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INTRODUCTION:
Research as Educational Paradigm

Research is disciplined inquiry. It is at the heart of human endeavor: we crave knowledge with every move we make. It is, of course, also at the heart of this University and the education we offer. The journal you are reading was made possible by donors who believe in our commitment to research. The following pages also emerge from the brilliance and dedication of our students and the faculty who mentored them during the academic year 2019–2020 in the College of Arts and Science at New York University. It is a celebration of the achievements of our most curious, driven students.

Research takes many shapes. The students featured in this publication spent time working in a lab with a team of scientists in order to understand brain development; they measured the dimensions of ancient human remains to understand cultural practices surrounding beauty; they picked through boxes in an archive, finding textual evidence to support a literary analysis; or interviewed living eyewitnesses to a major historical event in a foreign country. The benefits are many. Students work closely with a mentor, sharpen their problem-solving skills and learn about “the big ideas” of their chosen field. Students explore possible future careers, learn how to work independently and hone marketable skills such as effective written and oral communication. However, in personal terms, there is no greater achievement than meeting the challenges of a long-term project, following a passion to a wonderful conclusion and having completed work to show for it. It is a thrill and satisfaction like no other. The internal standard of excellence that our students discover within themselves is perhaps the most salient personal outcome of undergraduate research—a reward that keeps on giving no matter what one pursues after college.

This publication represents only a fraction of the research undertaken by College students, as individuals and in groups, under the close mentorship of faculty. For the most part, the projects featured here were supported by the Dean’s Undergraduate Research Fund, created through the generosity of alumni, parents and friends, providing the material support necessary to carry out their inquiries. (A list of the research scholarships that have been endowed in the Fund appears on page 2 of this journal.) These abstracts were also presented at the annual Undergraduate Research Conference, which was established over forty years ago and encompasses the natural and computational sciences, the humanities, the social sciences as well as creative writing.

The content of this issue underscores the crucial importance of independent inquiry as a paradigm for liberal arts education in the twenty-first century. We are very grateful to the students, their faculty mentors and the generous funders who have made this sort of educational experience, and this journal, possible.

Gene Andrew Jarrett
Seryl Kushner Dean of the College of Arts and Science
Professor of English
Polyphony of Power: Voices of a Late Nineteenth-Century Kongo Crucifix
Talia Abrahams, Art History
Sponsor: Professor Prita Meier, Art History

My research is a propositional interpretative study of an object in the Musee du Quai Branly’s African Art collection: a nineteenth-century Kongo “power object” (nkisi) and crucifix. The Kongo “power object” is a distinct type of sculpture that contains a spirit and special ingredients to “activate” its unique function. This object is singular because it is combined with a crucifix. Catholicism was first integrated into the spiritual and political fabric of the Kingdom of Kongo in the fifteenth century, yet its role in an nkisi is unclear, especially since this object is the only of its kind. Kongo “power objects” have long been associated, like other African objects, with the derogatory idea of “fetishism”, which suggests that the object is imbued with more power than an inanimate object should have. This accusation is made by the Western observer, who for centuries has deemed Kongolese artifacts, people, and culture as superstitious and inferior to justify heinous interventions into Kongo regions. I suggest that the “fetishistic” power of an object helps restore control and subjectivity to a people objectified by historical circumstance, a process of “de-objectification”. I cite first-person accounts of life in the southern Kongo region, providing acute descriptions of hardships, rituals, and ideological models of people living in this area in the late nineteenth century. I propose that there may be a relationship between shifting European-Kongo power dynamics and the experimental sculptural characteristics of the crucifix. There are irrecoverable voices and lines of contact bound into silent artworks, and embracing polyphony adds complexity more representative of the history it compounds.

Beasts, Battle, and Backgammon: A Study of Twelfth-Century Backgammon Pieces and Their Iconographic Significance in Medieval Europe
Milly Ames, Art History
Sponsor: Professor Kathryn Smith, Art History

Games are capable of offering us profound insight into a culture and its values. Over the past century, chess sets such as the twelfth-century Lewis Chessmen have been the subject of much scholarship. However, the same cannot be said for pieces of the medieval European precursors to the game of backgammon commonly referred to as tables. Despite their complex iconography and material richness, these intricately carved five-centimeter wide ivory rondels, known as tablemen, have long been overlooked. This paper examines the conflicting associations of the game, as well as the cross-cultural transmission of images and customs between Europe, Asia, and Africa through the lens of a group of six pieces dubbed the “Beast Riders” thought to have been carved in Cologne around 1175. My research marks the first time that the six tablemen have been considered as part of a single group. Through an analysis of the individual pieces and their resemblance to Byzantine and Sasanian textiles and metalware, I will demonstrate the potential for the game having been viewed as a metaphor for battle and how the pieces reflect the dynamic cultural, religious, and political landscape of the twelfth century.
contracts and Nomads: Gilles Deleuze’s Politics of the State in May ’68
Jack Booth, History, Computer Science
Sponsor: Professor Stefanos Geroulanos, History

This project seeks to map the evolving thought of Gilles Deleuze surrounding the problem of the State in and around the tumultuous events of May ’68 in France. To do this, the study will examine some of Deleuze’s major and minor works through the lens of a later interview done in 1990 with Antonio Negri, where Negri attempts to draw clear delineations in Deleuze’s work before and after May ’68, which Deleuze rejects. Through close readings of text and interviews, it will establish a position between these two interpretations, drawing on Deleuze’s pre-68 work, demonstrating the effect of the May ’68 events alongside the intervention of Deleuze’s long-time writing partner Felix Guattari. I conclude by examining the implications for their joint work in Capitalism and Schizophrenia. Using previous writings on sadomasochism from French theorists such as Jacques Lacan and Georges Bataille, the study will identify the unique characteristics of Deleuze’s writing on masochism, particularly in its focus on the contractual act. While on first glance it may appear to possess a similar character to Lacan, who finds transgressive erotic acts to be cogs in a psychoanalytic trap, this study will argue that Deleuze takes a more nuanced position how to the contract can be used to approach statehood. The meeting of Guattari, along with May ’68, will then be examined through previously unpublished notes and lectures of Guattari, establishing clear modifications which also possess distinct throughlines to the concepts of nomads and the war machine in their later work.

A Changing Landscape in New York’s Physical Retail: Coffee Edition
Wayne Chen, Urban Design & Architecture Studies
Sponsor: Professor Mosette Broderick, Urban Design & Architecture Studies

One can find coffee drinkers among New Yorkers from all walks of life. Consequently, coffee shops frequently act as gathering places for New Yorkers. However, over the last decade, tensions between big retail and small businesses have changed the coffee consumption habits of many, and it is revealing our city’s underlying income and socioeconomic inequality. While coffee carts and delis are struggling to compete against chains and independent cafés, New Yorkers have developed very different consumption habits, and it is driving them apart. I knew coffee is now weaponized as a tool for division when pundits coined the term “latte liberal”.

Fascinated by the context of such a simple drink, I asked myself: How does a neighborhood’s social demography correspond to the pattern of coffee consumption? I wanted to learn if comparing where coffee shops are and how they are scattered with data on the sociodemographic layout of New York’s population will answer this question. Researching this question made me realize the debate of coffee shops isn’t binary: there are ways where coffee carts, bodegas, national chains, and artisanal coffee shops agree and disagree with each other. Now more than ever, there is an emerging association between coffee prices and the location of coffee retailers—in wealthier neighborhoods, the price of items skyrocket. Of course, the outbreak of the COVID-19 pandemic complicated the research progress, but I was still able to gain some conclusions, and I believe the result should offer a new look into coffee shops as an indicator of emerging inequality, even when they are small businesses themselves.

Reclaiming the Red Hook Waterfront: An Analysis of the Urban Maritime Architectural Tradition in South Brooklyn
Emily Conklin, Journalism, Urban Design & Architecture Studies
Sponsor: Professor Jonathan Ritter, Urban Design & Architecture Studies

The Industrial Revolution created a worldwide social and economic shift, and cities today are filled with the remnants of the structures of industry, from factories and warehouses to the canals and docks that serviced them. Buildings form an integral part of the fabric of urban communities, and the histories and robust material makeup of the often overlooked vernacular architecture of South Brooklyn, and notably Red Hook, are at risk. This thesis will examine the industrial architecture of Red Hook, Brooklyn, and the potential of intangible heritage to preserve and repurpose its architectural character as a community asset for economic and cultural vitality in the immediate neighborhood, as well as for the greater New York City. This thesis is based heavily on site-specific research and tangible evidence gathered from visits to prominent sites on the peninsula, discussions with local residents and business owners, and physical interaction with the structures and streetscapes. My work connects field research with studies of waterfront regeneration, philosophies of space, and architectural theory. Industrial buildings serve their communities in nuanced, yet invaluable and economically viable ways that are impossible to replicate with newly built structures: Their demolition results in a loss of local history and community identity. Red Hook has the potential to realize radical grassroots transformations for and by its residents, as its low-lying brick structures are rare examples of well-preserved heavy timber and iron framing technologies in architecture, and of the working-class experience itself. They suggest an intangible heritage and a distinct genius loci in a historically blue collar, immigrant community. In examining Red Hook’s architectural legacy, this thesis argues that intangible heritage can be a
benchmark indicating the immediate and future success of waterfront regeneration, embodying preservation ideals of inclusivity and visual representation that build upon, rather than erase, vernacular tradition.

Art on the Street: What Happens at the Walls
Emily Gibson, Urban Design & Architecture Studies
Sponsor: Professor Mosette Broderick, Urban Design & Architecture Studies

Art on the Street: What Happens at the Walls is a study of graffiti in New York City: the urban climate that witnessed its birth and the urban forces that cultivated, destroyed, and warped it. 45 years ago urban youth found themselves spray painting their names on subway trains and sending them into the heart of the city for everyone to see. Fame was the ultimate motivator. 45 years ago New York City was fighting to be known as well. To be known once again as the great city that it had been before it was face to face with bankruptcy. Graffiti was cast as scapegoat for the city’s negative image and city authorities began their crusade to eliminate it. 45 years ago this meant buffing, but today a new tactic emerges. Instead of merely painting over graffiti with brown paint, many storefronts and landlords have opted for a mural instead. ‘Street art’ is a curated, formal approach to tackle graffiti’s quick, free expressiveness. The new relationship between street art and graffiti coexisting in the city is about space, and everyone’s access to it. What happens at the walls reflects what happens in the city.

The Poetry of Julia Uceda: Five Decades of Love and Seclusion
Lola Granger-Jourdan, Global Liberal Studies, Spanish; Alexa Nicole Mamoulides, Spanish & Linguistics
Sponsor: Professor Maria Jose Zubieta, Spanish

This is a Spanish literature and translation project comprised of three parts: a translation of an anthology of 72 poems by the Spanish poet Julia Uceda titled A Woman Walked and Walked and Walked, an introduction, and a research trip to Spain. The 72 poems are compiled from Julia Uceda’s works published during her prolific poetry career, spanning from 1959–2013, documenting over half a century of cultural shifts in Spain. Julia Uceda, one of the only female poets to be considered part of the Generation of the Fifties, managed to break out of the ideological impositions set for women in postwar Spain. The introduction to the anthology that was written after a research trip to Spain provides an analysis of the Franco Regime through a feminist literary perspective; this poet’s works challenge and expand the role of poetry, women and women poets in Spain under one of the most censored and oppressive times in Spanish history. Julia Uceda pushed in mid-twentieth-century Spain for the work of female poets not only to be considered in the context of “women’s poetry”, but also to be evaluated on the basis of quality, regardless of its author’s gender. This introductory piece delves into the main themes embedded in her works: memory, sexuality, love, death, and estrangement as well as their significance in the socio-political sphere of the time in which they were written. Julia Uceda’s work is not confined to the field of Spanish literature; rather, her work has ripples in feminism and Spanish history.

When Nonna Starts to Rap: An Exploration of Apulian Dialect in Modern Rap Music
Danielle Hadjin, Italian, Language and Mind
Sponsor: Professor Nicola Cipani, Italian

This senior honors thesis explores the motivations behind the use of Apulian dialect in rap music. As dialect monolingualism is becoming less common in Southern Italy, dialect has found other ways to be part of society. Dialect, a language of typically older generations, is finding itself inserted into one of the newest genres of music, rap. Although at first, the two are from seemingly different worlds, they harmonize perfectly to express Apulian pride. Famous Apulian artists like Caparezza, Sud Sound System, and Boomdabash have begun to use dialect in their raps for a variety of reasons, ranging from its more flexible syllable structure to its ability to connect back to their Apulian roots. This research draws on interviews with Apulian rappers, producers, and even a mayor, to provide motifs behind this linguistic phenomenon. Lyrics are also broken down to further explain the particular context for each artist. Perhaps the most important impact this thesis has is that it extends the research which has been done in this area of sociolinguistics, which has focused primarily on the famous Sicilian and Neapolitan languages. Although Apulian dialect may not be understood by all of Italy, let alone the world, the themes of expressing pride, language, tradition, and identity are common to all. Lastly, this research also provides insight to the question of what local, regional, and national pride feels and looks like to the Italian people.

Translation as Gesture: Le Petit Prince across Languages
Tyler Ingram, Romance Languages
Sponsor: Professor Lourdes Dávila, Spanish & Portuguese

This project consists of a comparative study of various translations of Antoine de Saint-Exupéry’s Le Petit Prince, a French children’s novel that has found worldwide success and become one of the most widely translated texts in the world. I first compare the original French editions with its translations in Spanish, English, and Catalan, basing my analysis on the linguistic changes that take place across the different translations and how these changes affect how the text is read and understood. I use transla-
Masculinity, Morality, and Mobility in *Harry Potter*

Shivani Kamat, English and American Literature

Sponsor: Professor Simón Trujillo, English

This thesis analyzes all seven books of J. K. Rowling’s *Harry Potter* series, focusing on five secondary male characters and their relationships with masculinity, morality, and character development. Engaging with feminist, queer, and narrative theory, this paper examines how male characters in the series are afforded complex character development and internal negotiations with morality in a way that the female characters are not. To understand this discrepancy, I concentrate on the characters of Draco Malfoy, Dudley Dursley, Sirius Black, Severus Snape, and Albus Dumbledore and analyze how they challenge binaries in the series, such as good and evil as well as conventional gender norms. I further argue that the race and status of the characters informs how they either abide by or break from standards prescribed by hegemonic masculinity. Each section covers a different character, in which I break down their initial descriptions, character arcs, deviation from traditional masculinity, and character-defining decisions related to morality. I argue that in all five characters, there appears to be a trend in which they are unable to fit into boxes of normativity and are isolated from others—conflicts which result in the necessity to choose between good and evil. Additionally, each of them begins as an antagonistic figure—with the exception of Dumbledore, whose darker past is revealed later. Despite choosing good in these climatic moments, they end up in a middle ground between the two, with neither justification for their villainous acts nor full redemption for their goodness. I conclude with the importance of representation and identity in children’s literature and how both the male and female characters in a series as influential as *Harry Potter* illustrate the values of nonconformity.

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“Eternal Passion! / Eternal Pain!”: Sex and Suffering in T. S. Eliot and Beyond

Clare Kernie, English and American Literature

Sponsor: Professor Peter Nicholls, English

The image of the nightingale has been infused into art, and especially poetry, for thousands of years. This project, driven by the persistence of the nightingale today, primarily examines five poems by T. S. Eliot that contain implicit and explicit references to the nightingale and the woman she symbolizes. The mythic Philomela, raped and mutilated by her brother-in-law, is most notably present in *The Waste Land*. But what poetic theorist Allen Grossman calls the “founding myth”—a narrative motif that has transcended time—of poetic pain pervades Eliot’s earlier poems as well as his personal life, including his marriage with his first wife, Vivien. With this framework, I assess Eliot’s use (and misuse) of suffering as represented by the nightingale and ultimately argue that Philomela’s pain is not Eliot’s to appropriate and aestheticize for the sake of his own art. Finally, I investigate excerpts from and perform close readings of Paisley Rekdal’s 2019 *Nightingale*, a poetic retelling of Ovid’s *Metamorphoses* that focuses on narratives of sexual trauma and recovery. Rekdal’s is a raw look at the suffering the Philomela myth activates, and it serves as a reminder that the image of the nightingale remains a powerful, unaestheticizable one in the twenty-first century.

*Smarginatura: The Language of Porosity in Elena Ferrante’s Neapolitan Novels*

Devanshi Khetarpal, Comparative Literature

Sponsor: Professor Rebecca Falkoff, Italian

Dissolving of margins, or *smarginatura*, in *My Brilliant Friend* (MBF) is a state of multiplicitous dissolutions. Physical, temporal, sentimental, material and psychological, it is a state the characters undergo as much as Naples, embedded in the rione inhabited by Lila and Lenù. Translated as “dissolving of margins” by Ann Goldstein, *smarginatura* presents a porosity that contrasts and amplifies the conditions of solidity and the materialism it implies thereof. In the evident materialism of the rione and of Naples, the porosity of materials and objects has been clarified and converted into metaphors to vividly describe how they pierce and affect the lives of the people who inhabit the various spaces within the city. Porosity is dialogic not only in Ferrante’s world but also in studies about Naples as a porous city that sanctions or provides the experience of *smarginatura*, a multi-layered trespass of meanings, materials, and existences exemplified through language.
Therefore, there is also an exchange and substitution of language between the two: the language that encapsulates the experience of Naples is often ascribed to the language that encapsulates *marginatura*. This overlap pushes Naples from the background of the tetralogy to the foreground where it becomes an active player that erupts and grows alongside Lila and Elena and, like their stories, runs deep underground. My paper attempts to explore Naples both absorbs, releases, and expresses its porosity through the experiences of Elena and Lila in *My Brilliant Friend* by observing, in conjunction with the novel’s sources such as *Bodies of Naples: Stories, Matter, and the Landscapes of Porosity* edited by Serenella Iovino and Serpil Oppermann, *Naples and Mental Health* by Mario Maj, *Letter from Naples: Saint Vesuvius, or the Volcanic Baroque* by Karen Berrmann, and *Elena Ferrante’s Key Words* by Tiziana de Rogatis, alongside HBO’s television adaptation, *L’Amica Geniale*.

**Analyzing the Absent Father in Japanese Manga and Anime**

*Edward Kim, English and American Literature*

*Sponsor: Professor Teresa Feroli, English*

Why are absent fathers so prevalent in Japanese *shônen* manga, and what role does the protagonist’s father play in these sorts of narratives? This thesis serves as an investigation of several prominent *shônen* manga that feature protagonists with absent fathers, analyzing how the father’s absence plays a distinct role in the narrative. Throughout the likes of Akira Toriyama’s *Dragon Ball*, Masashi Kishimoto’s *Naruto*, or Yoshihiro Togashi’s *Hunter × Hunter*, the son is in pursuit of a goal that has already been accomplished in some capacity by the father. These are coming of age stories, but unlike those that feature orphan protagonists in the western literary canon, the protagonist’s idea of success has been largely determined by the generation that came before him. This is personified through the protagonist’s father, whose renown gives the protagonist a potential path to follow on their own quest to define themselves. Typically, although not necessarily, the absent father is explicitly established as being alive early on in the narrative, contrary to orphan protagonist narratives where both parents are deceased. The father’s ability to be present in these narratives is just as pivotal as their general absence, as a major narrative moment across these manga is the eventual confrontation between father and son. The father often represents both what the son is seeking to achieve for themselves, as well as amplifying a critical aspect of themselves that they must overcome. Over the course of this thesis, I hope to elucidate the core purpose of these types of narratives as well as illustrate how this trope has evolved over time.

**Looted Korean Art in the US: A Case Study of Legal and Cultural Repatriation**

*Anna Sujin Leckie, Art History*

*Sponsor: Professor Michele Matteini, Art History*

The repatriation of looted works aims not just to redress the loss of cultural heritage but to heal rifts between nations due to cultural conflict. Some scholars and the Director of the Korea Cultural Heritage Policy Research Institute have estimated that roughly 100,000 looted Korean artifacts are currently in the US. By considering the 2013 repatriation of a nineteenth-century Hojo currency plate, my research will examine the due process of the repatriation with a focus on art looted during the Korean War. Between 1950 and 1953, the US government had extensive involvement in South Korea. Due to a lack of enforcement, American soldiers looted palaces and monasteries for valuable items that they smuggled back into the US. While the Korean Embassy in New York flagged the sale of these objects as a violation of the National Stolen Property Act, many were still sold. By examining the 1995 UNESCO UNIDROIT Convention and various other specialized law enforcements focusing on looted art, this paper will consider what can be done to improve and aid in the repatriation of looted Korean art in the US with the goal of applying it to possible findings of looted art.

