This research aims to better understand how New England forest dynamics may respond in the changing world. Physiological and morphological parameters were measured in three New England tree species exposed to varying levels of water availability and artificial insect predation. The results of this study will inform our understanding of how these tree species react to confounding environmental stressors, as well as aid in developing conservation efforts.

Academic Field: Biology

Dayna Vasconcelos '19

Effects of Videotaped Eyewitness Identifications on Eyewitnesses and Jurors

Amy Douglass, Psychology, advisor

The purpose of the current research is to determine if videorecording eyewitness identifications can help prevent wrongful convictions. The first experiment (N=200) targets eyewitnesses themselves by examining if viewing a video record of their own identification process can inoculate them against the effects of post-identification feedback, a variable known to distort eyewitnesses' retrospective self-reports (Wells & Bradfield, 1998). The second experiment (N=245) targets evaluators by examining if viewing the video record can help them recognize cues associated with inaccuracy and ultimately increase their ability to discriminate accurate from inaccurate eyewitnesses.

Academic Field: Psychology

Andrew Veilleux '19

Justified Retribution? Assessing Contemporary Memory of the Expulsion of Sudeten Germans from Czechoslovakia after the Second World War

Jakub Kazecki, German, advisor

Following the end of the Second World War in 1945, about three million German-speaking Czechoslovak citizens were deported, primarily from the border region of the Sudetenland, to Germany. These citizens were accused of their allegiance to Nazi Germany, which invaded Czechoslovakia in 1938. My research focuses on how the memories of these events are constructed today within the Czech Republic. This past February, I traveled to a series of memorials and museums in Prague to learn about how contemporary collective Czech identity focuses on victimization of their 20th-century history rather than address what many scholars have begun to describe as ethnic cleansing.

Academic Field: European Studies

Craig Waldie '19

An Evolutionary Algorithmic Approach to World Trade Theory

Raj Saha, Geology and Physics, advisor

I utilize evolutionary algorithms to consider with the

limitations of traditional international trade theory and models. Using a custom-made genetic algorithm with economic interpretations, I have modelled multiple extensions of a traditional model.

Academic Field: Economics

Xiaomeng Wang '19

Intracellular Localization of RNA and Protein in B. burgdorferi

Paula Schlax, Chemistry and Biochemistry, advisor

In *Borrelia burgdorferi*, the RNA composition varies rapidly when the bacteria shifted from tick to mammal. Recent works also show that some organisms regulate their RNA composition by the physical locations of those RNA molecules. To explore their spatial distribution in *Borrelia* cells, RNA molecules are visualized using fluorescent in situ hybridization with state-of-art stimulated emission depletion microscope, which yields higher lateral resolution. The imaging results suggest that in exponentially growing phase cells, different RNA transcripts locate in various locations.

Academic Field: Biochemistry

Sophie Warren '19

Nobody Puts IIA in a Corner: A Literature Analysis of the Neglected Half of the MHC Class II Heterodimer

Don Dearborn, Biology, advisor
Genes of the Major Histocompatibility Complex (MHC) provide immune defense and help assess viability of wild animal populations in the face of a changing planet. Most studies of class II MHC genes tend to focus on the beta subunit of the heterodimer protein and neglect the alpha subunit altogether. However, since both subunits compose the peptide binding region, assessments of species' immunocompetency are incomplete without alpha data. We conducted a meta-analysis of MHC class II α literature to understand what is already known about II α polymorphism and establish the importance of II α to understanding species' immunocompetency and potential extinction risk.

Academic Field: Biology

JR Watanasiri '19

Characterizing the Localization of dsrA Variants in Borrelia burgdorferi

Paula Schlax, Chemistry and Biochemistry, advisor

It is known that *Borrelia burgdorferi* regulates its RNA and protein levels throughout the enzootic cycle that transmits Lyme disease to mammalian hosts via tick bites. The spatial localization of RNA during this cycle is thought to be one important RNA and protein regulatory mechanism. In my senior thesis, I propose a method to characterize the sequence location and spatial localization of four potential dsrA strands using fluorescent in situ hybridization and stimulated emission depletion microscopy. Non-coding RNA dsrA is thought to regulate many proteins that are switched on and off during various stages of the cycle itself. This study will provide useful information on localization and function of dsrA, which may give more insight into the regulation of the Lyme disease enzootic cycle.