**Portraits of Disappearance: Photography, Justice, and Memory in Argentina**

*Devin Lee, Latin American Studies, Politics*

*Sponsor: Professor Jens Andermann, Spanish & Portuguese*

This thesis seeks to understand how and why photography became such an important component of Argentina’s movement for truth/justice following the country’s 1976–1983 dictatorship. With a specific emphasis on photographic portraits of the *Desaparecidos*, I track the emergence of photography as a tool for countering the military’s claims and proving their involvement in a nationwide network of violence. Interweaving the disciplines of historical analysis, photography theory, and memory studies, I examine the role of photo portraits in three different dimensions of the movement for truth/justice: 1) Portraits in Protest, 2) Portraits in Trial, and 3) Portraits in Media/Art. Through these examinations, I seek to provide a comprehensive overview of photography’s role within the movement for truth/justice, which I then use to contextualize case studies, focusing on the portraits of specific victims and the trajectory of their photographs in the public political sphere. Finally, I discuss the legacy of these images within Argentine society, analyzing the ways in which photography continues to be used in the country’s modern protest culture.
Eyes on Trash: An Investigation of the Relationship between the Built Environment and the Street through the Study of Litter
Nico Lob, Urban Design & Architecture Studies
Sponsor: Professor Mosette Broderick, Urban Design & Architecture Studies

Litter is one of the most ubiquitous features of urban life in New York. It also has many negative consequences, such as being unsightly and attractive to common pests. Through understanding the history of sanitation in New York, the reasons why people litter, and the effect of common urban planning ideas like “eyes on the street”, we can work to better understand and prevent litter. This project explores the history of sanitation and litter in New York City, as well as other research and theories into the prevention and causes of litter. The project also sets out guidelines for future street-survey-based research into the causes of litter on the streets of New York and discusses how to test previous theories into the relationship between the built environment and litter such as those that Jane Jacobs lays out in her book *The Death and Life of Great American Cities* (1961). This research could be vital to planners, architects, business improvement districts, urban designers, landscape architects, and others who are curious about litter mitigation and prevention. It is also hopefully an inspiration to others to think about litter in a more academic and rigorous manner and an interesting contribution to the relatively small amount of academic information on litter and the built environment.

Hotbeds of Discord: Elizabeth Street Garden, Chelsea Green, and the Conflict between Open Space and Affordable Housing
Olivia McCaughey, Art History, Urban Design & Architecture Studies
Sponsor: Professor Jonathan Ritter, Urban Design & Architecture Studies

In 2013, the Elizabeth Street Garden—a community-run, one-acre green space located in Manhattan’s North of Little Italy (NoLiTa) neighborhood—was designated a development site for a 123 low-income affordable housing unit named Haven Green. Haven Green, which will be developed through a public-private partnership with Pennrose Properties, Riseboro Community Development, and Habitat for Humanity New York, is one of the many affordable housing units announced within the past decade in response to the City’s ever-growing affordability crisis. Out of this affordability crisis emerged a seemingly irreconcilable tension between affordable housing and small urban green space. Elizabeth Street Garden is one of many community-run gardens throughout Manhattan, many of which are threatened by the prospects of development. Since the Haven Green project was announced, members of the public through Manhattan Community Board 2 meetings have advocated for the preservation of the garden and the creation of affordable housing on an alternate site on Hudson Street which could provide even more affordable housing than Haven Green will provide. The proposal of an alternative site for housing in exchange for the preservation of the garden is based upon the tradeoff between the City Government and local advocates which successfully occurred in Chelsea to create Chelsea Green Park. Chelsea Green is on the site of a former parking lot for the Department of Sanitation and was the first park to be built in Chelsea in over 40 years. The success of Chelsea Green can perhaps be used as a blueprint for the successful creation of new open space in the current housing climate. However, both Chelsea Green and the Elizabeth Street Garden highlight the constraints and shortcomings of New York City’s Community Board System and the gap between the government and community.

Translation, Localization, and the Problem of “Japaneseness” in English-Language Releases of Anime (1990s–Present)
Noah Mullenix, East Asian Studies
Sponsor: Professor Thomas Looser, East Asian Studies

Popular English-language releases of anime seem to experience a bell-curve of “authenticity”, wherein the 1990’s saw Japanese language and culture scrubbed out of English-language releases, the 2000’s saw an uptick in preservation, and the 2010’s saw the beginning of a return to-form mimicking the 1990’s trend. That curve is sampled using popular series *Pokémon, Naruto,* and *Doraemon,* establishing an interdisciplinary reading centering practices of linguistic translation, cultural translation, and marketing, which coalesce as localization. Many view translation as an act that bridges cultures and “good” translations as ones that avoid loss of source culture and intent. This study, however, problematizes a simple narrative of “loss” by exploring the globality of anime and questioning how “Japanese” anime is in the first place. If Japanese linguistic and cultural features are not removed during localization, but rather, kept out of anime altogether during its production, then discourses on cultural imperialism and homogenization in individual localization practices are unproductive. Through an extended metaphor of piracy and a look into the trappings of attempts to transcend the universal-particular binary, this study posits that anime cannot be separated from or reduced to either an essentialized Japanese form or a homogenized, global medium. The reasons we still feel loss when encountering a “bad” localization, despite the lack of something that can be lost, has more to do with an affective image of Japan constructed through its global consumption. As a media form that has been centered...
from its Japanese roots, which were not so firm to begin with, translation and localization of anime might not build a bridge so much as a pier or boardwalk—a branded space of global consumption. Theorization of anime may instead require a materialist approach that accepts its contradictions as reality, and builds upon that grounding to find more productive inroads of investigation.

Law & Literature: Legal Fiction Set in the Civil Rights Era
David Evan Schulman, English and American Literature
Sponsors: Professor Josephine Hendin, English; Professor Patrick Deer, English

Focused on the Civil Rights Movement in America, this thesis delves into the subject through the perspective of law and literature. The thesis is primarily comprised of Richard Wright’s Native Son set in 1930’s Chicago, Harper Lee’s To Kill a Mockingbird, which takes place in Depression Era Deep South, William Faulkner’s Intruder in the Dust to highlight 1940’s Mississippi, and, finally, The Secret of Magic by Deborah Johnson, to further demonstrate racial tensions in 1946 Mississippi. The first two stories contain in-depth and climatic courtroom scenes which epitomize legal fiction, while the latter two lack this feature. However, both Intruder in the Dust and The Secret of Magic make up for it in other thematic ways. Altogether, these novels are analyzed in such a manner that reveals how each author created their specific fictional tale in order to promote African American rights and social change. Ultimately, this thesis aims to show how law and literature is a unique field of study and how these two aspects of society intersect as each works off of and in conjunction with the other. Utilizing the specific era of American history that dramatizes the Civil Rights period, all four novels present keen examples of fictional stories where the law is a main proponent and the authors can be shown to have been actively influenced by the legal reality of the time in which they were writing. Furthermore, it is demonstrated how through their novels, each author desired to positively combat systemic racism.

Re-Defining the Eurocentric Narrative Surrounding the Italian Renaissance: Art and Exchange During the Fourteenth and Fifteenth Centuries
Ella Senglaub, Art History, Social & Cultural Analysis
Sponsors: Professor Carol Krinsky, Art History; Professor Gayatri Gopinath, Social & Cultural Analysis

Knowledge is a privilege governed by centuries of institutionalized injustice. Unevenly distributed and selectively celebrated, it divides societies based on prejudicial notions of race, culture, socioeconomic background, and religion. One area affected by such discriminatory sentiments is art history. Although city streets across the world are lined with museums and galleries dedicated to “encouraging and developing the study of the fine arts,” the visual narratives conveyed in these spaces continue to perpetuate elements of cultural exclusion. As a contribution to the recent surge of globally-sensitive narratives, whose work combats such harmful rhetoric, this thesis re-evaluates the commonly promoted Eurocentric narrative surrounding the Italian Renaissance. Focusing particularly on the movement’s Byzantine and Ottoman influences, my research highlights the effects of what modern society considers “non-western Europe” on art created in Italy during the fourteenth and fifteenth centuries. It provides historical background regarding the Renaissance’s socioeconomic and cultural development as well as a visual analysis of the movement’s representation in contemporary spaces. Through detailed observation and personal interactions with museums’ Renaissance collections, this thesis exposes the continued dominance of Western narratives, specifically in the field of art history.

Not a Story to Pass On: Margaret Garner and the Ways Writers Tell Her Story throughout American History
Juliette Shoemaker, American Studies
Sponsor: Professor Jennifer Morgan, Social & Cultural Analysis

This thesis uses the story of Margaret Garner to explore the way racialization occurring through the reproductive potential of black women has been expressed through resources available in the historical archive. The race-making that first occurred during encounters between European explorers and African female bodies in the fifteenth century is intrinsically tied to the logics of colonial slave laws that defined enslaved children through the status of their mothers. I use those logics to explain the way that Margaret Garner, a runaway slave who committed infanticide in 1856 in order to prevent her daughter from being returned to slavery, was indicted for theft instead of murder. Garner’s story has been told through newspapers from the mid-nineteenth century as well as contemporary pieces in the 1980’s and early 2000’s, and I discuss how it indicates the ways that cultural moments encouraged imaginative exploration of her story. Newspaper articles about her court case indicate the fantasies and motivations of mid-nineteenth century white American society, while more contemporary explorations of her story through fiction and art indicate to a culturally specific desire to reimagine slavery as a form of reparations and a way to work around the glaring absences of slave experience in the American archive. Ultimately, this piece takes a historiographic approach to Margaret Garner’s life, and uses the fiction about her life to explore the cultural moments in which the desire to turn slavery into a personal experience took to the mainstream culture.
“Dal and Chapatis”: When and How Home Structures Fail to Reproduce in the Diaspora
Sabeena Singhani, Media, Culture, and Communication, Sponsors: Professor Arun Kundnani, Media, Culture, and Communication, Steinhardt School of Culture, Education, and Human Development; Professor Natasha Schüll, Media, Culture, and Communication, Steinhardt School of Culture, Education, and Human Development

Using comparative and semiotic analysis, this thesis discusses the plot, character development, and aesthetic choices of three Desi diaspora films: My Beautiful Launderette, Mississippi Masala, and Bhaji on the Beach. These films date back to the late 1980s and early 1990s, when most of the scholarship on a Desi diaspora is rooted in heteronormativity. This thesis focuses on the failure of home structures to reproduce ethnic and national identities within the diaspora, structures normally conducted through heteronormativity and gender roles. By examining the gender and sexual practices of the Desi diaspora characters, this thesis gives an understanding to where this identity reproductive failure occurs. Moments of homosociality and cross-racial romance, moments antagonistic to whiteness and patriarchy, bring this failure to light. The films’ homosocial and cross-racial romances are key to understanding how home structures are created and maintained in the Desi diaspora, therefore key to understanding how they may be altered.

What We Talk about When We Talk about Angela Carter: On Actively Reading The Bloody Chamber
Polina Solovyeva, English and American Literature Sponsor: Professor Peter Nicholls, English

In her Foreword to the 2018 edition of Joanna Russ’s How to Suppress Women Writing, Jessa Crispin dismisses Angela Carter as a writer that “we know what to do with.” Contemporary rejection of Carter’s intricacy is widespread: when she is not simplified into a fairy godmother figure, she is flattened into an aggressively erotic writer. Pushing against this binary view of Carter as either archetypical or sensational, I argue that The Bloody Chamber is hostile toward binaries and is filled with localized contradictions that insist on an active and tangible relationship with the reader. Using Christina Bacchilega’s rejection of the third person narrative as objective, Merja Makinen’s idea of an “active reader”, and Carter’s own The Sadeian Woman I unsettle narrative construction of “The Courtship of Mr Lyon” and, drawing on the #MeToo movement, establish the story’s focalizer as an enabler of abuse. Using Caroline Webb and Helen Hopcroft’s phrase “conventional rationality”, I then read “The Tiger’s Bride” as a textual process of bodily and linguistic separation from the abusive external narrative, emphasizing the importance of what I call “productive pain”. Building upon the idea of productive pain, I argue for a compassionate—instead of an exhaustive—reading of “The Erl-King” and make a claim that the protagonist’s narrative uncertainty can be used as a tool of legitimization in 2020 and beyond. To exemplify Carter’s contemporary relevance, I conclude my thesis with a discussion of an excerpt from Carmen Maria Machado’s memoir In the Dream House that employs compassion as a catalyst for the process of a linguistic search.

The Erasure of the Middle: The Transformation of Taking Tiger Mountain by Strategy from Novel to Revolutionary Model Opera
Jayme Teoh, History, Politics Sponsor: Professor Rebecca Karl, History

Yangbanxi is the Chinese term used for revolutionary Beijing Operas infused with communist and nationalist political messages created during the Cultural Revolution (1966–76). The so-called model works monopolized Chi-
na’s theatrical and musical stages for a decade. Part of the series of model works, Taking Tiger Mountain by Strategy, was one of the first model dramas produced. The 1970 film version reached unprecedented levels of success amongst the public. This thesis explores the transformation of Qu Bo’s 1957 novel Tracks in the Snowy Forest into the yangbanxi Tiger Mountain. In particular, it will focus on the increasing starkness between good and bad characters during the various revisions of the yangbanxi. First introduced in 1958, Mao’s directive of “revolutionary realism combined with revolutionary romanticism” (2RRs) was subsequently applied to all arts and literature, including Tiger Mountain. This thesis will explore the erasure of a middle ground and “middling characters”, and how this served the goal of the 2RRs in effectively transmitting a particular revolutionary ideology to the masses. I will utilize both the source novel and model opera film to understand the process of transformation and the negotiations involved in its re-conceptualization encompassing the 2RRs for popular performance. Model drama and its revolutionary transformation was a fundamental aspect of the radicalization of the Cultural Revolution itself. Reproductions of the yangbanxi released in recent years, such as Tsui Hark’s 2014 blockbuster, demonstrates further interest in the area of yangbanxi and its cultural significance. This model work resonated deeply with the Chinese people and is still significant in present popular culture, suggesting the importance of yangbanxi beyond the context of the Cultural Revolution.

**Risk and Hopeful Reward: How Hamburg’s HafenCity Re-Envisions Its Historic Harbor for the Twenty-First Century**

Joe Tuano, German, Urban Design & Architecture Studies

*Sponsor: Professor Jonathan Ritter, Urban Design & Architecture Studies*

Spanning from the Hanseatic League’s domination in medieval Northern European trade to today’s highly integrated European economy, the Port of Hamburg remains a monolith of German and European commerce. To accommodate ever-growing cargo vessels from the 1800s onwards, expansions of the port were located away from the city center and constructed along the Elbe estuary’s southwestern bank. As a result of the port’s relocation, the historic, 500-year-old harbor on the Elbe’s northern bank became sparsely used and unmaintained. In 1997, the municipal government sought to transform the dilapidated industrial area into a world-class cultural and upscale residential neighborhood, naming the project “HafenCity”, or “harbor city.” Managed by HafenCity Hamburg GmBH, a private company overseen by the Hamburg municipal government, the project reflects the rising number of public-private partnerships spearheading large-scale urban developments globally. A centerpiece of the HafenCity is the city’s newest landmark is a performance space, the Elbphilharmonie. Plagued by ridicule from the press and public due to delays and costs, this controversy became intertwined with the success of the entire HafenCity development. An overview of the harbor’s history leads into an analysis of various press publications and municipal documents in order to provide a year-by-year analysis on public opinion for the Elbphilharmonie and HafenCity projects. This analysis argues that municipal governments and developers have much to gain in completing the project, despite the ridicule and financial and temporal setbacks, raising a key point for the growing number of public-private relationships globally. Now integral to Hamburg’s skyline, the Elbphilharmonie’s successful integration into the urban fabric continues the hope of seamless integration for the HafenCity for its completion in 2025.

**The Sustainable Development of American Metropolitan Areas: Adapting Public-Private Partnerships and the Øresund Example**

*Julius Venuti, Environmental Studies, Metropolitan Areas*

*Sponsors: Professor Thomas Sugrue, Social & Cultural Analysis; Professor Mosette Broderick, Urban Design & Architecture Studies*

The 2018 revision of the United Nations’ World Urbanization Prospects notes that 82% of North America’s total population resides in urban areas and that 55% of the globe’s total population currently resides in urban areas, a statistic predicted to rise to 68% by 2050 (UN 2018). Using the Øresund region (the metropolitan area comprising the cities of Copenhagen and Malmö) as its main point of contrast, this thesis aims to serve as a tool for the development of socially inclusive, economically prosperous, and environmentally secure American urban areas. These three facets are inextricably tied together in the capable understanding of urban sustainability and, thus, can enable the sustainable development of both American metropolitan areas and global ones. That said, the American understanding of private property and land as commodities poses an obstacle to fulfilling each facet of the tripartite framework of successful sustainable urban development without cooperation between private entities and municipal governments. This thesis analyzes the failures of public-private partnerships in American urban design and planning in the mid-twentieth century and the failures inherent to design and architectural philosophies of the plans that these partnerships produced. It then contrasts them with Øresund’s design philosophy and ability to thrive in comparative periods of deindustrialization and urban decline. In doing so, it uses a variety of primary and secondary sources from urban philosophers, anthropologists, architects, planners, and economists. This thesis ultimately argues for a bottom-up approach to American infrastructural restoration.
through the incorporation of local communities in urban development and the adaptation of public-private partnerships in order for them to coalesce with local communities to create successful, sustainable American cities.

**Not Who You Think I Am: Identity Fragmentation and Disillusionment in Zadie Smith’s NW**

*Hester Yang, English and American Literature*

*Sponsor: Professor Patrick Deer, English*

Focusing on *NW*, Zadie Smith’s second Northwest London novel, this thesis examines the relationship between socio-political inequality and individual emotional affect in modern city life. Unlike the London of Smith’s debut novel, *White Teeth*, *NW* is a more severe social commentary upon the contemporary changes and conflicts prevalent in early twenty-first-century Austerity Britain. The novel focuses on the lives of London’s second-generation immigrant population, specifically the characters, Leah, Natalie, Felix, and Nathan, for whom the marks of postcolonialism and institutionalized racism result in experiences of dislocation. *NW*’s modern and turbulent political sphere instigates a new space of ambiguity and uncertainty, prompting the rise of a new social stasis—state of being that I term “slow-cooked catharsis”, representing the slew of negative feelings arising from factors of prolonged racial and gendered injustices. The eventual eruption from the pressures of these marginalizing experiences leave the characters and their surroundings in a simultaneously shell-shocked yet stupefied state, and ultimately deny them of a true feeling of improved freedom or clarity. With Si-anne Ngai’s emotional affect theory providing a provisional framework, I explore how *NW*’s diverse set of characters handle the effects of slow-cooked catharsis. My thesis, engaging with critical work in postcolonialism, affective theory, and cosmopolitanism within British contemporary literature, offers an interdisciplinary foundation which attempts to connect the political and emotional disruptions of slow-cooked catharsis to periods and characters of stagnancy within Smith’s London. Ultimately, I argue that *NW* challenges our conventional views on individuality versus society, of the capabilities and limits of human empathy, and to rethink the parameters of connection and relatibility. Smith’s soberingly realistic novel thus provides a glimpse into the rapidly increasing need to create a new definition of what it means to be an individual and part of a “multicultural” and “global” society.

**Game of Thrones: A Comparison of Governmental Shifts in Three Kingdoms and Tale of Heike**

*Xiaoke Yang, East Asian Studies*

*Sponsor: Professor Moss Roberts, East Asian Studies*

As the opening of *Three Kingdoms* said, “the empire, long divided, must unite; long united, must divide”, the historical developmental process is always accompanied with the competition between these two contradictory elements. In *Tales of Heike*, the former leading power of the Heike family represented by Taira no Kiyomori, after seizing authority of Insei system, gradually lost control of its dominant position during the 5-year Genpei War with Minamoto no Yoritomo, who later started the first united shogun-control dynasty in Japan. A similar case could be found in *Three Kingdoms* where Cao Cao, like Kiyomori, forced Emperor Xiandi to become his puppet on the throne and finished the situation of tripartite confrontation with Liu Bei and Sun Quan, while his son Cao Pi removed Emperor Xiandi to become the new emperor of short-lived
Cao-Wei dynasty. One alike mode could be concluded when putting the two novels and their historical backgrounds in comparison: vulnerable imperial power caused the rise of military force to seize the authority and led to the problem of separation, which would be solved after battles and reconciliations between sections of power. The goal of this essay is to have a closer look at both historical and literary materials related to the period around the Genpei War and Sanguo to analyze the catalyst and process governmental shifts happened during this time and how this mode could be related to analysis on other resources.

Plato’s Female Ruler
Fei Yi, Philosophy
Sponsor: Professor Jessica Moss, Philosophy

Plato is acclaimed for his progressive argument that it would be unjust to prohibit women from education and social responsibilities merely on the grounds that they are women. However, I believe there exists a contradiction within his argument, because he also made the claim that women are weaker than men in all aspects. This exploration focuses on the question: if women are truly weaker than men in all aspects, would it still be just to have female rulers as he advocates? Plato’s concept of social justice, his concept of rulership, and his concept of women are all relevant in this examination.