Academic Field: Biochemistry

Ian Wax '19

Spatial Filtering and Plasmon Enhanced Nonlinear Optical Generation in Gold Microplates

Matthew Côté, Chemistry and Biochemistry, advisor

Plasmons are the collective oscillations of mobile conduction electrons in metals. The strong electric field associated with plasmons can enhance the nonlinear optical responses of metal nanostructures. Spatial filtering was used to investigate the connection between symmetry and second harmonic generation of gold plates.

Academic Field: Chemistry

Katie Weidmann '19

Internet Communities as Minority Stress Reduction Tools for LGB People

Joshua Goodman, Psychology, advisor

The purpose of this study is to examine lesbian, gay, and bisexual people's participation in Internet communities as it relates to social support, minority stress theory, and mental health outcomes. Self-identified LGB participants recruited through Amazon Mechanical Turk completed measures about Internet use and key factors of minority stress theory. Data was analyzed using a multiple regression in order to determine a correlational relationship between social support (both online and in person), factors of minority identity, and psychological distress. Implications of this research will be discussed.

Academic Field: Psychology

Christian Welch '19

Inhibiting Working Memory through Tongue Twisters

Kathy Mathis, Psychology, advisor

When presented with a visual list of words, prior research has found that people have more difficulty recalling words that are phonologically similar compared to a control list of dissimilar words. This result, known as the phonological similarity effect, suggests that when participants are attempting to recall visually presented stimuli, they subvocally rehearse the words in the phonological loop section of working memory, and similar phonemes significantly reduce memory recall. The current study analyzed the phonological similarity effect by testing the accuracy of memory recall on lists of phonologically similar non-rhyming words (cod, pulled, curd, poured, kid, pad), phonologically similar rhyming words (cared, paired, cad, pad, cod, pod), and phonologically different non-rhyming control words (wool, yard, bark, chill, math, slump). Although the phonologically similar rhyming words overlapped on more phonemes than the non-rhyming lists, words from the phonologically similar non-rhyming lists were designed to be difficult to read aloud (i.e., tongue twisters) and therefore were expected to increase subvocal rehearsal time and decrease accuracy. Bates College students participated in a series of memory recall tests, in which they were required to report the serial position of each word after they heard an individual list. To keep the materials standardized, each word contained a similar length, frequency of use, and mean naming reaction time across all three conditions. In this repeated measures

design, participants received nine different sets of six words, three sets in each condition. Implications of the findings are discussed in terms of theories of working memory.

Academic Field: Psychology

Gwen Whidden '19

Islam, Women's Rights, and the Nation-State: Explaining the Uneven Liberalization of the Personal Status Code in Tunisia

Senem Aslan, Politics, advisor

Upon gaining independence in 1956, Tunisia abolished sharia courts, established a secular legal system, and significantly reformed its Personal Status Code (PSC). However, it maintained the sharia-based inheritance law according to which women inherit half as much as men intact. This thesis examines why Tunisia maintained traditional inheritance law while reforming almost all other components of its Personal Status Code in the post-independence period. I argue that the state preserved sharia-based inheritance law because its nation-building objectives constrained the extent to which it could reinterpret Islamic law.

Academic Field: Politics

Aliza White '19

Leaving the Safety of Your Own Home: A Historical Analysis of the Foreign Fighter Phenomenon in Iraq between 2003 and 2011

Senem Aslan, Politics, advisor

From the 1980s onward, the number of foreign fighters fighting in countries other than their own has increased. This presentation uncovers the reason behind the foreign fighter phenomenon in Iraq between 2003 and 2011 through a historical analysis of the origins of the pan-Islamic movement. I argue that the militarization of pan-Islamism as formulated by Abdullah Azzam, a Palestinian religious leader, in conjunction with the Soviet-Afghan War led to the emergence of the foreign fighter movement. This thesis draws from the literatures of violent Islamist movements and terrorism.

Academic Field: Politics

Jack Willis '19

***We Are Proud To Present* ▲**

Tim Dugan, Theater, advisor

We Are Proud to Present, by Jackie Sibbles Drury is a play within a play, including presentational scenes and process scenes, that asks if we can present a genocide in our modern-day era without getting into race, peoples' own perspectives, and opinions. In this play, actors inflict suffering on one another due to them getting carried away in the scene and the violence becomes scary. An undercurrent of the race issues of contemporary America is present in this rehearsal as the actors, three Black and three White Americans, struggle to retain a sense of polite correctness while trying to humanize both the Herero and German colonizers.