His Death Looks Familiar: The Politics of Recreating Iconic Death Images in Film as Transnational Medium
Soyoung Elizabeth Yun, Cinema Studies
Sponsor: Professor Marina Hassapopoulou, Cinema Studies, Tisch School of the Arts

This research, focusing on 1987, examines how a film recreates iconic press images of dying activists. As the film audio-visually recreates the recognizable historic tragedies, the images become narratives and the figures become characters. As a transnational medium, the film evokes emotional reactions from the audiences with different social and political backgrounds. The old black-and-white images of the activists’ death gain visual and emotional immediacy in cinematic images that travel across the borders and meet new sociopolitical contexts. This research further raises the problem of skewed gender representations in transnational media. Carrying more media power, the death of male activists or civilians that show political injustice has incited national movements and was frequently recreated into films. The lack of media attention to female activism and state violence inflicted on females creates significant tension for the contemporary cinematic recreation of historical footage. With a thorough investigation of media coverage and recreations, this research leads to an open, unfinished survey of the gendered dynamic of media re/production.

The Manchurian Episode: An Insider’s Look into the Japanese Empire in Northeast China
David Zarowin, East Asian Studies
Sponsor: Professor Thomas Looser, East Asian Studies

This analysis of Manchuria seeks to understand Japan’s mark on the region and represents a gateway to studying the war in Asia. World War II’s start in Asia can be traced to tensions building between the Japanese and Chinese in the late 1800s, coming to a head at the end of World War I, when Japan was granted access to the former German colony of Shandong. Their army’s power grew as did their autonomy throughout the 1920s. The Mukden Incident is deemed by many as the pretext for Japan’s takeover of Manchuria. Other scholars point to the Marco Polo Bridge incident as the starting point for the war in Asia. This paper suggests the dynamic relationship between China and Japan did not begin in the 1930s, as pivotal events do not simply arise de novo. This research encourages scholars to look more deeply into the implications of the Manchurian episode.
How Does the US Influence IMF Conditionality for its Allies?
Tanvi Abichandani, Economics, International Relations
Sponsor: Professor B. Peter Rosendorff, Politics

Existing literature claims that the United States uses its disproportionate influence in the International Monetary Fund (IMF) to help its allies. US influence on the IMF can be understood by analyzing loan conditionality for US allies. There are two ways of thinking about US influence on IMF conditionality: One way is that the US helps its allies get easy loans from the IMF as borrowing countries prefer to retain more autonomy on the funds they receive. The other way is that the US helps its allies by tying their hands with more loan conditions when asked to do so. To ensure a thorough analysis, this thesis will focus on the number of conditions and scope of conditionality attached to loans extended to borrowing countries. Often, several conditions refer to one policy area, but, as conditions cover a broader scope of distinct policy areas, the effective level of conditionality imposed on a government increases. It is important to analyze the scope of IMF loan conditionality as conditions for some countries may be higher in number but less intrusive as they may cover fewer policy areas or vice versa. Furthermore, as conditionality differs for different types of IMF loan arrangements, this thesis will estimate the extent of US influence on loan conditionality by loan arrangement type, i.e. Extended Fund Facility (EFF), Standby Arrangement (SBA) (grouped together since they only differ in their time horizon) and Poverty Reduction and Growth Facility (PRGF).

The Implications of Unconscious Bias
Alara Alagul, Neural Science, Psychology
Sponsor: Professor Madeline Heilman, Psychology

A growing number of companies invest in methods to reduce biases in employees and create more diverse workspaces. One widely used type of diversity training focuses on unconscious bias and relies on the idea that making people aware of their biases will lead to less stereotyping and discrimination. However, achieving a more inclusive workplace remains an ongoing issue, and such trainings have had questionable results. We propose that describing bias as unconscious could backfire and make people feel like biases are outside of their control. Indeed, experiment 1 demonstrated that when participants were told that bias is unconscious they judged perpetrators of bias as less to blame for their actions, find it less justifiable to conduct an investigation, and indicate perpetrators should be penalized less than individuals in the bias or in the control conditions. In experiment 2, we gave participants an opportunity to engage in stereotypical description of either a male or a female professor of a male gender-typed course. Preliminary results show that only participants in the Unconscious Bias condition were more likely to stereotype the female professor as less competent than the male professor, and they were more likely to believe that a course would be less difficult if it’s taught by a female professor than by a male professor. These results lend support to our prediction that telling people bias is unconscious will make them less likely to try to control their biases. We are collecting additional data in order to investigate these questions further.
Effects of Toy Type and Caregiver Availability on Infants’ Locomotor Activity
Gabriela Koch da Costa Aguiar Alves, Psychology; Jamie Karns, Psychology
Sponsor: Professor Karen Adolph, Psychology

Infants’ experience promotes improvements across all developmental domains (e.g., perception, cognition, and language). But, experience-related improvements in motor skills such as locomotion are unique because infants must generate their own practice regimens. What factors instigate locomotor practice? We tested the effects of environmental factors, social factors, and infants’ prior walking experience on their self-generated locomotion. We observed 40 12- to 22-month-old walking infants (walking experience ranged from 12 days to 10.03 months) in two environmental “toy” conditions (gross-motor toys and fine-motor toys) crossed with two social “caregiver” conditions (joint play with caregiver; independent play without caregiver). Overall, infants generated more locomotor activity with gross-motor toys than with fine-motor toys. Moreover, infants’ prior walking experience interacted with toy condition. Locomotor activity increased with walking experience, but only when infants played with gross-motor toys. While playing with fine-motor toys, infants moved more when they played independently than while playing with their caregivers. Thus, environmental and social factors interact with infants’ prior experiences to influence their self-generated practice regimens.

How Do Different Forms of Visual Attention Influence Exercise and Physical Activity?
Jasmine Amigon, Global Public Health/Biology
Sponsor: Professor Emily Balcetis, Psychology

Despite the overwhelming evidence linking physical activity and positive health outcomes, physical inactivity is still rampant in the United States. What factors influence and encourage individuals to exercise? This research investigates how different forms of visual attention influence exercise and physical activity. I surveyed experienced runners just before competition and non-runners during leisure activities. I asked them to indicate the points during a running race in which two forms of visual attention would be more effective for high performance. I report differences in the perceived effectiveness of both narrowed attentional focus and wide attentional focus on running and investigate differences in perceived effectiveness as a function of running expertise. I discuss implications for these attention strategies on individuals’ motivation to sustain physical activity outside of competition contexts.

Wildfire Management, Prevention, and Preparedness in Climate Change Stressed Redwood Ecosystems: Community and State Strategy to Account for High-Intensity Fires along the Central California Coast
Katie Anastas, Journalism, Sociology
Sponsor: Professor Brooke Kroeger, Journalism

Northern California’s coastal fog cover, a primary water source for Redwoods, is disappearing. This decline will likely lead to a shift in habitat distribution as new growth is not sustainable given a limited water source. The regrowth of young trees will likely decrease in parallel to an increasingly dry environment. This is concerning in the context of the elongated wildfire season California now experiences. Redwoods’ height, root systems and thick bark render old growth essentially fireproof, limiting ecosystem damage during increasingly violent wildfire seasons. However, since Redwoods were historically used for cheap lumber, old growth only accounts for seven percent of Redwood forests. New growth is not old enough to grow thick, fire-resistant bark, but tall enough for fire to travel to old growth crowns. Climate concerns like California’s historic drought, pathogens like Sudden Oak Death, which is thought to increase fire intensity, and poor forest management that prioritizes tree density over safety further heighten the chance of intense wildfire in Redwood Habitats. The communities located in the southern extension of the California Redwood belt, an increasingly at-risk, populous, and historically fire-resistant environment, are not employing appropriate mitigation or management strategy given the danger of high-intensity wildfire. Furthermore, the population of these areas has consistently increased alongside the exacerbation of these issues. My goal is to understand how climate change and California’s elongated wildfire season are impacting Redwood ecosystems and how to protect Redwoods and the communities that reside alongside them.

Hex the Internet: Modern Witchcraft, Social Media, and the Politics of the (Female) Body
Cameron Andersen, Anthropology
Sponsor: Professor Elayne Oliphant, Anthropology

While witchcraft has existed for centuries, it has undergone significant change since the introduction of newer technology and social media. Many would argue that this change has resulted in a magical practice that is less engaged, less bodily, and less grounded in the real world. Social media, however, has not had as much of an effect on witchcraft as one might think—the physical practices of witches seem to have stayed static over the past several generations concerning the actual casting of
spells and performance of rituals. While some might claim that social media has created a more disengaged mode of practice, I would argue that the only effect social media has had is in creating an environment where witches can more easily communicate with and learn from one another. The physicality of spellcasting and magical practice has not been altered. This physicality then bleeds into the politics of witchcraft—the body, the female body in particular, has always been the site of political contestation. The question I sought to answer with this work has been through-lines of political contestation throughout magical history, and what the role of the body is in modern witchcraft. With this thesis I explore these questions and ultimately come to the conclusion that today’s magical practice is linked to past incarnations of witchcraft through its interpretation of gender, its use of the body, and its politics and political activism.

Health Resource Utilization Patterns of Individuals Experiencing Homelessness: A Scoping Review
Gavin Arneson, Global Public Health, Nursing
Sponsor: Professor Maya Clark-Cutaia, Nursing, Rory Meyers College of Nursing

This scoping literature review explores the ways that individuals experiencing homelessness in the United States access health services as well as the types of services they seek. Using a scoping review strategy, Medline, CINAHL, and PubMed databases were searched for articles published within the last five years. The synthesis of the literature found that individuals experiencing homelessness rely disproportionately on emergency care when accessing health services than their housed counterparts, and this reliance is often due to either inappropriate emergency admissions or illnesses that are preventable with earlier primary intervention. The articles described the barriers that individuals experiencing homelessness face when attempting to access health services, including those related to stigma, navigating complex insurance schemes, and addressing competing immediate needs. Additionally, the articles described several interventions tailored specifically to individuals experiencing homelessness that have demonstrated promising results in increasing access to health services in this population including mobile health clinics, public health nurses, and trauma-informed caregivers. This study’s findings demonstrate that interventions designed to increase engagement with primary health services in this population should be specifically tailored to the needs of the population including the clinical, social, and psychological, before aiming to integrate them with traditional means of primary care.

Urbanism and Elites in Anglo-Saxon England
Henry Aufderheide, Anthropology and Classical Civilization
Sponsors: Professor Pam Crabtree, Anthropology; Professor Joan Connelly, Classics

The Anglo-Saxon period in England was a time of vast social, economic, and political change, a Romanized society became a medieval one. Central to those changes was the reappearance of urban centers and trade. This paper will examine these developments and their relationship with the estate centers of secular and ecclesiastic elites. The urban sites of most concern are the trading towns known as Emporia or Wics; vibrant and active towns active roughly from the 7th to late 9th centuries. But while they were short lived, they were the first urban centers since the end of Roman rule in England, a striking new form of settlement that was continued in the large cities of the later medieval period. Mostly situated on the southern and eastern coast of England, these sites were extremely involved with the cross-channel trade, engaging with similarly developing towns in continental Europe. These sites are the subject of intense academic debate, and the general paucity of evidence has left many fundamental questions unanswered. This paper will address several existing debates and theories, examining what can be proved or disproved by the archaeological evidence, and how this evidence can be brought to bear on existing theories. Further, this paper will examine the decline of the emporia and what role the increasing landed power of the church and a changing ritual economy had in this. It is hoped that this study furthers our understanding of the late history of the emporia.

Reward Motivation Enhances Memory across Development
Kristen Avallone, Psychology
Sponsors: Professor Catherine Hartley, Psychology; Dr. Alexandra Cohen, Psychology

Motivationally significant, rewarding experiences enhance memory in adults, typically after a delay. However, little is known about how reward motivation affects memory across adolescence, from childhood to adulthood. Connections between the mesolimbic dopamine system, which includes the ventral tegmental area (VTA), and the hippocampus facilitate reward-motivated encoding. The mesolimbic dopamine system has also been implicated in reward processing more broadly. Evidence from animal and human research suggests that during adolescence, dopamine signaling peaks in subcortical brain areas and may underlie adolescents’ reactive behaviors in response to rewards. Thus, increased dopamine signaling and greater sensitivity to reward during adolescence may have im-
important implications for motivated memory. To determine if memory is particularly enhanced for high, relative to low, rewarded events during adolescence, we administered a functional magnetic resonance imaging (fMRI) paradigm to 90 participants ranging from 8 to 25 years old. Participants returned 24 hours later to complete a behavioral memory retrieval test. Due to adolescents' heightened sensitivity to reward and their increased availability of dopamine, we hypothesized that adolescents would show better memory for high relative to low-reward memoranda, as well as higher brain activity in the VTA and hippocampus compared to children and adults. Behavioral data and whole-brain analyses during encoding periods revealed changes in frontal and occipital cortex activity for high relative to low-reward memoranda. These results may help us to better understand the influence that reward has on memory across development.

**South American Immigrant Acculturation in Miami and New York**

*Ariana Avila, Sociology, Spanish*  
*Sponsor: Professor Linsey Edwards, Sociology*

The aim of this research project is to explain what conditions decide the acculturation strategy that first generation South American immigrants in the US adopt, specifically in Miami and New York. I look at how community and location affect the way these immigrants identify ethnically and culturally. I’ve found that South Americans are comparably an understudied group of immigrants when it comes to acculturation in the United States. South Americans are increasingly becoming a large immigrant community in this country, so it’s important to determine the acculturation strategies that immigrants are adopting and the conditions that influence them in order to improve policies and practices that help this specific group of immigrants settle into their new homes. Based on semi-structured interviews with 19 first-generation South American immigrants living in Miami and New York City, this study examines how these individuals navigate, through their ethnic identity and social interactions, in a newfound multicultural city. I hypothesize that South Americans living in Miami, a very Latin American area, are more likely to maintain their native ethnic identity, while South Americans living in New York City, a much more multicultural area, are more willing to acquire an American identity or culture. My findings show that South American immigrants living in both Miami and New York are equally attached to their ethnic identity and culture but differ in how they adopt American culture.

**Diversity Based Reasoning**

*Ericka Barroso, Psychology*  
*Sponsor: Professor Marjorie Rhodes, Psychology*

This study tests how children generalize new information about animal categories from different samples of evidence. Sample diversity is an important feature that adults consider when learning about the natural world. For example, adults generally view a diverse sample (e.g., a robin, a turkey, and a penguin) as providing a stronger basis for generalizing new information (e.g., whether birds in general have hollow bones) compared with a non-diverse sample (e.g., three robins; Osherson et al., 1990). However, previous work in the Rhodes’ lab has found that younger children fail to incorporate information about sample diversity into their reasoning about animal kinds because of a heightened focus on another type of information: category ideals (Foster-Hanson*, Moty*, Ocampo, Cardarelli, & Rhodes, under review; Foster-Hanson & Rhodes, 2019). While adults know that categories vary, and so they seek out samples composed of diverse category members in order to make broad generalizations about categories, children under age 9 view information about variation within the category as less informative, and instead seek out more ideal, less diverse samples to learn from (Foster-Hanson et al., under review). However, it is unclear whether this bias might also shape how people generalize from different samples of evidence across development. Adults and older children generalize more broadly to categories from diverse samples of evidence than non-diverse ones (Osherson et al., 1990; Rhodes & Liebenson, 2015). Do younger children generalize new information as broadly (or even more broadly) when it is gleaned from non-diverse, more ideal samples than when it is gleaned from less ideal, more diverse samples? This is the research question we ask in the current study.

**How Alternative Political Regimes Influence the Determination of Children’s Rights: The Case of Children’s Access to Needle and Syringe Exchange Programs**

*Ellie Bartlett, Global Public Health/Sociology*  
*Sponsor: Professor Lynne Haney, Sociology*

This research examines the influence of alternative political regimes on the state management of children’s rights through the study of the establishment of Needle and Syringe Exchange Program (NSP) policy. By examining this specific policy sphere, the project aims to understand how states balance children’s rights with paternalistic government ideals. Looking at both the central and first devolved governments in Australia, New Zealand, and the United States, this project employs two research strategies.
couched in both qualitative and quantitative methodological approaches: (1) the qualitative content analysis of NSP policies and (2) the quantitative analysis of legislative composition data, the operationalization of two political models, and the statistical analysis of project results. The findings of this thesis challenge the common argument that politics, particularly right-wing partisan ideology, play a predictably restrictive role in the determination of children’s rights, as political ideology differentially impacts children’s rights approaches within each country’s NSP policies. Further deviating this project’s results from the literature, the degree of legislative control by a party had no impact on policy outcomes. Not only does this research take an explanatory approach to children’s rights, rather than the more-common descriptive approach, but it also lays out the range of children’s rights policy approaches within the NSP policy arena. It demonstrates the unpredicted, differential role that politics plays in children’s rights policy and necessitates further research on social and political factors that lead to specific children’s rights policy outcomes.

Who Runs the World? (Not) Girls: How Restrictions on Women’s Rights Affect Voting Outcomes for Female Candidates
Sammi Baruch, Politics, Sociology
Sponsor: Professor Christopher Dawes, Politics

Despite representing over half of the American population, female legislators comprise only 28.9% of state legislatures. What accounts for this discrepancy? Bias against female candidates would explain why fewer female candidates run in—and win—elections. Research regarding voter gender bias typically involves surveys, but in this study, I look at state legislative election returns in order to gauge the actual voter response to female candidacy. I use the Gonzales v. Carhart (2007) Supreme Court decision which upheld a federal Partial-Birth Abortion Ban as a lens to examine whether restrictions on women’s rights affect female candidacy and gender bias. I aim to determine if this restriction affected whether women decided to run for office and how they were perceived at the polls compared to male candidates. Ultimately, I find that the Supreme Court ruling had a negative effect on the propensity of women to run for office and had no significant effect on how female candidates perform at the polls. Although, when looking exclusively at female Republican candidates, I find that their propensity to run was significantly positively affected and their performance was significantly negatively affected by this ruling. I conclude that this ruling increased the threshold by which female candidates decide whether they are qualified to run for office. Thus, because only the most exceptionally qualified women ran, a bias against females was not shown at the polls. Ultimately, it appears as though pre-election effects continue to mask voter gender bias.

The Rhythm Rule: A Case of Phonetic Duration
Sam Beames, Linguistics, Romance Languages
Sponsor: Professor Juliet Stanton, Linguistics

The term “rhythm rule” describes a phenomenon wherein the stress of certain words depends on their environment. The word “thirteen”, for example, is usually stressed on the second syllable (thir-TEEN), but in the phrase “thirteen trumpets” stress shifts to the first (THIR-teen TRUM-pets). In other phrases, however, this stress shift is less likely (e.g. thir-TEEN trom-BONES). This project investigates what the factors are that make the rhythm rule more or less likely to apply. In particular, I will explore the hypothesis that the English rhythm rule is sensitive to the total phonetic duration between two stresses. To give an example, the idea is that stress is likely to shift in “THIR-teen TRUM-pets” because, in the alternative “thir-TEEN TRUM-pets”, there would not be enough time between the two stresses. In “thir-TEEN trom-BONES”, however, there is already sufficient time between the stresses, so no stress shift (to “THIR-teen trom-BONES”) is necessary. To test this hypothesis, I did a production study with 30 native speakers of American English. The goal of the experiment was to determine whether or not the rhythm rule is productive and, if so, if phonetic duration plays a role in how likely it is. Preliminary results indicate that the expected trends are present if subtle.

The State and Space: A Historical Materialist Analysis of Housing Production in East and West Berlin
Michael Bearman, Sociology
Sponsor: Professor Thomas Ertman, Sociology

The central concern of this study is how space is produced. Though there have been countless attempts from multiple theoretical perspectives at addressing this question, there seems to be no conclusion on the matter. Marxist theory tells us that space, in addition to other elements of the superstructure, is linked to the economic base of society. Though the nature of this relationship is debatable, it suggests there is a distinction in space production under capitalist and socialist political-economic systems. In order to explore this relationship, this study utilizes a historical materialist approach by examining explicitly the production process of space, from planning to allocation, rather than merely the aesthetic or social characteristics of spatial object. This study also uses a comparative-historical methodology that identifies particular instances of spatial production to confront the research question. In particular, I compare the production of housing projects as form of a spatial object in West Berlin, a capitalist, social democratic city and East Berlin, the capital of the one-party state-socialist German Democratic Republic (GDR). The case studies of comparison are the 1940s and 1950s projects Stalinallee in East Berlin and Hansaviertel in West Berlin, as well as the 1960s and 1970s projects Marzahn in East
Berlin and Märkisches Viertel in West Berlin. I ultimately demonstrate how fundamental differences between the political-economic systems of East Berlin and West Berlin led directly to critical differences in housing production at every stage of production. The study ends with a number of analytical and methodological implications, including a critique of studies of state socialism from a capitalist society’s viewpoint.