Academic Field: Theater

Ethan Winglass '19

Theater in Process: On and Off Stage in Winter 2019 Productions 📌

Tim Dugan, Theater, advisor

Actors, directors, and stage managers break the fourth wall to discuss the creation of two Bates theatrical productions, *We Are Proud to Present* and *The Wolves*, staged in winter 2019. I discuss how Constantin Stanislavski's method acting technique was applied to the preparation and performance of my role.

Academic Field: Theater

Mackenzie Winslow '19

Effect of Substance Abuse Recovery on Cognitive and Affective Flexibility

Nancy Koven, Neuroscience, advisor

Cognitive flexibility, an executive function that permits switching between task demands, is known to be disrupted in substance-dependent populations, but there is conflicting evidence as to whether cognitive dysfunction returns to baseline during recovery. In contrast, very little is known about affective flexibility, an affiliated construct that indexes the ability to adapt to changing emotional stimuli, in substance-dependent and/or substance-recovered adults. This study investigates 1) whether substance-dependent individuals (SDI) in various stages of recovery show atypical cognitive and affective flexibility profiles and 2) whether degree of atypicality co-varies inversely with the length of time of abstinence.

Academic Field: Neuroscience

Louisa Woodhouse '19

Mental Illness or Aggrieved Entitlement? Understanding the Motives of America's Mass Shooters

Michael Rocque, Sociology, advisor

The purpose of this thesis was to examine the primary driving factors leading to mass public shootings in America. Through a systematic analysis of perpetrator profiles and motivations, I investigated whether mental illness appeared to be the primary driving factor behind rampage shootings in the Obama and Trump administrations, or if these incidents appeared to be the manifestation of aggrieved entitlement—a theory proposed by sociologist Michael Kimmel. Additionally, given that the current political climate has triggered a resurgence of public racial discourse, this project examined evidence that political rhetoric has become a catalyst for mass shootings in the United States.

Academic Field: Sociology

Kristine Zengeler '19

Reducing TET2 in the CA1 of the Hippocampus Enhances Spatial Memory

Andrew Kennedy, Chemistry and Biochemistry, advisor

Active DNA methylation in the hippocampus is necessary for the formation and maintenance of memories. Enhancing the fidelity of DNA methylation in the CA1 of the hippocampus enhances the strength and lifetime of object location memory in mice. DNA demethylation in the hippocampus, driven by ten-eleven translocation 2 (TET2), negatively regulates memory function at this spatial memory task. Conversely, TET2 knockdown or knockout enhances 24-hour object location memory, and preserves the fidelity of the memory beyond neurotypical capability. The conditional knockout of TET2 in CA1 excitatory neurons coincided with the hypermethylation of genes associated with plasticity and memory.

Academic Field: Neuroscience

Hanchen Zhang '19

SNARC Effect, Spatial Annotation, and Spatial Attention Constraint

Todd Kahan, Psychology, advisor

Responses to a target are faster when distracting information is congruent with the response relative to when distractors are incongruent, and this congruency effect is larger when people are alerted that a target will appear. Schneider (2018) showed that this interaction occurs for arrows but does not generalize to tasks where people respond to colors. The present study used numbers to explore whether this interaction requires pre-existing directional associations. Numbers were used because these are associated with spatial locations (smaller numbers to the left and larger numbers to the right). Implications for theories of attention and cognitive control are discussed.

Academic Field: Psychology

Katie Ziegler '19

The Repurposing of 19th-Century Tenement Buildings in Present-Day Berlin

Jakub Kazecki, German, advisor

Berlin's tenement buildings, or *Mietskasernen*, were widely criticized when they were first built in the late 19th century. Today, the tenement buildings house desirable modern apartments, and in some cases, boutique shopping complexes. This presentation discusses the question: How do narratives of nostalgia for the late 19th-century and images of the working-class tenements interact with the forces of gentrification? Evidence will be presented in the form of photographic documentation of the buildings, a comparison of historical and contemporary discussions of the tenements in the press, and a discussion of the reception of artistic depictions of the historical *Mietskasernen*.

Academic Field: German