The Alphabet: A Novel Approach to Reduce Fear-Conditioned Responses
Dimple Belani, Psychology
Sponsors: Michael Liu, Psychology; Dr. Lycia de Voogd, Donders Institute

Extinction learning is defined as the process by which a learned response to a threat is not expressed anymore following the display of a stimulus that was previously threatening (Pavlov, 1927). Other research has shown that improvement of extinction learning can result from an eye-movement intervention that is cognitively demanding (de Voogd et al., 2018). The eye movement intervention task during an experiment results in suppression of the amygdala, which is the part of the brain responsible for emotion processing and specifically fear. The theory behind the effects of eye movement intervention is that goal-directed eye motions comprise a large part of EMDR (eye movement desensitization and reprocessing). EMDR treatment is an evidence-based therapy used to treat fear and anxiety-related disorders (Bisson et al., 2013) during which patients divide their attention between the recalling of traumatic memories and conscious lateral eye movements. Previous research has suggested that the activation of working memory with eye movements competes with the negative emotions associated with recollection of traumatic memories (van den Hout and Engelhard, 2012), which in turn dulls the memory and related emotions (Andrade et al., 1997). However, the impact of alternative cognitively demanding tasks on extinction learning is unknown, as many findings restrict attribution of the result to eye movements (de Voogd et al., 2019). Improvement of extinction learning can potentially optimize psychotherapy for anxiety-related and fear-related disorders (de Voogd et al., 2019). While repeated exposure results in reduced fear and anxiety-related symptoms, the symptoms often return (Bouton, 1993). This research can benefit psychotherapy for anxiety-related and fear-related disorders such as PTSD, which benefits the field of psychology overall.

Globalization, Wealth, and Crime: Evidence from the UK
Sam Bernstein, International Relations
Sponsor: Professor B. Peter Rosendorff, Politics

One of many consequences of increased international trade and globalization in recent decades has been increasing divergence between the “winners” and “losers” in Western countries. I exploit the China shock instrument, a tool used to measure the exogenous effect of increased Chinese imports in Western countries over the past few decades, to explore the relationship between income shocks and crime. Using a 2SLS approach, I find that import shocks lead to increased criminal damage and arson-related crimes through wealth mechanisms. That is, globalization leads to income shocks, which subsequently affect the opportunity cost of committing criminal damage and arson crimes, thus driving up these crime rates. This effect is significant to the 10% level for criminal damage and arson crimes, and although insignificant for other crime categories, the relationship remains positive.

Eyes on the Prize: Looking Facilitates Children’s Planning of Multi-Step Actions
Catherine Bianco, Psychology
Sponsor: Professor Karen Adolph, Psychology

Many everyday actions involve multiple steps to achieve the end goal, such as grasping a hammer to pound a peg. Such “multi-step” actions require actors to plan their movements multiple steps in advance. Previous work examined effects of perception on action planning by altering object properties (e.g., size, orientation) that subsequently require change in motor actions (change in grip aperture or hand orientation). We tested whether perceptual information facilitates action planning with no change in motor requirements. We encouraged 3- to 5-year-olds (N = 19) to grasp a hammer to pound a peg. We varied perceptual information across trials with a plain, wooden hammerhead versus a sparkly, golden hammerhead, and recorded children’s movements, gaze, and neural activity using video recording, motion-tracking, head-mounted eye-tracking, and EEG. Children showed faster reaction times, faster reaches toward the hammer, and more direct reach trajectories on sparkly hammerhead trials. Increased movement efficiency with the sparkly-head hammer corresponded to earlier visual fixation on the hammer and earlier neural activation in motor cortex.

Costly Migration Potential and Foreign Aid
Marisa Bianco, International Relations, Spanish
Sponsor: Professor B. Peter Rosendorff, Politics

This paper seeks to determine how perceptions of costly migration potential influence incumbent governments’ decisions on how to allocate Official Development Assistance (ODA). Using the measure of costly migration potential developed by Leblang, Schneider, and Tobin (2019), I test its effect on bilateral foreign aid from all 29 OECD donor countries to 153 recipient countries from 1970–2015. I find that costly migration potential has a positive and significant effect on foreign aid. The results support the theory that incumbent governments use foreign
aid as a tool to reduce potentially politically harmful migration.

Bias in Technology: An Examination of Culture in Public Artificial Intelligence (AI)
Erica Bisognano, Anthropology
Sponsor: Professor Pam Crabtree, Anthropology

Through advanced programming and machine learning capabilities, it has become increasingly difficult to define boundaries between human and machine. Anthropomorphism is the act of humanizing non-human individuals or entities through the inorganic attribution of human traits. Commercial technology programmed to feign human relatability has brought attention to numerous social and cultural issues. Siri, Alexa, and other widely used virtual assistants are evidence of gender bias as traditional gender roles are mimicked with a deliberately female assistant. In 2016, Tay, Microsoft’s AI bot, reflected sexist, racist, and xenophobic commentary on twitter within 24 hours of being released. Deliberate or accidental bias can be detrimental to a number of minority groups through the encoding of pre-existing micro aggressions. As long-standing prejudice becomes translated into technology, it is further ingrained into universal cultural systems. Therefore, in this study, I will explore different expressions of human characteristics within past and emerging technologies. As AI is a rapidly growing industry in the technology marketplace, I aim to shed light on emerging issues and redefine what is appropriate for enterprises to produce and promote.

The Development of Overlapping Representations of Race and Gender
Magnolia Byrne, Psychology
Sponsor: Professor Marjorie Rhodes, Psychology

Gender and race information interact to shape the development of category representations from an early age. This interaction can result in systematic psychological and societal invisibility for people whose race and gender identities have conflicting stereotypes (e.g. for Black women: Blackness is associated with masculinity, which conflicts with gender associations of femininity). The present research (N = 93, ages 7–11) examines the developmental trajectory of gendered-race—the psychological overlap of race and gender categories such that certain racial groups are viewed as more prototypically masculine or feminine. We also tested three predictors of individual variation that may serve as cognitive pathways that underpin gendered-race cognitions: racial identity flexibility, category flexibility, and racial essentialism. We corroborated previous findings of gendered race cognitions: children were slower and less accurate in categorizing Black women as women relative to White and Asian women. Additionally, children who perceived their own identities as more flexible and children with higher essentialist beliefs about race were less likely to hold representations of gender that were biased by race.
Do Accuracy and Variability Trade Off in Bilingual Speech Acquisition?
Annika Julia Canta, Communicative Sciences and Disorders
Sponsors: Professor Tara McAllister, Communicative Sciences and Disorders, Steinhardt School of Culture, Education, and Human Development; Sandy Abu El Adas, Communicative Sciences and Disorders, Steinhardt School of Culture, Education, and Human Development; Professor Karla Washington, Communication Sciences and Disorders, University of Cincinnati

Due to the lack of normative data about bilingual speech development and limited availability of diagnostic tools that are best suited for this population, bilingual children seeking speech-language services are at an elevated risk of misdiagnosis. In the absence of validated assessment tools, speech-language pathologists may use measures of accuracy and variability of speech production to diagnose suspected speech sound disorders in bilingual children. Research in general motor development in infants suggests that variability and accuracy may trade-off in the course of maturation, whereby movement variability spikes before the transition to a more mature stage of motor control. Such variability-accuracy trade-offs have been described in monolingual speech development but are understudied in bilingual populations. For this reason, this study aimed to explore variability-accuracy trade-offs in the speech of 20 children from Kingston, Jamaica, who are bilingual in Jamaican Creole and English. We hypothesized that children who showed higher accuracy in their productions would also exhibit more variable speech, indicating a variability-accuracy trade-off. To this end, the Word Inconsistency Assessment from the Diagnostic Evaluation of Articulation and Phonology was administered to measure accuracy and variability in English. Contrary to the hypothesis, we observed that individuals with higher accuracy tended to be less variable in their productions. To fully answer our question, future research should also consider how interactions between languages spoken by bilingual children impacts accuracy in a single linguistic context.

Children’s Use of Drawings and Language to Communicate about Space
Ira Cekici, Psychology
Sponsors: Professor Moira Dillon, Psychology; Dr. Agata Bochynska, Psychology

Young children interpret scenes differently from objects both in everyday life and when they are represented in symbolic pictures (Dillon, Huang, & Spelke, 2013; Dillon & Spelke, 2017). When asked to draw simple arrangements of scenes and objects, moreover, 4-year-old children tend to omit scene information but include object information in their drawings (Dillon, in revision). What might explain children’s differential treatment of scenes and objects when they interpret and produce symbolic pictures? For example, children might omit scene information in their drawings because it is less salient or important. If this is true, we might expect that when asked to communicate about locations in a room that are best defined by features of the large-scale scene (e.g., a location at the junction of two walls), children will include relevant information about the scene. In this study, we ask 4-year-old children (N=80) to communicate the location of a target placed in a fort composed of six elements: three walls and three objects. Half of the children communicate the location of the target by drawing where it is (“drawing condition”) and the other half by verbally describing its location (“language condition”). We measure how many walls and objects children include in their drawings or verbal descriptions across the two conditions and the different target locations. While this study is ongoing, our findings will provide new insights into how children communicate about different kinds of spatial information and how this might relate to their everyday interactions navigating through layouts and recognizing objects.

Effect of Age on Hong Kong Chief Executive Rating
Elina Chen, Politics
Sponsors: Professor Anna Harvey, Politics; Professor Christopher Dawes, Politics

As tensions rise in the relationship between Hong Kong and Mainland China, we see how recent protests have been led by the younger generation. Not only are young people leading today’s protests in Hong Kong, they were also leading Hong Kong’s 2014 Occupy Central movement. As the political landscape in Hong Kong slowly shifts towards a younger demographic, and as the younger generation gravitates towards more unconventional political methodologies to voice their concerns, we are faced with a question: what role does age play in Hong Kong residents’ political views? To answer this question, this paper examines how ratings of Hong Kong’s Chief Executive (CE) changes in response to interpretations and decisions of the Hong Kong Basic Law by the National People’s Council Standing Committee (NPCSC) in Beijing. Analysis shows that younger Hong Kong residents tend to rate the CE less favorably than older residents, and younger Hong Kong residents respond more negatively to the treatment variable (interpretations and decisions on the Hong Kong Basic Law). These findings support the initial hypothesis that younger Hong Kong residents hold more unfavorable views towards Mainland China and the Chief Executive.
My research explores the current lives of former Chinese dissidents who fled to the US as political refugees after the 1989 Tiananmen Square Protest, how they have carried the traumatic memory with them in a strange land, and what changes and influences over the decades this history has had on each individual. Divergence between different groups of protesters further evolved when they arrived as asylum seekers in the US, a democracy which represented their political ideals. Under a common collective identity as the Tiananmen exiles, their life trajectories diverged, and how they lived with the historical trauma and treated the identity of both agony and glory varied. Some moved on and struggled to earn a living in the American society as an American citizen. Some refused to walk away from the past, and had decided to forever tie themselves to the history and to live and die as a dissident against the communist party. The latter launched the overseas Chinese Democracy movement, which thrived shortly in the 1990s. In the following years, however, as international relations between China and the US warmed up and as China’s booming economics caught more attention than its human rights issue, the movement has ebbed and became a de facto immigration business that helps undocumented workers obtain citizenship as political refugees. The overseas democracy movement, the remaining, tenuous tie between the former dissidents and the Tiananmen history, is now a shell of unfinished political ambitions and self-redemption from the survivor guilt and history amnesia.

**Brilliance Beliefs**
Sonia Chen, Psychology
Sponsor: Jalisha Braxton Jenifer, Psychology, University of Chicago

A common belief in the United States is the idea that natural ability, or brilliance, is needed in order to succeed in math or math-related subjects. As STEM fields continue to be dominated by men, this belief could be harmful towards girls’ interests in STEM. The goal of the current research project was to investigate whether endorsement of the belief that brilliance is necessary for success in math predicts lower self-efficacy and interest among girls (but not boys). In order to investigate this, we recruited 161 1st through 4th graders from New York City and Chicago with a roughly equal gender distribution in our sample. To assess brilliance beliefs in math, children rated a series of statements on a scale from 1–4 to indicate how much brilliance they thought was required to do well in school and competition contexts. Additionally, children rated a series of statements on a scale from 1–4 to indicate their interest and self-efficacy in math. Overall, we found significant gender differences in math brilliance beliefs in 3rd grade, with boys holding stronger beliefs than girls in the school context. Furthermore, we found a significant positive relation between school math brilliance beliefs and self-efficacy for 1st grade boys. These findings suggest that girls may not hold stronger math brilliance beliefs than boys, and that these beliefs may not consistently predict math interest and self-efficacy.

**Detached Activism**
Tarra Chen, Economics, Journalism
Sponsor: Professor Jason Samuels, Journalism

After a burning of an Israeli flag and two arrests, working title: “Detached Activism” follows four NYU student activists struggling with the Israel and Palestine conflict and the repercussions of their actions. Tensions between Pro-Palestine and Pro-Israel groups have always been present at NYU, but these tensions culminated in an extreme display during a rave in Washington Square Park on April 27, 2018. During this event, Realize Israel, the main Pro-Israel, Zionist group on campus, organized a rave celebrating Israel’s 70th Anniversary. Groups SJP (Students for Justice in Palestine) and JVP (Jewish Voices for Peace), both Palestine sympathizing groups, organized a protest of the event, planning to burn the Israeli flag at the celebration. This documentary deals with what happened that day as well as the events that followed afterwards on campus including the BDS sanction by the student council as well a famous lawsuit against NYU.

**Vehicle Forfeiture and Krimstock Hearing and Its Effects on Disadvantaged, Low-Income, and Ethnic Communities**
Kimberly Cheung, Metropolitan Studies
Sponsor: Professor Amarilys Estrella, Social & Cultural Analysis

The New York City Police Department (NYPD) Legal Bureau Civil Enforcement Unit (CEU) uses vehicle forfeiture, an initiative that is meant to disincentivize drunk driving, illegal possession of weapons, and illegal possession of drugs and substances that take place in a vehicle. Prior to their criminal court hearing, defendants may participate in a Krimstock hearing derived from the 2002 *Krimstock v. Kelly* opinion, that grants owners of vehicles seized by New York City procedural due process at a pre-judgment hearing. The hearing assesses the NYPD’s merit to retain the vehicle based on a three-pronged approach and allows defendants the ability to show the court how their vehicle was not an instrument of the crime and provide why it is permissible to return the seized car. In my research, I will be studying the social and economic significance of policing in New York City by exploring how the NYPD Civil Enforcement Unit uses legislation and civil
One Small Step: The Process and Impact of Prosthetic Technology
Lindsey China, Journalism, Politics
Sponsor: Professor Jason Samuels, Journalism

In the United States alone, the Amputee Coalition reports that nearly 185,000 amputations are performed annually, with the majority of those individuals requiring prosthetic limbs. The Amputee Coalition also reports that nearly 2,000,000 people in the United States live with limb loss. That number is expected to double by 2050. This research project looks at modern advancements in prosthetic technology, the process that goes into the creation of prosthetic limbs, and the struggles individuals using prosthetics face every day through the story of a man who lost his leg below the knee after a tragic accident in 2016. After learning to walk again and then, eventually, to run, he has dedicated his life to running marathons for charity and to helping others to overcome their obstacles. The research was obtained as part of the production of a short documentary focusing on the prosthetic industry and its impact on individuals requiring prosthetic limbs.

12 Years
Natalie Chinn, Anthropology, Journalism
Sponsor: Professor Jason Samuels, Journalism

Henry and Cindy Tam are a Chinese American couple who live in the San Francisco Bay Area and have been married since their mid-twenties. After several years of on-and-off attempts at getting pregnant, the couple decided to try in vitro fertilization, the method of fertilizing an egg outside of the mother, and then implanting her with multiple embryos in hopes of one attaching itself to the uterine lining. As devout Christians—Henry is a pastor—the couple decided to do fresh embryo cycles, a way of minimizing the number of lost embryos to thawing, which is normal in frozen transfers, the more popular method of IVF. However, after many expensive cycles and many heartbreaking miscarriages, the couple realized they needed another plan. Henry and Cindy decided to try embryo adoption, which is made possible by the donations of couples who previously froze their embryos during IVF treatment. The Tams used a Christian company called Snowflakes to match them with an embryo donor. These matched embryos would be shipped to the Tam’s hospital, where they would be transferred to Cindy’s uterus in hopes of it attaching. They were matched with a few Asian embryos, but none of the embryos evolved into a pregnancy. Not wanting to limit their opportunities of having children, the Tams opened themselves up to matching with a Caucasian set of embryos. After twelve long years of trying to have children, Cindy finally carried a child to full term

The Effect of Newcomer Extraversion on Their Ability to Persuade a Group
Kathryn Chin, Psychology
Sponsor: Professor Tessa West, Psychology

This study will investigate the relationship between a newcomer’s extraversion and their persuasiveness. Extraversion is a personality trait that has long been studied with many positive outcomes becoming associated with the trait such as intelligence and attractiveness (Meier, Robinson, Carter, & Hinsz, 2010). Extraverts are more likely to persuade others and less likely to be persuaded by others (Carment, Miles, & Cervin, 1965). An interpersonal interaction that is particularly challenging to navigate is when individuals join already existing groups and have to become integrated within the group as a newcomer. In order to investigate the relationship between a newcomer’s extraversion and their ability to persuade a group, three participants will complete a NEO-PI questionnaire to assess extraversion. Two of the three participants will complete a task together to establish rapport with one another. The third participant will be the newcomer to the group and all three will complete a decision-making task in which they will pick the best candidate for a job. After reading the candidate profiles, they will fill out a survey which will record which candidate they think is best for the job. Extraversion will be compared to whether or not they successfully persuaded the group to pick the candidate they chose in the survey. I predict that the more extraverted the newcomer, the more successful they will be in persuading the group. Results may help determine whether extraversion can be protective against challenges faced by newcomers.
and gave birth to a healthy blue-eyed Kiara five years ago
and twins Asher and Christian three years ago. This docu-
mentary follows the Tam family through their challenges
with infertility and unique experience of raising a blended
family through embryo adoption.

Drisla: A Window into North Macedonia’s Air
Pollution Crisis
Jana Cholakovska, Journalism, Politics
Sponsor: Professor Brooke Kroeger, Journalism

My research, a work of journalism, explores the
difficulties of addressing climate change in developing
countries. The Drisla landfill, situated eight miles south-
east from North Macedonia’s capital, Skopje, has a tumult-
uous history. Since it opened in 1994, it has collected and
processed most of the country’s municipal and hazardous
waste. The wellbeing of the environment was not consid-
ered a pressing issue as the country had just declared its
independence from Yugoslavia a mere three years earlier
and was just trying to figure out its place in Europe and
the world. Drisla was not the priority. In the following 25
years, it changed numerous owners and lacked the consist-
tency that was needed to deal with something as delicate
and as important as the environment. In my thesis, I follow
the landfill’s history, and I attempt to point out the critical
moments which have made what it is today: inefficient,
outdated, underfunded, and struggling. I situate the story
of Drisla within the larger context of Skopje’s disastrous
air pollution and North Macedonia’s unstable political
milieu. This is as much a story about climate change as
it is a story about politics and culture. I used a combina-
tion of methods. I conducted interviews with government
officials, Drisla management, medical officials, and envi-
ronmental activists. I also consulted numerous government
documents, third-party reports about Drisla’s performance,
other journalistic work, and data from the European Envi-
ronment Agency.

The Effects of Race and Facial Expression on Trust
Cameryn Cooley, Psychology
Sponsor: Professor Lawrence Ian Reed, Psychology

How do race and facial expressions affect percep-
tions of trust? We examined whether African American
or Caucasian faces influenced trusting behavior among
perceivers when displaying either a neutral facial expres-
sion or a smile. Participants saw a photo depicting either
a Black or White confederate partner displaying a neutral
expression or a smile before making a behavioral decision
in one of two economic games. In the Trust Game (Exper-
iment 1), participants played the role of the investor and
in the Dictator Game (Experiment 2), participants played
the role of the allocator. Past research suggests that people
share more with smiling faces over neutral faces and share
more with partners of the same race. Our findings suggest
that manipulating race or smile had no significant effect on
trusting behaviors, nor do the two factors interact with one
another to affect trusting or altruistic behaviors. While our
results were non-significant, some interesting trends exist
for future research.

An Anthropological Approach: The Factors and
Motivators That Lead to Public Composting in New
York City
Louis Dalle, Anthropology, Public Policy
Sponsor: Professor Anne Rademacher, Environmental
Studies

Every day, groups of New York City residents
take time from their day and, without compensation, go
to public composting bins to deposit the food waste they
carefully triaged throughout the week. I was curious to
understand what motivated these composters to act as they
did. In fact, how does “composting” play into their identi-
ties? Socio-Cultural Anthropology has a long-established
toolkit to deal with geographically located identities; how-
ever, this project challenges the toolkit both in a multi-sited
ethnography and by studying only a facet of an individual’s
identity. The objective is to find out what are the causes and
motivators behind composting in NYC public composting
bins. Through participant observation, I ran interviews,
observed composting sites, and ran a materialist analysis
to collect as much data as possible in a minimally intrusive
manner. From there, I build a model categorizing potential
motivators in four categories: emotional, cultural, social,
and political. Overall, I find that social factors are rather
insignificant when it comes to composting. Instead, com-
pacting seems to stem either from cultural habits individ-
uals are socialized into, or, from a political desire to break
the cultural norms through an ideological act. These two
contradicting statements point to the complexity of iden-
tities and show that although individuals can be grouped
by social action, heterogeneous groups within NYC can
practice similar actions for different purposes. At the same
time, I offer a metacommentary on the role of the ethnog-
raper as a tool for data collection and analysis.

Global Peace or Internal Security: Democratization
and Peacekeeping Contributions
Maevyn Davis-Rackerby, International Relations
Sponsor: Professor B. Peter Rosendorff, Politics

The end of the Cold War, the early 1990s, marks
a significant turn in the way the United Nations uses its
peacekeeping forces—there was an increased emphasis on
peacebuilding and conflict resolution not just global pol-
ing. So, too, did peacekeeping numbers skyrocket, with
more states contributing more troops. At the same time,
there was a mass wave of democratization, and these new
democracies came to be in a changed world. How, then,
did these new states contribute to international peacekeep-
The Effects of Gender-Based Effort-vs-Talent Stereotypes on Children’s Motivation
Nicole P. Dayton, Psychology
Sponsor: Professor Andrei Cimpian, Psychology

Often, men’s academic successes are attributed to natural talent while women’s are attributed to effort. These gender-based stereotypes may have adverse impacts on women’s motivation (i.e., their confidence and interest) to pursue stereotypically male-dominated fields such as science, technology, engineering, and mathematics (STEM). While this demotivating effect has been shown in adults, this has not been explicitly studied enough in children, when the communication of these stereotypes first begins. The present research aims to gauge the effect that presenting these stereotypes to children (four to eight years old) has on their confidence, interest, persistence, and reaction to failure for a novel game. When a female peer is presented as being naturally talented at the novel game, both boys and girls show increased confidence for success and interest in the game. However, when a boy is presented as being naturally talented, both boys and girls reported less confidence and interest for the novel game. The implications of these findings may lead to a greater understanding of the connection between gender-based effort-vs-talent stereotypes and early motivation to pursue fields that women are told they will need a lot of effort to succeed in. These findings are the first step in shedding insight into how parents and teachers can encourage children, especially girls, to have confidence in their abilities and give them an equal chance to develop a preference for certain male-dominated fields, like STEM.

Effect of Generic Language on Assumptions Children Make about Unmentioned Social Groups
Alison De Leon Escobar, Psychology
Sponsors: Professor Marjorie Rhodes, Psychology; Kelsey Moty, Psychology

Generally, adults will use generic language (“Christians value compassion”) to communicate information to children. Previous research has shown that children as young as four years old make assumptions about unmentioned social groups when they exist along a binary. For example, the statement, “Boys are good at sports”, suggests to children that girls, therefore, are not. However, many social categories exist outside a binary (race, religion). It is unclear whether children will continue to make these inferences about unmentioned groups when a social category has more than one contrasting group. Therefore, if children were to hear, “Christians value compassion”, do they infer that individuals from other religious groups (e.g., Jews, Muslims) do not? More specifically, this study also addresses how the inferences that children make go beyond the literal meaning of a statement to the development of social stereotypes. Though this research is ongoing, we expect to see similar projections (based on initial data analysis) to past research concerning the development of inferences as well as the fact that these assumptions strengthen with age.

Analyzing Overt Symptoms of Depression through Prompted Vocalizations
Alexis Egazarian, Neural Science, Psychology
Sponsor: Professor Pascal Wallisch, Psychology

We are interested in determining if there are vocalization indicators of clinical level depression in prompted speech. Although there are a large number of symptoms of depression (e.g., low mood, feelings of hopelessness and helplessness, negative attitudes about the self), there is a lack of observable physical symptoms, thus making depression extremely difficult to accurately diagnose (Beck, Ward, et al., 1961). This means that our current knowledge of depression may not be sufficient, and integration of different methods may be needed to increase our understanding of depression and elicit more accurate diagnosis. One such method is analyzing properties of speech. It has been shown that emotions and mood are expressed through speech (Low, Maddage, et al., 2011). Therefore, a depressed person’s emotional state may affect the quality and content of their speech and would differ from that of a non-depressed individual. Thus, we believe that the properties of vocal response, including the length of response, number of silent pauses, range of frequency, and the content of the response, could be utilized to detect depression.

435 Cap in Hand: How House Delegation Size Affects Federal Assistance Awards
Fareid El Gafy, Film & Television, Politics
Sponsors: Professor Anna Harvey, Politics; Professor Christopher Daves, Politics

According to the Constitution, the assignment of seats in the House of Representatives is to be reassessed every ten years. Historically, the number of seats would increase to accommodate the growing population of the country, but with the passage of the Reapportionment Act of 1929, Congress enforced an arbitrary cap of 435 seats. Since then, district sizes have ballooned and states whose populations continue to grow have lost vital repre-
Instigators of Locomotor Experience: How Infants Move, How Well They Move, and How Far They Must Move
Yasmine Elasmar, Psychology
Sponsor: Professor Karen Adolph, Psychology

The quantity and the variety of infants’ experiences drive locomotor development. But what factors shape infants’ locomotor experiences? Here, we tested effects of how infants move (whether they are crawlers or walkers), how well infants move (i.e., their locomotor skill), and how far they must move to get to interesting destinations. Using a within-subjects design, we tested age-matched (12.5-month-olds) crawling and walking infants during free play with their caregivers in two 10-minute conditions in which we varied the proximity of interesting destinations: toys were either clustered in one location or dispersed around the room. We tested 9 crawling infants (expected n = 20) and 4 walking infants (expected n = 20). Between conditions, we tested infants’ crawling or walking skill on a calibrated walkway. We are coding videos of the sessions to determine how much infants move, how far they move, and the variety of their movements. We predict that walking infants will move more and move farther than crawling infants and that more skilled infants in both postures will do likewise. Most critical, we predict that both groups of infants will move more and farther when the toys are spread around the room compared to when toys are clustered in one location, but that the increase in locomotor activity will be exaggerated for walkers. If our predictions hold true, findings would indicate that developmental factors (locomotor posture and skill) and real-time factors (proximity of destinations) shape infants’ self-generated locomotor experiences, which in turn drive locomotor development.

Punishing the “Black Sheep”: Stereotypicality as a Moderator for the Black Sheep Effect in Legal Decision-Making
Lucia Espineira, Psychology
Sponsor: Professor Emily Balcetis, Psychology

Previous studies have established the black sheep effect: the phenomenon of punishing a member of one’s ingroup more harshly than a member of one’s outgroup for a deviant behavior due to concerns about the other’s behavior impacting one’s own reputation. The present research tested whether racial minority group members are more likely than racial majority group members to demonstrate the black sheep effect, particularly when the deviant behavior is congruent with ingroup stereotypes. We investigated how the stereotypicality of an offense influenced mock juror judgments. Black (n = 205) and White participants (n = 331) were randomly assigned to read about a Black or White offender who committed a crime stereotypically or non-stereotypically associated with their race. We hypothesized that Black participants would punish an ingroup member more harshly than an outgroup member when the crimes were stereotypical compared to non-stereotypical. By contrast, we hypothesized that White participants would not punish an ingroup member more harshly than an outgroup member both when the crime was stereotypical and non-stereotypical; however, White participants would punish an outgroup member committing a stereotypical crime more harshly than a non-stereotypical crime. Contrary to our hypothesis, we found that stereotypical crimes were punished more harshly regardless of offender race or participant race. Additionally, we found that White offenders were punished more overall. We discussed implications in the legal system.

Vernacular Voting: The Impact of Polling Place Language Assistance on US Election Outcomes
James Ewer, Linguistics, Politics
Sponsors: Professor Christopher Dawes, Politics; Professor Anna Harvey, Politics

In 1975, the Voting Rights Act (VRA) was amended to include provisions for Americans who predominantly rely on a language other than English. These provisions currently require that if the number of limited English proficient voting-age citizens in a political jurisdiction surpasses a predetermined threshold, that jurisdiction must provide any and all election materials that it otherwise supplies in English—such as ballots, instructional forms, or voter registration resources—in the relevant minority language. By extending assistance to individuals whose language may have prevented them from easily participating in the electoral process, these measures enfranchise a greater number of US citizens. While past research on this amendment to the VRA has primarily addressed its effect on voter registration and turnout, minimal work has
been conducted regarding the impact of minority language voting resources on election results. This study aims to determine whether the implementation of the VRA’s language minority provisions influences a covered jurisdiction’s party vote share in a presidential election. Utilizing both difference-in-differences and regression discontinuity models, the study examines county-level results in US presidential elections from 1992 to 2016 in order to investigate whether vote share for a particular party increases in a county after it receives coverage status under the provisions. The results indicate that a requirement to provide language assistance in a county is causally related to an increase in support for Democratic candidates, suggesting that the realized political preferences of a jurisdiction have the capacity to change drastically when voting resources are made accessible in more languages.

**What’s in A Name? How Media Attribution Reflects Partisan Bias**

*Camden Fieldman, Journalism, Politics*
*Sponsors: Professor Julia Payson, Politics; Professor Christopher Dawes, Politics*

Is it possible that news will be found less trustworthy by members of certain political parties if it comes from outlets which supposedly lean against their viewpoints? Moreover, what if the exact same article of news information, when its attribution changed to a network associated with bias, is taken as less credible? I show that Democrats find the content of news articles less credible when the attribution of Fox News is given. I used an online survey experiment where respondents were randomly assigned the attribution of the Associated Press, Fox News, and MSNBC for three articles which were in actuality written by the Associated Press. They were then asked to rank the credibility of each article. In addition, I find that a respondent’s ability to recall information from each article is not affected by the attributions of Fox News or MSNBC. These results suggest that although Democrats may view information coming from Fox News as less credible than other outlets, they are still absorbing the facts that they are reading. These findings imply that political identity can play a role in believing the authenticity of news information when certain media outlets and partisan readers cross paths.

**Differential Effects of Anonymity on Anti-Black Bias in Legal Sentencing Decisions**

*Sara Field, Psychology, Spanish*
*Sponsor: Professor Emily Balcetis, Psychology*

The present study aims to explore factors that exacerbate or mitigate the occurrences of race-based bias in legal decisions. I investigate whether Black and White mock jurors’ punishment decisions differ as a function of whether the judgment is a private or public evaluation of a convicted Black or White defendant. I hypothesize that social desirability concerns will motivate White jurors to appear egalitarian and unbiased in public decision contexts, but those concerns will be muted when rendering punishment decisions in private. As such, White jurors will sentence White defendants most harshly when making a public decision, and will sentence Black defendants most harshly when making a private decision. In contrast, I expect that Black Americans will sentence Black defendants harshly in both private and public contexts in order to uphold a positive group image. As members of a historically marginalized group, the unique threat that ingroup deviants pose may result in ingroup policing behavior that serves to manage reputational concerns. The present study paves the way toward a better understanding of Black jurors’ evaluations of in- and out-group defendants and the psychological mechanisms underlying these evaluations. Since mock-juror research is routinely used in policy recommendations, it is critical to expand this line of research.

**Anxious Adolescents Show Increased Pavlovian Learning Biases**

*Careen Foord, Neural Science*
*Sponsor: Professor Catherine Hartley, Psychology*

Anxiety disorders are the most common mental illness worldwide and often emerge during adolescence. A core feature of anxiety disorders is avoidance, which may arise from a greater reliance on reactive Pavlovian responses as compared to flexible action learning that enables goal-directed behaviors. Whereas Pavlovian learning couples action and valence to reflexively drive behavioral approach to reward-related cues and withdrawal from punishment-related cues, instrumental learning fosters deliberate action that can bring about a desired outcome. When these learning systems interact, reward-driven Pavlovian approach and punishment-driven avoidance can either facilitate or impede instrumental learning. Although adults with anxiety disorders experience heightened Pavlovian biases on instrumental learning, little is known about how these forms of learning interact in anxious adolescents, especially given that non-anxious adolescents exhibit an attenuated Pavlovian bias. Here, we assessed how well anxious adolescents can learn an action in response to a reward- or punishment-related cue using a behavioral task that can index these two forms of action learning. We hypothesized that anxious adolescents, unlike non-anxious peers, may show heightened Pavlovian biases on instrumental learning, accounting for the increased avoidance behaviors evident in this population. Our preliminary results suggest a positive relationship between Pavlovian biases and trait anxiety, such that individuals with greater anxiety show an increased reliance on reflexive behaviors. Such greater Pavlovian interference evident in anxious adolescents may constrain the exploration of actions, im-
Unintended Consequences: US Foreign Policy’s Effect on Sexual and Reproductive Health and Rights Access Internationally

Imogen Fordyce, International Relations
Sponsor: Professor Shanker Satyanath, Politics

This study examines whether the Mexico City Policy, a conservative driven US foreign policy mechanism, colloquially known as the Global Gag Rule, which intends to diminish access to abortions internationally, has an unintended negative effect on access to sexual and reproductive health rights and services (SRHR) for women worldwide. Operationalizing maternal mortality ratio, contraceptive prevalence, the percentage of births with a skilled attendant present, and adolescent fertility rate as indicators of sexual and reproductive health access, this study applies a difference in difference design to observe the level of significance that the policy’s presence has, or not, on SRHR worldwide, between President Bush’s tenure when the policy was active, and President Obama’s when it was not. The study includes 112 countries, grouped by their relative exposure to the policy, low (control) or high (treatment), based on their historic level of reproductive health funding from the US. The results revealed that both maternal mortality ratio and the presence of a skilled birth attendant were significantly affected by the policy’s removal. However, the other indicators were not, a result that with further investigation suggested other US foreign policy programs may be compounding the effects of the Mexico City Policy and further reducing access to SRHR support. An outcome that this study hopes will provoke further exploration of the collective effect US foreign policy has on SRHR access and what the scale of the negative repercussions of this may be for women worldwide.

A Hidden Crisis: Testing Arrest and Release Patterns against Jail Capacity Constraints
Claudia Franke, English and American Literature, Politics
Sponsors: Professor Anna Harvey, Politics; Professor Christopher Dawes, Politics

In the past decade, state and federal prison populations have steadily decreased, leading some to proclaim a new golden age in the fight against mass incarceration. However, this determination leaves out a crucial part of the criminal justice system: local jail facilities, the “front gate” to America’s mass incarceration crisis. In this paper, I examine how capacity constraints in local jail facilities affect arrest and release patterns both for general inmate populations as well as among inmates from different racial groups. I analyze how capacity constraints in 105 county facilities across five states affect the number of people being arrested and released. The goal of this project is to explore not only how capacity constraints affect outcomes for defendants but also, more broadly, how financial incentives (and financial pressure) may affect criminal justice outcomes. The findings provide strong support for the hypothesis that local law enforcement officials arrest fewer people when jails are more full. In addition, this analysis indicates that when jails are full, arrest rates decrease more for white inmates than for non-white inmates. This analysis provides robust support for the theory that local law enforcement officials are influenced by capacity challenges within facilities, and thus adds to a growing literature about American criminal justice, and more specifically about American jails.

Visual Confirmation Bias
Sean Frydman, Psychology
Sponsor: Professor Emily Balcetis, Psychology

I define visual confirmation bias as the tendency for people to replicate the same pattern of eye movements from one viewing of evidence to the next. My research investigates whether people do or do not use additional opportunities to view evidence to fill in the gaps of what they did not see upon their initial viewing. They may, upon first viewing, generate a narrative account of an event that they then test in subsequent viewings by repeating their viewing trajectory. In the real world, in a case where video evidence is available, one would hope that jurors would benefit from multiple opportunities to watch the video footage, as repeated viewings could provide new information that was missed earlier. Participants watched a muted short video clip depicting real footage of a police officer engaged in a physical altercation with a civilian on an eye-tracking enabled screen. I measured both fixation count and duration on the police officer and civilian respectively as an index of visual confirmation bias through the use of the eye tracking technology, Tobii. My results suggest that participants attempted to confirm their initial judgments from one viewing of the footage to the next by paying the same amount of attention to the same target. No juror is completely free of bias, and now we know that any stereotypes or biases that a juror might have towards a defendant tend to be visually confirmed in their second viewing of evidence rather than refuted.

Aiding Mental Simulation in Spatial Planning
Qixiu Fu, Psychology
Sponsor: Professor Wei Ji Ma, Psychology

People often use imagination to simulate an immediate outcome, like imaging making a turn at a crossroads when driving. However, in planning, one needs to generate sequences of outcomes to achieve a long-term goal. This makes mental simulation hard in planning because im-
aging multiple sequences of actions are computationally challenging. In this study, we investigated the process of mental simulation in spatial planning in a Number Estimation task. We asked participants to estimate the number of cities they can connect by following a specified order using three different levels of a budget length. We found that the participant’s estimation was less accurate with a longer budget length. This result suggested that simulating a longer sequence of actions was more challenging, so can we alleviate the burden of mental simulation in spatial planning? In a Road Construction task, we asked participants to connect as many cities as possible on a map under two conditions: 1) a condition where they only make one set plan, 2) a condition where they had the chance to re-plan using an undo button. The undo button aided mental simulation in visualizing alternative outcomes. Our pilot results showed that participants connected more cities with undo, and it took them longer to make their first choice without undo. This study may help in understanding the benefit of mental simulation in spatial planning and navigation behaviors.

You’re Awfully Nice, for a Robot: Instrumental Trait Learning across the Human-To-Nonhuman Spectrum
Nico Giannant, Global Public Health/Anthropology
Sponsor: Jeffrey Berg, Psychology

We often learn about others and their sharing behavior instrumentally through direct interaction and feedback. During these interactions, we can learn about how much someone has shared with us (the absolute value of their sharing, or how rewarding they are). However, we can also learn how generous someone is, by comparing how much they shared to how much they could have shared in total. Past research has shown that human participants prioritize generosity when interacting with other humans, and prioritize reward more so when interacting with non-humans (slot machines; Hackel et al., 2020). How would human participants behave if they were to encounter a nonhuman that looked humanoid (i.e., a robot)? This study examined how we learn about traits versus rewards when interacting with slot machines, robots, and other humans. We hypothesized that human participants would prioritize generosity with humans, followed by robots, and then by slot machines, toward which humans will prioritize rewards. Additionally, humans producing and interacting with robots is likely to expand in the foreseeable future; therefore, it is imperative that we comprehend how people are learning and interacting with these nonhumans. As robots continue to be treated more like humans, analyzing the trend of how people learn about nonhumans can shine light on how and why relationships between humans and nonhumans develop.

Reimagining Aging: The Effects of Utopian Thinking on Hope, Agency, and Abstract Thinking in Older Adults
Maya Goldman, Drama, Psychology
Sponsors: Vivienne Badaan, Psychology; Professor John Jost, Psychology

In our society, not only do older adults suffer from a marginalized role and loss of social status, but aging is equated with deterioration. As people age, depression and despair may be experienced if negative assumptions about late life are internalized. Since the population is aging, how do we envision new models of old age, contest the status quo so negative models of aging are challenged, and promote social change? If one can imagine a society in which aging is embraced, valued, and even celebrated, it may be possible to increase hope in older adults, encourage them to work against ageist notions and promote change. My study “Reimagining Aging” addresses this question: Does induced utopian thinking—i.e., imagining a better society—prime older adults to engage in abstract thought, that is, big-picture, high-level, complex thought, and experience enhanced personal and social hope? I also investigate whether inducing utopian thought dampens system justification motives—the tendency to accept, justify, and bolster the social status quo, where negative stereotypes of aging abound. Lastly, this study clarifies if utopian thinking, by means of increasing hope and abstract thinking, helps older adults see themselves as agents of social change. The findings of this study can support utopian thinking as a tool that clinicians, writers, and social advocates can use to enable older adults to conceptualize a world in which they feel empowered to elicit social change. One’s realm of possibilities is limited to what one can envision.

Body-Environment Relations in Infants’ Everyday Walking Experiences at Home
Sarah Goffredsen, Journalism, Psychology
Sponsors: Professor Karen Adolph, Psychology; Margaret Shilling, Psychology

Flexibility is essential for locomotion because everyday activity is variable and novel. Infants’ situations are constantly changing, creating new constraints on balance and locomotion. Thus, infants must select and modify locomotion to suit the current situation. We hypothesize that infants acquire behavioral flexibility through immense amounts of practice with varied body-environment interactions. Every step on a different surface (varying in slip, texture, slant, etc.) compounded with every functional change to infants’ bodies (boots, sneakers, barefoot; bulky/light clothes, naked, etc.) provides experiences with different body-environment interactions. Previous research has tested infants’ locomotion on motorized treadmills or while infants crawl or walk along straight paths. But in real life, paths are cluttered, and ground surfaces are infinite-
ly changing in type and texture. This study characterizes
the amount and type of body-environment interactions in
infants’ everyday walking experiences at home. We vid-
eo-recorded 30 13-, 18-, and 23-month-old walking infants
during one hour of everyday activity. We scored videos for
the type and number of different surfaces infants stepped
on and the number of transitions between surfaces. We
also recorded every change in clothing (bulky, medium,
light) and footwear (different shoes, socks, barefoot). The
interaction of surfaces and body revealed all the unique
body-environment relations that babies experience con-
stantly, and we hypothesize that these relations allow and
encourage flexibility. Analyses are ongoing.

Amount and Consistency of Infant Locomotor
Activity: Effects of Age, Space to Move, and Infant
Temperament
Sarah Gotfredsen, Psychology; Aastha Vasa, Psychology
Sponsor: Professor Karen Adolph, Psychology

Infants’ “walking experience” is the single best
predictor of improvements in walking skill. However,
walking experience as it is traditionally measured chron-
icles only elapsed time (i.e., days since walk onset), and
researchers know little about the actual content of infants’
locomotor experiences. Understanding experience-related
mechanisms requires a rich description of infants’ every-
day walking experiences. Thus, we video recorded 30 13-,
18-, and 23-month-old walking infants during everyday
activity at home during two 1-hour visits. Infants moved
in short bursts (M = 2 s) of time-distributed activity (M
= 180 bouts/hour), separated by longer periods with no
locomotion (M = 14 s), and the stop-and-go pattern was
common across infants. On average, infants spent about
20% of each hour in motion, but individual differences
were notable (5% – 38%), and locomotor activity was rel-
atively stable across visits (r > .438, p = .01). Home size
(studio city apartment to multi-level house in the suburbs)
and mothers’ reports of infant temperament were unrelated
to infants’ locomotor activity (rs < .336, ps > .09). In sum-
mary, we found a robust, self-generated practice regimen
of locomotor activity that holds across infants, time, and
variations in home environments. Our findings suggest
that large amounts of time-distributed practice predict
improvements in walking skill and have implications for
designing interventions for infants with disabilities.

Transforming the Norm for Survivors: Legal and
Community-Based Solutions to Sexual Violence in the
United States
Emma Grasso Levine, Dramatic Writing, Social &
Cultural Analysis
Sponsor: Professor Lisa Duggan, Social & Cultural
Analysis

For survivors of sexual violence, documented defi-
ciencies in the legal system and lack of access to alternate
strategies for combating violence prevent survivors and
their communities from finding justice and healing. Yet
few resources on this issue propose policy reforms along-
side robust, existing community-based strategies in order
to more holistically address sexual violence. This project
analyzes the combined impact of both legal strategies and
intersectional, community-based activism to address sex-
ual violence, arguing that transformative justice and com-

munity accountability techniques, which do not rely on the
state, can address the documented limitations of legal and
institutional systems for responding to sexual violence.
While policy changes within legal and institutional sys-

tems have increased protections for survivors, these pieces
of legislation are also increasingly limited in power and
efficacy. Intersectional feminist literature, toolkits, work-
books, and case studies provide examples of how to effec-
tively utilize transformative justice strategies in response
to sexual violence within communities. This project focus-
es on the case studies of the organization INCITE! Women
of Color Against Violence and the student-run group Stu-
dents for Sexual Respect at NYU to illustrate that trans-
formative justice strategies can be effectively implemented
to address sexual violence at colleges and universities as
well as within broader communities. Ultimately, this thesis
utilizes these case studies to highlight different options for
survivors of sexual violence so that survivors whose needs
are not compatible with legal or institutional procedures
can still find their own version of justice. Transformative
justice and community accountability strategies provide
survivors and communities impacted by sexual violence
with the tools they need to transform rape culture, interrupt
cycles of sexual violence, and better support survivors.
Part of its history dating back to the Ottoman Empire. For
consider. Food is a vital part of Turkish culture and a prominent
ingredient—and that’s what makes food a global con-
also about history. Almost everyone can relate to a dish or
dish that means a lot to them. It is not only about taste but
and empathize with immigrants who step into the unknown
with some recipes, a couple of spices and a lingering taste
of home.

*Food, Culture and Immigration: The Turkish Immigration Experience as Told by Restaurant Owners in London and New York*

*Alya Gulec, Global Liberal Studies, Journalism*

*Sponsors: Professor Ijeoma Fulani, Cultural and Social Identities, Global Liberal Studies; Professor Mitra Rastegar, Cultural and Social Identities, Global Liberal Studies*

Speakers receive two types of information from their tongue while speaking. Tactile feedback is received when the tongue’s surface is touched, while proprioceptive feedback is information about the tongue’s position in the mouth. Both types are necessary for appropriate tongue shape and placement as shown in studies where manipulating tactile or proprioceptive feedback leads to speech errors (Ringel and Steer, 1963; Jones and Munhall, 2003). “Somatosensory acuity” encompasses the ability to use tactile and proprioceptive feedback to plan and adjust speech. As no widely accepted standard for measuring somatosensory acuity exists, this study compared three measures in 20 adults: 1) an oral shape identification task measuring tactile input to the tongue (Steele, Stokely et al., 2014); 2) a novel task measuring proprioceptive awareness of tongue position; 3) an oral perturbation task in which participants speak while attempting to overcome altered jaw and tongue position while their hearing is occluded (Zandipour, Perkell et al., 2006). To relate somatosensory acuity with speech production skill, we collected these three measures from adults learning Mandarin vowels (Li, Ayala et al., 2019). To test the hypothesis that participants with higher somatosensory acuity would show larger increases in vowel accuracy, participants’ scores on each task were examined in relation to acoustic change from before to after training. Task 3 was selected as the measure most strongly associated with change in production accuracy. A valid index of somatosensory acuity will enable future research to elucidate somatosensory influences on speech production, with implications for clinical treatment planning.

*Toward an Index of Oral Somatosensory Acuity: Comparison of Three Measures in Adults*

*Olesia Gritsyk, Communicative Sciences and Disorders*

*Sponsors: Professor Tara McAllister, Communicative Sciences and Disorders, Steinhardt School of Culture, Education, and Human Development; Heather Kabakoff, Communicative Sciences and Disorders, Steinhardt School of Culture, Education, and Human Development*

Speakers receive two types of information from their tongue while speaking. Tactile feedback is received when the tongue’s surface is touched, while proprioceptive feedback is information about the tongue’s position in the mouth. Both types are necessary for appropriate tongue shape and placement as shown in studies where manipulating tactile or proprioceptive feedback leads to speech errors (Ringel and Steer, 1963; Jones and Munhall, 2003). “Somatosensory acuity” encompasses the ability to use tactile and proprioceptive feedback to plan and adjust speech. As no widely accepted standard for measuring somatosensory acuity exists, this study compared three measures in 20 adults: 1) an oral shape identification task measuring tactile input to the tongue (Steele, Stokely et al., 2014); 2) a novel task measuring proprioceptive awareness of tongue position; 3) an oral perturbation task in which participants speak while attempting to overcome altered jaw and tongue position while their hearing is occluded (Zandipour, Perkell et al., 2006). To relate somatosensory acuity with speech production skill, we collected these three measures from adults learning Mandarin vowels (Li, Ayala et al., 2019). To test the hypothesis that participants with higher somatosensory acuity would show larger increases in vowel accuracy, participants’ scores on each task were examined in relation to acoustic change from before to after training. Task 3 was selected as the measure most strongly associated with change in production accuracy. A valid index of somatosensory acuity will enable future research to elucidate somatosensory influences on speech production, with implications for clinical treatment planning.

Conspiracy theories have recently become more acceptable to endorse, even without any factual basis. This evokes a motivation to understand who the population of believers are and if there are any commonalities in the social motives underlying their beliefs. This research project identifies the psychological mechanisms and the role of social identity motives in people’s endorsement of conspiracy theories. A preliminary study was given to NYU students identifying a positive relationship between needs for shared reality and conspiracy theory beliefs. A follow-up study focused on needs for uniqueness and needs for shared reality and their relationship to conspiracy theory beliefs and the dissemination of these beliefs. Participants from the platform Prolific were observed to conclude whether the need for shared reality is positively related to conspiracy theory beliefs and whether shared reality moderates the relationship between need for uniqueness and conspiracy theory beliefs. We found that participants with a stronger need for shared reality reported stronger conspiracy theory beliefs. In addition, we found that need for uniqueness was positively related to conspiracy theory beliefs but only for participants with a high need for shared reality.

**Social Motives Underlying Conspiracy Theory Beliefs**

**Sahar Hafezi, Economics, Psychology**

**Sponsors: Professor Jay Van Bavel, Psychology; Anni Sternisko, Psychology**

A closer look at the vegetarian movement: Why do former vegetarians drop the meatless diet?

**Anna Han, Sociology**

**Sponsor: Professor Jacob Boersema, Sociology**

While more than 10% of the American adult population report that they have practiced vegetarianism at one point in their life, there are only less than 3% vegetarians in America, which means that 7 out of 10 Americans who tried the vegetarian diet eventually dropped out (Asher, Kathryn et al., 2014; Harris Poll, 2016). Aimed to explain such a discrepancy, this research uses 10 in-depth interviews with former vegetarians and 200 survey responses to explore reasons for people to disengage from the vegetarian movement by understanding their motivations for terminating their vegetarian lifestyle.
a meatless diet. Building on previous studies of people’s conversion to vegetarianism as well as its socio-cultural implications, this research also provides vegetarian activists with insights into possible improvements to keep people in the movement by understanding the challenges and obstacles that push people out of a vegetarian diet.

Searching for a New Identity: Industry Losses in Rural America
Jimmy Herdegen, Public Policy
Sponsor: Professor Colin Jerolmack, Sociology

While the economic and demographic effects of deindustrialization on rural communities have been well documented, few have looked at the repercussions of a major company closure on the host community’s sense of civic pride. Monroe County, Ohio was affected by the closure of the aluminum factory Ormet, which was one of the biggest employers in the county. In the summer of 2019, I moved to the county seat in Woodsfield, Ohio to understand how social relations and the community’s perception of itself shifted after Ormet’s demise. Based on ethnographic observations, interviews with former Ormet workers and members of the community, as well as the collection of historical documents, I show that a shared narrative emerged of the county losing its identity. The struggle was not only to find a new source of jobs, but also to find a new foundation upon which to construct both one’s personal identity and sense of civic pride.

Linguistic Landscape Study: Arabic Use and the Palestinian Identity in Santiago de Chile
Jacob Hershiser, Middle Eastern Studies, Spanish
Sponsors: Professor Benjamin Hary, Hebrew and Judaic Studies; Professor Lourdes Dávila, Spanish & Portuguese

Chile is home to the largest Palestinian diaspora outside of the Middle East. And, after more than 100 years of migration, Palestinians still speak, teach, and celebrate Arabic. As a result, spaces like the Patronato neighborhood in Santiago have become fascinating language communities, filled with bilinguals, code-mixing, and mixed language. This study investigates how the Palestinian diaspora, and the wider Levantine diaspora, has used the Arabic language to maintain its culture and identity in the Chilean context. Studying the nature and results of contact, both linguistic and cultural, can help us understand how Spanish and Arabic speakers had to adapt to one another; how did they shape the linguistic environments they entered, and how were they shaped by said environments? How is that reflected in the linguistic landscapes of Santiago? Through documenting linguistic landscapes, both modern and historical, verbal and visual, the study shows that Spanish and Arabic both underwent phonological, grammatical, and semantic changes, and that a mixed language has been developing in this community. Beyond general instances of code-switching, the close grammatical relationship between Spanish and Arabic has led to certain switches unique to these speakers and this community. These types of switches, and Spanish/Arabic bilinguals in general, are highly under-researched, and they reveal that this study only scratches the surface when it comes to the breadth and possibilities of language mixing in such communities.

From the Cafeteria to Commencement: The Effect of the Community Eligibility Provision on High School Graduation Rates
Aidan Hoffman, Politics
Sponsors: Professor Anna Harvey, Politics; Professor Christopher Dawes, Politics

This paper analyzes the impact of the Community Eligibility Provision (CEP)—a federal universal free school meals program—on adjusted cohort graduation rates in public high schools around the country. Using a two-stage, fuzzy regression discontinuity design and school level data, I find no significant effect of CEP participation on graduation rates. This effect remains insignificant when accounting for year and demographic fixed effects. The weak first-stage effect of eligibility for the CEP—determined by an Identified Student Percentage of .4 or higher—on participation in the program may understate the effect of the program. Though selection bias prevents causal inference, further analysis of the results suggests that for participating schools, the program has a positive effect. These results demonstrate that future study could provide better insight into the effects of this program.

Lobbying and Employee Retention in the United States Bureaucracy
Milo Hudson, Politics
Sponsors: Professor Hye Young You, Politics; Professor Anna Harvey, Politics; Professor Christopher Dawes, Politics

There is a robust literature in political science on the revolving door between the legislative branch and the lobbying sector, but there has been relatively little analysis on how bureaucrats in the executive branch respond to variation in lobbying output in their decision to transition to the private sector. This paper explores the relationship between direct lobbying of the United States federal bureaucracy and the propensity of federal employees to remain in the public sector. Using longitudinal data from 1998 to 2014 of aggregate lobbying expenditures from Center for Responsive Politics and government employee separations from the United States Office of Personnel Management, I apply a differences-in-differences model to test the effect of lobbying expenditures on the likelihood of bureaucrats exiting the federal government. I find that agency lobbying in a given period has a significant positive effect on the likelihood of a bureaucrat quitting in the next period,
suggesting a public sector retention challenge in the face of increased lobbying expenditures.

**Gender Bias in Legal Decision Making**  
*Shabeba Islam, Psychology*  
*Sponsor: Professor Emily Balcetis, Psychology*

In the present study, I explored whether the role of gender interacts with political ideology in influencing legal decision making. Participants viewed ambiguous video evidence and recommended punishment for the officer involved in the documented case of police use-of-force. Punishment recommendations were indicated by how much they would fine each of the people in the video, or how many months of probation they would assign to the police officer. Post punishment section, participants reported demographic questions including the gender they identify with, and how they would place themselves on the political ideology spectrum ranging from 1 (extremely liberal) to 11 (extremely conservative) on a Likert scale. I expected to find that more liberal political leanings are correlated with harsher fines and more punitive decisions for the officer. As the female gender role still being associated with being warm and forgiving, I expected to find that female participants are more lenient towards the officer compared to male participants. Furthermore, I expected that there is an interaction between gender and political ideology that affects these punitive decisions. Specifically, female participants who are more liberal-leaning would report less punitive tendency towards the officer, compared to male liberal-leaning participants, while female conservative-leaning participants would be more lenient on the officer compared to male conservative participants. The American legal system is based heavily upon contributions of jury members, who come from the common people—making up 51% of this population, women contribute greatly to legal decisions. These results can be applied to future legal studies that study bias on active juries.

**Taxed Out of Town: The Effect of State and Local Taxes on Domestic Migration**  
*Ajay Iyer, Economics, Politics*  
*Sponsor: Professor Christopher Dawes, Politics*

This paper analyzes the effect of taxation on people’s migration decisions; specifically, if people choose to migrate into jurisdictions with lower levels of taxation and emigrate from those with higher tax levels. This study achieves its purpose using two different methods. The primary method examines the effect of per-capita county property tax income as a proxy for property tax rates on the rate of net domestic migration in counties. The secondary method finds the effect of income tax reforms on rates of net domestic migration in states by using three case studies of reforms by referendum in Tennessee, Georgia, and California. The results of the first study show a small but significant negative correlation between per-capita county property tax revenue and county net domestic migration rates. Both the Tennessee and Georgia case studies reported insignificant results; however, the California case showed a significant and substantial decrease in net domestic migration rates as a result of the passage of Proposition 30 in 2012. Previous literature holds that the wealthy and upper class have a higher propensity to migrate in order to avoid taxation, and this research furthers that by showing that this pattern holds in general, albeit at a much lower magnitude.

**Special Education in New York City Public Schools**  
*Sarah Jackson, English and American Literature, Journalism*  
*Sponsor: Professor Brooke Kroeger, Journalism*

This journalistic piece investigates the state of special education in New York City public schools. It looks first at the track record of the city’s special education system. New York City is home to the largest school system in the country, with more than 1.1 million students, of
whom approximately 20 percent have disabilities (NYC Department of Education, 2019). Yet, New York City has operated outside of compliance with federal law regarding special education for the past thirteen years (NYS Education Department, 2019). This piece examines how effective the city’s public schools are at meeting all of the requirements laid out in special education students’ Individualized Education Programs (IEPs). In addition, this piece documents various situations that arise when the city falls short of meeting IEP requirements, including parents withdrawing their children from the public school system altogether as well as parents taking legal action against the city. Lastly, this piece focuses on community action that strives for improvements to the city’s special education system, featuring interviews with special education teachers, lawyers, peer advocates, and more.

Direction against Despair: Effects of “Deaths of Despair” Mortality Rates on State Gubernatorial Election Party Vote Shares
Jay Kang, Politics

Prior research on voting behavior debates the presence of rational electoral accountability, wherein voting constituencies punish or support incumbent parties based on perceived behaviors and preferences (Achen and Bartel, 2017; Stiers, 2019). At the same time, additional research indicates the emergence of “deaths of despair”, mortality related to deteriorating social conditions, as a guideline for voting behavior—especially during the 2016 presidential election (Monnat, 2016; Bor, 2017; Bilal et al., 2018). However, despite the attention paid towards the federal government, state executives may be better positioned to address local crises and bear the burden of performance and evaluation. This project seeks to apply a similar analysis of “deaths of despair” mortality rates to the state level and determine the effects it may have on electoral results, using mortality rate data received from the Center for Disease Control Wide-ranging Online Data for Epidemiological Research (CDC WONDER) and state/county-level gubernatorial election results from the CQ Voting and Elections Database. The results showed that an increase in the crude “deaths of despair” mortality rates corresponded with an overall increase in incumbent party vote shares (with fixed party effects). Democratic vote shares, incumbent or not, suffer a decrease as mortality rates increase. Corresponding Republican vote shares, on the other hand, experience the opposite effect—an increase in mortality rates corresponded with an increase in vote shares. The findings suggest an empirical difference in voting behaviors between partisan groups, something that can be further explored with additional demographic variables and government positions considered.

Human Capital, Tech Diffusion, and Tax Rates
Alper Karakas, Economics

Total factor productivity (TFP) measures a country’s technological knowhow to efficiently use specific levels of physical capital and labor, and technology diffusion is understood as the distance between TFP levels of different countries and the TFP leader. Benhabib and Spiegel (2005) find that human capital plays a positive role in the determination of total factor productivity growth rates through its influence with the rate of catch-up (tech diffusion). More recently, however, the field has uncovered more relevance in assessing the effects of tax rate changes on technological growth due to recent political tension revolving around its effectiveness. This paper examines if, through a raw OLS method, human capital, TFP diffusion, and tax rates can serve as good indicators of TFP growth. It uses the long run growth of education in years and includes long run income and consumption tax rates changes in the model. Plus, the model is run separately for high-, middle-, and low-income countries. This paper finds that countries further from the TFP leader experience more positive effects of educational growth, encouraging educational growth policies. This is particularly the case for middle- and low-income countries. This paper finds that when educational growth is low, smaller TFP diffusion is associated with more TFP growth, encouraging catch-up through imitation policies. This is particularly the case for high-income countries. Only middle-income countries find that lower consumption taxes are associated with more TFP growth. Lastly, an OLS analysis finds that substantially low capital stocks are associated with slow TFP growth, possibly hinting at a capital-TFP related poverty trap.
Learning the Obvious: How Mothers Teach the Designed Actions of Everyday Objects

Bella Kasaba, Psychology; Carmen Zhang, Psychology

Sponsor: Professor Karen Adolph, Psychology

Many everyday artifacts require specific designed actions to use as the designer intended (e.g., untwisting the lid of a jar, pulling off the lid of a Tupperware container). Recent work (Rachwani et al., 2020) showed that knowing the designed action (twisting, pulling) is insufficient; children must also know the details of the action (twist continuously to the left, pull from the corner) and possess the perceptual-motor skill to implement it (stabilize the base and twist or pull with the opposite hand). Caregivers often provide social information to help children learn (e.g., encouragement, instructions about what actions to do, or hands-on assistance), but not all input is equally informative or effective for learning. To determine the natural input children receive, we asked mothers to teach their 12- to 36-month-old children (N=76) to open 7 containers with either twist-off or pull-off lids. Preliminary results showed that most mothers produced both verbal and manual behaviors, with three types of support within each modality (attention directives, information about the designed action, and assistance with implementation). Verbal input did not change with children’s age, but manual input decreased with children’s age and varied by container type. We are currently examining how children’s behaviors affect the real-time stream of mother input, how different types of input affect children’s subsequent behaviors, and which types of input influence learning the designed action, the relevant details of the designed action, and the perceptual-motor skills to implement the designed action.

Gender Generics, Part I

Arb Kasemsantitham, Psychology

Sponsors: Professor Marjorie Rhodes, Psychology; Emily Foster-Hanson, Psychology; Josie Benitez, Psychology

The present study explores the production of gender language in parent-child conversations about gender by examining 1) the correlation between parents’ production of generic statements and those produced by children and 2) the change of production of generic statements across age. Expanding on previous work by Gelman, Taylor, & Nguyen (2004), we will record conversations of 150 parent-child dyads at three child-age groups (3-years-old, 4-years-old, and 5-years-old) through a storybook reading task containing illustrations depicting stereotype-consistent or stereotype-inconsistent activities. While previous work recorded parent-child conversations in a lab setting, the current study will use a new modality: parent-child dyads will complete the study from home on their computers as conversations will be recorded through webcams. We then will code the participants’ utterances from the videos, particularly the uses of generic nouns and noun phrases that refer to the target activities in the storybook (e.g. “boys dig for worms”). We expect that the results of the current study, through online data collection, will be similar to those obtained by Gelman et al. (2004), which found significant correspondence between parent and child production of generics (r =.48; p<.001). Parents who use more generics tend to have children who use more generics. A main effect in age group was also shown in Gelman et al. (2004), with the production of generics increasing markedly with age. Children will, thus, increase their production of generic statements with age, and the relationship between parent and child production of generics will also increase in magnitude across age.

Effects of Acquiring Language: The Influence of Multilingualism on the Categorization of Multiracial Faces

Dor Katz, Psychology

Sponsors: Gustav Lundberg, Psychology; Professor Jon Freeman, Psychology

The purpose of the current research was to examine the role that multilingualism plays in multiracial categorization. This study (N = 180) involved a mouse tracking paradigm that looked at bias in categorization of multiracial face stimuli, and how this bias is associated to both multilingualism level and multiracial exposure. We were able to replicate past results, providing further evidence for an initial, reflexive monoracial attraction effect when categorizing multiracial faces. This effect was mitigated as participants had more exposure to multiracial people, through multiracial relationships. This study also found that multilingualism level predicts bias in multiracial categorization. While we hypothesized that multilinguals will be less biased in their categorization of multiracial faces, we found that they were more biased. Additionally, multilingualism level was found to have no significant effect on trustworthiness ratings of multiracial faces. The effects of multilingualism are still largely unknown, and this study aims to understand more of how speaking multiple languages can influence one’s brain and behavior. The results suggest that multilinguals’ ability extends beyond just speaking more than one language, to differences in facial perception, identification, and the process of racial categorization. However, due to a low completion rate of multilingualism-related questions, it is difficult to draw strong conclusions. Further research must be done to better understand and expand on the potential effects of multilingualism on the categorization and perception of race.
Opioids Hit Home
Katie Keller, Journalism, Politics
Sponsor: Professor Jason Samuels, Journalism

Seven years after Hurricane Sandy barreled through, Long Island has found itself yet again in the midst of another crisis—the opioid epidemic. Having lost children due to drug addiction, a group of Long Island mothers finds a way to work through unspeakable grief, while learning to smile again together.

A State of Statelessness: Gazans in Jordan
Celina Khorma, Journalism, Social & Cultural Analysis
Sponsor: Professor Brooke Kroeger, Journalism

Palestinians brought waves of immigration to Jordan during the 1948 Nakba and the 1967 Six-Day War (Al Abed, 2004). Those from the West Bank, which the Kingdom annexed in 1950, received full Jordanian citizenship, but the 158,000 who fled from Gaza have been stateless ever since their plight in 1967 (Al Abed, 2004). Jordanian citizens, including those who were naturalized from the West Bank, hold five-year temporary passports, but Gazans carry two-year temporary passports. These documents are expensive to renew and lack a raqam watani, which grants the right to work, vote, own, and essentially live in the country (Al Abed, 2004). On top of these issues, those who have remained in the Gaza Camp, the most impoverished refugee camp in all of Jordan, also suffer safety hazards from its poor infrastructure, asbestos roofs, and freely flowing wastewater (Perez, 2010; Jiménez, Blanca et al., 2009). By contrast, Syrian refugees, who only began fleeing to Jordan in 2011, have nearly all services covered for them by the UNHCR. The internationally funded organization works with the Government of Jordan to normalize Syrian life in the Kingdom after war. This includes paying for work permits, healthcare, school, as well as other essential services (UNHCR, 2019). Zaatari, the refugee camp with the highest number of Syrian refugees, and the second biggest camp in the world (Geddes, 2013), is far more habitable than the Gaza Camp. The homes, walkways, and general community is built with stronger, safer infrastructure, and the camp itself is better regulated. Despite having fled to Jordan 44 years earlier, Gazans and their descendants have far less opportunities available to them in Jordan than Syrians do, and the inequalities have significantly hindered the enhancement of their livelihoods.

Combatting the War on Drugs: How MDMA Is Helping Veterans Heal
Sydney Kinsey, Journalism, Psychology
Sponsor: Professor Brooke Kroeger, Journalism

MDMA—often wrongly referred to as Ecstasy or Molly, has shown promise medically and is now under FDA jurisdiction. 3,4-Methylenedioxymethamphetamine (MDMA), also known as Ecstasy or Molly, is illegal. 3,4-Methylenedioxymethamphetamine (MDMA), often wrongly referred to as Ecstasy or Molly, has shown itself to be successful in the treatment of post-traumatic stress disorder that the FDA recently categorized it as a breakthrough drug. This means that for the first time, government-approved trials of psychedelics are able to take place. We are finally at a point where a window is starting to open, and MDMA is one of the first to lead the way.

Plant Medicine in New York City: How Ancient Traditions Are Finding a New Home
Willa Konsmo, Journalism, Sociology
Sponsor: Professor Brooke Kroeger, Journalism

In the last several years, ayahuasca has become the subject of celebrity attention, various documentaries, and news stories, cited as a cure for various mental ailments and run-of-the-mill anxieties. It’s not just ayahuasca that’s become popular. Many plant medicines and psychedelics have returned to the forefront of cultural discourse in the US after their last appearance in the 1960s and 70s. Psilocybin mushrooms are an example of a plant medicine with indigenous origins that lost its spiritual identity once it became popularized in the US. Part of the reason is accessibility. Mushrooms grow just about everywhere, whereas ayahuasca is a tea brewed of two plants that grow only in the Amazon. But people get it anyway, and for most who use it, the ritual, the ceremony, is the reason they seek it out, whether gathered in a cabin upstate or in an apartment in Brooklyn. Understanding why people use plant medicines as well as who they are, hinge on the intersection of cultural attitudes, political status, and medical validation. Right now, mushrooms are becoming decriminalized in several areas across the country, partially influenced by medical research advocating for their health benefits as cultural acceptance grows. My research indicates that at least In New York City, plant medicine users are young professionals looking to better understand their place in the world, middle aged women coping with children leaving home, people of all kinds sorting out past trauma, artists...
Attention, Experience, & Running
Emmanuel Lapitan, Psychology
Sponsor: Professor Emily Balcetis, Psychology
Insufficient physical activity is one of the primary contributors to poor health and for people with poorer physical health, there are obstacles that make engaging in exercise more difficult; such as lower self-efficacy. In my research, I tested the effect of narrowing one’s visual focus of attention on the efficacy of running as exercise. I contrasted this strategy against individuals who looked at their visual environment as they naturally would. I measured the amount of time it took to run 400-m around an outdoor track when runners were randomly assigned to either narrow their focus or look naturally. I found that participants who used the narrow strategy ran faster than those that used the natural attention strategy, even after statistically adjusting for participant height and waist-to-hip ratio—physical qualities of runners that directly impacts running pace. I discuss the implications of these attentional strategies with regards to exercise motivation and physical health, among runners with varying degrees of expertise, and individuals who lack exercise self-efficacy.

Re(Defining) Cultural Citizenship: Mexican Migrant Experience in the United States
Renata Lara Arizpe, Anthropology, French
Sponsor: Professor Anne Rademacher, Anthropology
This research will analyze the spaces, systems, and practices that highlight the nuances of the disjuncture and convergence of cultural and formal citizenship for Mexican migrants with a precarious status in the United States. The methods utilized to answer the research question include primary and secondary data. I conducted participant observations at the Center for Educational Resources for Adults (CREA), located in East Harlem in NYC, to add closer and more timely insights into how people conduct their daily lives. These findings will be analyzed alongside academic literature on belonging and extended ethnographies on the Mexican migrant experience. The following points lay out a roadmap to answer the central research question. First, Immigration law and discourse equate migrants with criminality, contributing to their marginalization. Second, the contrast between English and Spanish serves as one of the most pointed articulations of what belonging to the social norm can mean in the United States. Third, the Catholic faith, plays a transnational role representing membership that is a very significant part of individual and group identity. Fourth, there are spaces and systems that are often perceived as separate units that are deeply interconnected in ways that show significant articulations of cultural citizenship. Through a contextualization of the central question and an analysis of my ethnographic work and relevant literature, my aim is to show a more nuanced view of the lives of a fundamental group in American society.

Burying the Park: A Documentary Film
Jenny Levine, Anthropology, Journalism
Sponsor: Professor Jason Samuels, Journalism
Eight years ago, Hurricane Sandy devastated Lower Manhattan. The city responded by working with community members to renovate the East River Park into a modern flood resilient park. Two years ago, the city blindsided the community and announced they would bury the park under ten feet of landfill for a flood wall. With the threat of no green space in a lower income elderly community, members of the community turn to activism to fight the city and dark development interests.

US-China Politics on Chinese International Students and Universities
Emma Li, Journalism, Language and Mind
Sponsor: Professor Brooke Kroeger, Journalism
Interviews with Chinese students at universities in the United States indicate an increasingly negative outlook on the overseas experience, contributing to a drop in new student enrollment. These students are beginning to feel more confident about achieving social and professional success back home in China. The US is combating theft of confidential research brought over to China by releasing statements of national security and putting stricter visa policies in place, but these actions are perpetuating suspicion toward innocent scholars. Chinese students are already facing issues on campus including xenophobic acts often fueled by political differences and more recently, the coronavirus. The consequence has been a declining trend of Chinese students studying abroad and instead, making the choice to go elsewhere or stay domestic. The more recent appeal of homegrown alternatives includes higher chances for promotion within established companies and entrepreneurial opportunities. While Chinese students continue to make up a large percentage of student bodies throughout the US and Europe, a strengthening sense of Chinese pride is making them more inclined to return home upon graduation. Their decision is directly impacting the business of study abroad facilitation agencies and revenue for US colleges. Talent particularly in the STEM and business fields is being outsourced as Chinese graduates turn to their native country for more fulfilling education and job prospects.
Statistical Bias and the Treatment of Multiracial People in Race-Related Regressions
Helena Li, Economics
Sponsor: Professor Timothy Roepen, Economics

This project examines the statistical bias in estimators related to race resulting from failing to accurately account for multiracial populations in regression designs using dummy variables. This analysis is conducted by running three regressions on race and earnings using data from the 2012 to 2014 American Community Surveys: one in which race is treated as it normally is by economists, meaning all multiracial people are forced to choose a single race, and one in which the multiracial population can identify themselves, and one in which the multiracial population is accounted for using ancestry data. The goal is to compare the resulting estimates of race’s association with earnings for each racial group in each regression. Regardless of what results are found, it is important to understand whether economists’ common practice of failing to account for multiracial people in regressions related to race does or does not lead to bias in their estimates, especially considering the breadth of this practice and the growing size of the multiracial population in the United States.

How Need for Cognitive Closure (NFC) Moderates the Effect of Sense of Direction on Enjoyment
Egret Liu, Psychology
Sponsor: Elizabeth Mutter, Psychology

The need for cognitive closure (NFC) is a desire for clear and definite answers, as opposed to ambiguity and uncertainty. People with high NFC are motivated to pursue order, predictability, and quick decision-making. This study investigates whether individual differences in NFC moderate the effects of sense of direction on people’s enjoyment of an open-ended story-writing activity. We first hypothesize that in an open-ended activity people given a clearer sense of what to do (i.e., sense of direction) will enjoy the activity more than people left aimless. Furthermore, we hypothesize that the effect of sense of direction on enjoyment will be stronger for people with high NFC because a sense of direction fulfills their desire for certainty. Participants recruited from MTurk will be randomly assigned to one of three conditions: elevated sense of direction for the story-writing activity (i.e., strong-relevant group), elevated sense of direction for an unrelated activity (i.e., strong-irrelevant group), or an inactive control. Level of NFC will be measured before random assignment with a 27-item scale. Enjoyment will be measured after the story-writing activity with a 7-item scale. Using multiple linear regression, we expect to observe a significant interaction effect, such that the effect of sense of direction on enjoyment will be stronger for people with high NFC compared with people with low NFC.

Learning about Squishy Surfaces: Are Crawlers Advantaged?
Yueqiao Liu, Psychology
Sponsor: Professor Karen Adolph, Psychology

Navigation requires perceptual information about upcoming obstacles to guide locomotion adaptively. Typically, visual information about obstacles and surface layout is available from a distance. However, visual information about surface rigidity is not available from a distance; it requires direct contact because deformability is an emergent force. Thus, in previous work where adults, preschoolers, and infants walked over a platform interrupted by a foam pit, participants of all ages did not slow down or stop to explore the surface. Instead, they required at least one experience falling into the foam pit to learn its properties (Joh & Adolph, 2006). However, unlike walkers, crawling infants may obtain information about surface rigidity serendipitously because their hands are in front of their bodies. If so, are crawlers advantaged? We observed 21 infants longitudinally every three weeks, from 10.5 (when all were crawlers) to 15 months, when all infants had begun walking. We encouraged infants to repeatedly cross a platform interrupted by foam pit. Data show that overall, avoiding the foam pit increased across sessions. However, group data belie important individual differences. Four infants avoided falling from their first trial and on every subsequent trial and session. Eleven infants fell initially, then avoided after some period. Six infants showed no evidence of learning, and fell repeatedly in every session, with no hesitation or exploration. In sum, data suggest that most crawlers, like walkers, required multiple falling experiences to learn about a squishy surface due to a lack of visual information from distance.

The Association between Primary Care and Colorectal Cancer Screenings in the Mexican Population
Melissa Lopez, Neural Science
Sponsor: Dr. Rosario Costas-Muñiz, Ph.D., Psychiatry and Behavioral Sciences, Memorial Sloan Kettering Cancer Center

Colorectal cancer (CRC) is the second leading cause of death from cancer in the United States. Early screenings can aid in the prevention of death, but most states report less than 20% of minorities got screened in the past year. In New York City, Latinos have similar CRC screening (CRCS) rates (72.2%) to other groups such as non-Latino Blacks (68.1%) and Whites (71.6%). However, this population faces healthcare access barriers such as access to health insurance and providers, resulting in a medically underserved population. The purpose of this study is to explore the association between intention to receive CRCS and past CRCS and access to primary care (i.e., having health insurance and a PCP). Formative research via a needs assessment was conducted with 83 Mexicans...
above age 45 and who reported Spanish as their primary language. The factors assessed included 1) demographics, 2) CRC cancer and CRCS beliefs and knowledge, and 3) CRC perceived risk. In our sample of Mexicans and Mexican Americans, 39% have received a CRCS. Analysis revealed a statistically significant association between having received CRCS advice and past CRCS and a statistically significant association between having a PCP and past CRCS. This sample of Mexicans has lower access to CRCS than other Latinos in New York. Given these findings, it is important to address the healthcare access needs of these medically underserved Mexican individuals.

Emotional Status and Mental Health of Latino Patients with Advanced Cancer
Melissa Lopez, Neural Science
Sponsor: Dr. Rosario Costas-Muñiz, Ph.D., Psychiatry and Behavioral Sciences, Memorial Sloan Kettering Cancer Center

Advanced cancer patients may experience significant psychological distress as they understand their prognosis and experience greater symptom burden. When faced with advanced cancer, meaning in life can get distorted, leading to anxiety and depression. Depression is a significant symptom for 25% of palliative care, while anxiety is being reported even more symptomatic than depression. Previous studies show that US Latino cancer patients exhibit significantly worse distress, depression, and quality of life than non-Hispanic White and African American patients. Very few psycho-oncological interventions have been developed or adapted for Latino cancer patients. Given the demonstrated need, 24 Spanish speaking Latino patients with advanced cancer were interviewed about their meaning-making processes and coping, sources of meaning in their lives, spirituality, and meaning-making after their cancer diagnosis.

Helping Explain Civil Violence: Does Democracy Aid Have a Place in Our World?
Benjamin Lotto, International Relations, Middle Eastern Studies
Sponsor: Professor B. Peter Rosendorff, Politics

It is the chief concern of many academics in international relations to understand why and how conflict occurs and discern how to prevent it. Some researchers have found that democracy-conditioned foreign aid—that is, foreign aid disbursed when a country democratizes—may contribute to decreasing civil violence within democratizing countries and increase levels of human rights and democracy thereon. This study furthers this research by looking at the extent through which democracy-conditioned foreign aid reduces state-based civil violence in OECD-eligible aid countries. This study contends that democracy-based foreign aid can help consolidate democracy by empowering civil society and NGOs, solidifying democratic institutions like the judiciary, and assisting electoral processes, ultimately limiting the opportunity for rebels to take advantage of weak central power and reducing potential commitment problems. It finds that foreign aid that is conditioned on democratic reforms negatively affects levels of state-based civil violence. However, when the government of a state is either not involved in the violence or facing no rebel contestation, I find aid to have no significant impact in reducing civil violence.

The Reshaping of New York City Transportation
Doris Lu, Economics, Psychology
Sponsor: Professor Hunt Allcott, Economics

Around 17.1% of total US greenhouse gas (GHG) emissions in 2017 comes from light-duty vehicles (United States Environmental Protection Agency). As environmental concerns slowly seep into mainstream consciousness, cities worldwide began to explore sustainable commute alternatives to the petroleum-based option that has long dominated urban transportation. One often mentioned option is replacing driving or riding in taxi with biking. Indeed, biking has become a popular mode of transportation not only for leisure, but also commuting. In 2014, a total 855 cities offered bikeshare programs for their residents (Meddin, 2014). As biking’s and bikeshare system’s popularity continue to surge, analyses of the substitution between commuting via bikes and bikeshare systems and via automobiles are critical for understanding, assessing, and quantifying their environmental benefits. This paper seeks to contribute to the ongoing assessment of bikeshare system’s environmental benefits through addressing the following two questions: 1) What is the impact of Citi Bike’s launch in neighborhoods on taxi and ride-hailing apps’ ridership? 2) What is the consequential impact of Citi Bike’s launch in neighborhoods on air quality and GHG emissions? Leveraging Citi Bike’s System Data, and NYC Taxi & Limousine Commission’s (TLC) taxi and for-hire vehicle (FHV) trip records, I attempt to establish a causal link between the launch of Citi Bike and taxi and ride-hailing services’ ridership in the affected neighborhoods. Citi Bike’s launch in 2013 and later expansion in 2015, 2016, and 2017 allow one to capture the impact of placing a Citi Bike station in a neighborhood on the neighborhood’s taxi and ride-hailing services usage. Through designating the first day of the first month of operation of a certain station as the chronological cut-point, my paper will examine the fluctuations, if any exists, and directions of fluctuations in the number of taxi and ride-hailing services’ pickups in affected neighborhoods.
The Impact of Media Reform in Argentina: How aMedia Giant Reacts to Increased Competition
Maddy Lyskawa, International Relations, Journalism
Sponsor: Professor Shanker Satyanath, Politics

Across Latin America during the last 20 years, a number of governments have implemented legislation in an attempt to control the media, whether that be through structural regulation, content regulation, or both. While the impact of that legislation may vary, especially as a result of the degree of its implementation, each piece of legislation tends to have unintended consequences as well. In Argentina, legislation passed in 2009 was intended to break up monopolistic audiovisual media organizations, specifically Grupo Clarín, in order to introduce new players to the field to diversify the producers of content as well as the overall content produced. In this thesis, I address an unintended consequence of this legislation, being whether or not Grupo Clarín’s messaging changed in its reporting as a result of the addition of new competitors to the audiovisual media market across Argentina. To do this, I compiled all of the articles published by Clarín’s daily newspaper between January 1, 2000, and January 1, 2016. With these articles, I used sentiment analysis to find suggestive evidence that the sentiment expressed through the articles published by Clarín’s newspaper changed to become more positive after the implementation of the law in 2009 and before the law’s effective demise in early 2016 under the presidential administration of Mauricio Macri. These findings are significant, especially when compared with the lack of a similar change in the sentiment expressed by Pagina 12, another daily newspaper in Argentina across the same time period.

Something from Nothing: Null Morphology in Feminine Plural Verbal Inflections in Modern Standard Arabic
Michael Marinaccio, Linguistics
Sponsor: Professor Alec Marantz, Linguistics

This research analyzes the feminine plural verbal inflections in Modern Standard Arabic (MSA) using the framework of Distributed Morphology (Halle & Marantz, 1993). Nearly all non-singular inflectional suffixes in MSA follow the pattern [-V:n]: an overt long vowel followed by the alveolar nasal [n]. However, the feminine plural inflections seem to stray from the pattern, surfacing as simply [-n]. I posit that a null but featurally significant morpheme precedes the [n] in the feminine plurals. The rationale behind incorporating a “null vowel” into the morphology of the feminine plural inflections lies in the small vocalic inventory of MSA. This language has just three vowels to work with, but eight non-homophonic, non-singular inflections to produce. The addition of a null morpheme to act as a covert vowel in [-V:n] suffixed inflections increases the number of distinct combinations of prefixes, suffixes, and vowels to cover all eight non-singular inflections. This thesis seeks to support the theory of a null morpheme by reflecting aspects of MSA root-and-pattern morphology, phonology, and syllable structure. In addition to calling upon the principles of Distributed Morphology, my analysis incorporates a constraint-ranking system modeled after Optimality Theory (Prince & Smolensky, 1993). Together, these theories bolster the hypothesis of a distinct null morpheme in the feminine plural inflections and provide evidence for its “pronunciation” in several environments in MSA.

Justice versus Peace: The Effects of Transitional Justice on the Electoral Success of Authoritarian Successor Parties
Alex Mason Pazmiño, International Relations
Sponsor: Professor Shanker Satyanath, Politics

This paper researches the effects of mechanisms of transitional justice, namely trials, truth commissions, amnesties, and vetting on the electoral success of authoritarian successor parties in Latin America. Latin America transitioned from authoritarianism, mostly in the form of military dictatorships, into democracy in the latter half of the twentieth century, in what is referred to as the third wave of democracy. Authoritarian successor parties became active politically, even winning elections and ruling democratically. Authoritarian successor parties are democratic parties formed either by members of the dictatorship or with strong ties to the regime. Their electoral success can sometimes be puzzling, given the human rights abuses and repression that often characterize the dictatorships of Latin America. This paper researches the effects of transitional justice on the vote share of authoritarian successor parties in each presidential election since transitioning to democracy. This research indicates that trials in isolation are associated with an increase in vote share, but when measured in conjunction with truth commissions, amnesties, and vetting separately, the interactions of trials and these mechanisms are associated with a decrease in vote share. With the exception of vetting, these results become amplified when limiting the analysis to countries that experienced a highly violent authoritarian regime, measured by a level of three or higher on the Political Terror Scale.

Apostate: On Being Exiled from BYU’s Ballroom Dance Community
Carly Mattox, French, Journalism
Sponsor: Professor Jason Samuels, Journalism

In the competitive world of ballroom dance, Brigham Young University is the apex of amateur excellence. When a diverse group of dancers dare to step outside the boundaries of that community, their dance careers are derailed—exposing troubling accusations of intolerance. Tyler Wilson, Jonathan Bailey, and Ira Pollock were once successful dancers in their prime, creating a life and a
future for themselves within the dance community before Brigham Young University managed to intervene—in BYU’s dance program, you can’t be gay, you can’t have natural black hair, you can’t teach students who end up leaving the church. Fate has allowed these three individuals to come together again in Woodside, Queens, even living in the same house together and attempting to move on with their lives. As they reflect upon a world where deviance from the status quo comes at a cost, their stories reveal an uncomfortable truth about the ballroom dance community.

**Upwardly Mobile Nicaraguans Faring with Stigma in Costa Rica**

*Maria Jesus Mora, History, Sociology*

*Sponsors: Professor Deirdre Royster, Sociology; Professor Robert Jackson, Sociology*

The stigmatization of Nicaraguan identity in Costa Rica is severe, so much so that historically Nicaraguan immigrants have attempted to hide their nationality to avoid discrimination. Even Nicaraguan children disguise their immigrant identity to avoid symbolic and physical violence. This study, explores how upwardly mobile college-age Nicaraguans, who are recent immigrants or who grew up in Costa Rica, experience and manage stigma in relation to their Nicaraguan-origins while living among Costa Ricans. Using a purposive snowball sample, I was able to conduct 32 interviews (and collect corresponding survey data) for this set of Nicaraguan college students looking specifically at how they perform (stigmatized) identity management. My design allowed me to explore differences in identity management strategies between the early-age Nicaraguan immigrants and Nicaraguan immigrants who migrated in adulthood. The majority of early-age Nicaraguan immigrants adopted passing and covering up mechanisms during their time in elementary and high-school but tended to become more open about their Nicaraguan origins when enrolled in higher-education institutions. Inversely, recent adult-arrivals commonly did not engage with passing mechanisms but did occasionally cover-up their identity in an ad hoc manner. Additionally, many adult-age migrants have younger family members who currently pass to avoid discrimination and bullying. This suggests passing mechanisms predominate among Nicaraguan youth in Costa Rican pre-university institutions. Lastly, through the experiences of Nicaraguan college students, Costa Rican stereotypes about Nicaraguans become self-evident. Nicaraguans who do not fit the stereotypical mold are believed to be either suspect and not genuinely Nicaraguan.

**Turning Anguish into Activism after Femicides in Puerto Rico**

*Paola Nagovitch, Journalism, Politics*

*Sponsor: Professor Brooke Kroeger, Journalism*

My journalistic investigation looks into rising femicides in Puerto Rico and how government inaction has spurred an advocacy movement comprised of grieving families, feminists, and artists. Puerto Rico has one of the highest and under-recognized femicide rates per capita in Latin America. On average, a woman is murdered every seven days on the island, though that rate is increasing. After Wanda Vázquez’ ascension to Puerto Rico’s governorship last August, Puerto Ricans were hopeful that the island’s second female governor would take concrete steps to curb the crisis, given that she previously served as the island’s Secretary of Justice and director of the Office of the Women’s Procurator. Seven months into her tenure, however, Vázquez’ approach has been diplomatic in her lack of actual policy implementation. In refusing to declare a national state of emergency despite public outcry, Vázquez has instead upheld barriers to justice for victims while dismantling effective structures once in place to combat gender-based violence. In response to what many perceive as inadequate government response, feminist advocacy organizations, artists, and grieving families have taken up the fight against gender-based violence on the island. Beyond extensive policy advocacy and protests, these groups have turned to art and public education as their mediums for mobilizing Puerto Rican society. I tell this story of artistic and political resistance largely led by women through Deddie Almodóvar, an artist-turned-activist who lost her sister to a femicide in December, 2018, and organizers from two leading organizations, La Colectiva Feminista en Construcción and Proyecto Matria.

**Frantz Fanon: Is It Possible to Decolonize the Mind?**

*Liam North, Romance Languages*

*Sponsor: Professor Cécile Bishop, French*

With the recent addition of the Cultural Formulation Interview to the DSM-5, many practitioners and researchers are approaching patient outcomes with cultural competency in mind. Often cited as the founding figure of critical ethnopsychiatry and culturally competent psychiatry, Frantz Fanon’s work is the focus of this research project. I believe that, by investigating his clinical work at the psychiatric hospital Blida-Joinville, we can better understand the roots and limitations of evidence-based treatments that rely on cultural competency. In essence, my research aims to delve into the realization of Fanon’s philosophical ideas concerning decolonization. According to the psychiatrist, decolonization is an inherently violent process, so how would one go about this nefarious task in clinical terms? Previous authors (Gibson & Beneduce, 2017) have cited Fanon’s treatment of his Algerian patients as ahead of his...
time, utilizing group therapy and refusing to adhere to the inherently biased French psychiatry system. Do these attempts amount to adequate treatment or recovery? Is it possible to decolonize the mind?

The Role of Social Status on Perception Variability
Celeste Nsubayi, Psychology
Sponsor: Professor Tessa West, Psychology

The present study investigates whether social status influences perception variability. Research has shown that, in general, high-status individuals tend to be paid more attention to (Chance, 1967; Cheng, Foulsham, et al., 2011; Dietze and Knowles, 2016). At the same time, high-status individuals themselves seem to pay less attention to those around them, presumably because they have less motivational incentive to do so. This study was meant to complement the existing research on perception variability by assessing its relationship to social status and how it influences people’s perceptions of others’ status. In two studies, a status manipulation was performed in order to form a high-status group and a low-status group. Later, participants in each group rated the amount of influence that other individuals would have relative to them based on their status. It was found that those assigned to the low-status conditions had a significantly higher deviation in their ratings compared to those in the high-status condition. These findings suggest that people who are lower in status are more sensitive to differences in the social hierarchy and are better able to perceive variability in social status. Further research could investigate whether this higher perception variability could serve as an advantage for low-status individuals in interpersonal interactions.

Examining Issues in Recruiting America’s “All Volunteer Force”
Cam Oakes, Journalism, Sociology
Sponsor: Professor Brooke Kroeger, Journalism

My research, a work of journalism, examines the recruiting tactics of the US military. During the War on Terror, federal education legislation was passed that required schools to give basic information (phone, address, grade) about its students (17+) to military recruiters who sought federal funding. At the same time, the Department of Defense began building a database of student information. The military’s Joint Advertising, Market Research and Studies database, JAMRS, became the subject of legal scrutiny in 2005 and the DoD agreed to tighter restrictions on data collection. But President Obama passed legislation in 2015 that eliminated the clause in the original legislation that made it illegal for the military to compile a database of high school/college students for recruiting purposes. The DoD can now compile a database of students containing whatever information the department seeks. I used a mixed methods approach that combined data (in the form of documents) and interviews to study the DoD’s recruiting strategy and its impacts. Over the course of nine months, I conducted dozens of interviews with service members, former recruiting prospects, and military recruiters. I also obtained hundreds of pages of documents. The evidence gathered suggests three things: the government is collecting information on students like GPA, social security number, and race; the military contracted with marketing companies to give presentations on how to market military jobs to Black and Hispanic/Latino students; and that recruiters across the country have engaged in misconduct while carrying out their duties to convince high schoolers to subscribe to a career in the military.

How Involuntary and Voluntary Attention Alter Visual Representation
Sara Okun, Psychology
Sponsor: Professor Marisa Carrasco, Psychology

Covert spatial attention, which occurs in the absence of eye movements, benefits performance in many visual tasks. However, there is evidence that involuntary and voluntary covert spatial attention improve performance in different ways. It is unclear how the benefit of spatial attention affects the visual representation of low-level features like orientation and spatial frequency. Moreover, it is unknown whether the effects are the same or differ for involuntary and voluntary attention. Here we investigate how voluntary attention affects the representation of these low-level features, and compare this effect to that of involuntary attention using a within-subject design, enabling a direct comparison of attention type on feature representation. We use a detection task with two experiments, each manipulating either voluntary or involuntary attention, and ask participants to report whether they detected a vertical target embedded in noise. We used psychophysical reverse correlation to infer how neurons in visual areas are responding to these low-level features from our behavioral data. We found that involuntary and voluntary attention improved task performance and scaled participant sensitivity to the vertical target orientation without narrowing response selectivity. The representation of spatial frequency differed for each type of attention: involuntary attention shifted peak sensitivity toward higher spatial frequencies whereas voluntary attention shifted peak sensitivity toward lower spatial frequencies. This difference in sensitivity suggests that the representation of spatial frequency is largely dictated by the type of attention being deployed.

Perceived Status Influences the Assimilation of Newcomers into Groups
Mari Otsu, Art History, Psychology
Sponsor: Professor Tessa West, Psychology

The main goal of this project is to examine the ways in which the arrival of a high or low status newcomer in-
fluences a preexisting social group during a decision-making task. To what degree will the preexisting group be motivated to accept or reject the newcomer based on the newcomer’s status? How is decision-making affected by perceived status, and does this perception of the newcomer hinge upon pre-established group rapport (i.e. whether the group was already unsuccessful or successful)?

**Take the 7 Train: The Unrealized Extension that Confinces Immigrant Accessibility**

*Min-Jae Park, Metropolitan Studies*

*Sponsors: Professor Sophie Gonick, Metropolitan Studies; Professor Mosette Broderick, Urban Design & Architecture Studies*

This research examines the effect of the transit infrastructure that is not accessible to the immigrant communities of northeastern Queens, New York. This research defines accessibility as a broader term for the ability of the population to utilize public transit—as it is close to where they live and work—and viable in terms of affordability and convenience. The discussion surrounding the plan for Flushing-Main Street Station indicates that the initial dissonance of the community and the transit agencies has permanently marked the future of transportation planning in the region. The conflict resonates in the current decision-making process for the area, as the commuters struggle to find impactful ways to present their voice in significant transit service changes. These difficulties exceptionally incapacitate the region’s large immigrant populations with limited English proficiencies, as the shared information of those changes does not consider the population’s need for translations. The research defines conflict as the difficulties faced by the commuters who have to adapt to the outdated transit infrastructure, which often had a purpose utterly incompatible with the growing interest toward the mostly immigrant community’s access to other regions through affordable transit. From site visits, interviews, and community board meetings, the process of visualizing community participation includes quantitative as well as qualitative data from interactions with stakeholders concerning the resolution of the transit crisis. The research concludes that the government’s process of encouraging community participation is inept for prevailing immigrant society in the area.

**Do US Counterterrorism Operations Support Peacebuilding? Bridging the Data-Policy Gap on Counterterrorism**

*Mallika Parlikar, Politics*

*Sponsor: Professor Michael Gilligan, Politics*

In regions such as Afghanistan, Syria, and Nigeria, ongoing counterterrorism operations seem to have made those countries no closer to sustainable peace. Seminal research by the Cost of War Institute at Brown University has shown that the US is present in 40 percent more places in the world than publicly listed. Yet, terrorism has not seemed to decline—not, at least, where America has keen interests. Counterterrorism operations, like peacekeeping, seem to have been taken at face value for their positive impact on war-torn regions. And, while this may be true, research evaluating the empirical relationship between counterrorism and peacebuilding is limited. This project employs both quantitative analysis of a dataset encompassing all cease-fires in civil wars impacted by terrorism from 2001 to 2015 and in-depth, qualitative analysis of two carefully selected conflicts. The statistical analysis seeks to answer two questions: 1) Where does the US choose to deploy counterrorist forces? and 2) Do they make peace more durable? Controlling for factors that may affect both durations of peace and counterrorism operations, I find that certain counterrorism forces have difference effects on states than others. Intuitively, combat and drone strikes counter peacemaking measures, while training, assistance, and funding tend to work in a supportive capacity to peacemaking measure in place.

**Gender Differences in the Perceptions of Political Polarization in the US**

*Ka'înâz Patravala, Psychology, Public Policy*

*Sponsors: Professor Eric Knowles, Psychology; Mao Mogami, Psychology*

This project examines the potential gender differences in perceptions of political polarization. Specifically, it investigates whether these perceptions of polarization can be mitigated and whether efforts to mitigate these perceptions differ based on gender. First, participants were shown bell curves representing both Democrat and Republican opinions in either one of three conditions. In the “Moving Closer” condition, the opinion distributions converged while in the “Moving Away” condition these distributions diverged from the currently estimated overlap in partisans’ views. No visual representations were shown in the Control condition. Participants were then asked to estimate the similarity between Democrat and Republican opinions both overall and on political topics. No gender differences were found in the perceptions of political polarization, collapsing across all conditions. Those in the “Moving Closer” condition, however, were more likely to perceive Democrats and Republicans as similar than those in the Control condition. There was also no interaction between gender and condition across both general and political topics.
Exploring Digital Space: Examining Effects of Education and Income on User Control over the Facebook News Feed

Emma Patton, Sociology
Sponsor: Professor Paul DiMaggio, Sociology

In this paper, I aim to better understand how individuals view their own agency in the sociotechnical space of the Facebook News Feed, using data collected in the 35th Wave of the Pew Research Center’s American Trends Panel Survey. Does socioeconomic status impact control over technology in the same way it affects control over other areas of life? The current literature suggests that low socioeconomic status is associated with a low sense of control, while higher socioeconomic status is correlated with a higher level of control. While there is no difference by education on the level of perceived control, college graduates are nearly twice as likely to assert control through trying to influence their Facebook News Feed as those with a high school degree or less. Contrary to what the literature suggests, there is no significant difference by income level on perceived control over the Facebook News Feed and small effects on asserted control, suggesting education is a driving factor in the sociotechnical space of the Facebook News Feed. I also find the effects of age and frequency of Facebook use on both perceived and acted control to be statistically significant. This research is an important contribution to work examining the impact of internet users’ social background on how they interact with online spaces. The popularity of Facebook and the insertion of the Facebook News Feed into the social lives of its users make this study particularly important.

Friends or Foes: Multiethnicity, Out-Group Attitudes and Willingness to Compromise

Sargam Prakash, Economics, International Relations
Sponsor: Professor Shanker Satyanath, Politics

This study examines the effect of priming multiethnicity on out-group attitudes and willingness to compromise. It focuses on Indians’ out-group attitudes of Hindus, Muslims, Christians, and Buddhists, and their willingness to compromise with Pakistan over the Kashmir conflict, one of the bloodiest conflicts in Indian history with over 47,000 deaths reported. Given the current events in India, this study comes at an apt time to gauge public opinion. I created a survey with a treatment of priming multiethnicity to perform my own data collection, and directly administered it to people in India through the use of the Amazon Mechanical Turk crowd sourcing platform. Using this methodology, I found that priming multiethnicity resulted in both more positive and negative out-group attitudes, specifically in relation to Hindus and Muslims. I explore heterogeneity of religion in detail in this paper. Furthermore, priming multiethnicity did not have a significant effect on people’s willingness to compromise. This study raises important questions about the effectiveness of priming multiethnicity in changing people’s attitudes and beliefs, providing a foundation for follow up surveys in the future.

Why So Hard? A Developmental Study of Why-Questions

Daniella Presti, Linguistics
Sponsor: Professor Ailis Cournane, Linguistics

“Why”-questions are ambiguous when they occur with quantifiers, or when they include embedded clauses (Collins, 1991): e.g., 1) Why does everybody hate John? 2) Why did John say Mary left? In examples with quantifiers, like 1), “why” could be asking for one collective reason (e.g., “Everybody hates John because he is disruptive in class.”) or several individual reasons (pair-list; e.g., “Mary hates John because he copied her test. Sally hates John because he insulted her…”). In examples with embedded clauses, like 2), “why” could be asking for a response to the higher “saying” event (e.g., “John said Mary left because Sally asked him where Mary was.”), or to the lower “leaving” event (e.g., “John said Mary left because she was running late to work.”). “Why”-questions are argued to be syntactically different from other questions, allowing for ambiguity that would not be permissible with other questions. The current study investigates whether “how come”-questions, which ask for explanations, similarly to “why”-questions, have the same ambiguities as “why”-questions, or whether they have more restricted meanings (only collective and saying reasons) determined by non-“why”-like syntax, as argued in Collins (1991). A within-subjects truth-value-judgement and grammaticality-judgment experiment conducted online demonstrated that adults (n = 13) actually treat “why”- and “how come”-questions in the same way. These results contradict the judgments in Collins (1991), so the results may provide evidence of language change in progress. This study is a portion of my Honors Thesis, which is about children’s acquisition of “why”-questions. The current study was meant to be an adult pilot of a child experiment and to verify the claims in Collins (1991) before testing children, but the unexpected results proved to be interesting on their own.

The Success of Radical-Right Parties in Western Europe: Chinese Imports and Immigration

Jessica Purcell, Politics
Sponsor: Professor B. Peter Rosendorff, Politics

The recent widespread success of radical right parties in Western Europe has brought even more attention to a topic that academics have been exploring since the 90s. Italo Colantone and Piero Stanig have examined globalization in the context of “The Chinese Import Shock” specifically. Their results determine a strong positive correlation between a Western European region’s level of exposure
to the shock and radical right vote shares in that region. Accompanying the anti-globalization stance of these parties is the prominent topic of immigration, anti-immigrant sentiment and rhetoric. Existing literature analyzing the influence of foreign-born populations on nationalist attitudes and far right support has proven limited and contradictory. On one hand, a theory emerges from the contact hypothesis suggesting that higher numbers of foreign-born residents would lead to greater tolerance and better attitudes from natives in the area. On the other hand, it has been noted that a high presence of foreign-born residents may lead native voters to feel they or their country is threatened by or in competition with these residents, especially in the wake of economic crisis. This paper seeks to further understanding on globalizing in the context of Chinese import shock, immigrant populations, and how these factors impact support for the radical right in Western Europe. Empirically, we will interact foreign-born population shares with import shocks to determine how immigrant populations impact the aforementioned linear relationship studied by Stanig and Colantone.

Inferences about the Elderly: Spontaneous Trait Inferences
Palak Ramani, Psychology
Sponsors: Professor James Uleman, Psychology; Abdullah Althenayyan, Psychology

In this study, we aim to understand how stereotypical impressions about the elderly are formed. In this project, we will utilize the false recognition paradigm (Todorov & Uleman, 2002) which is similar to social media sites, such as LinkedIn, in that faces are paired with descriptive sentences about the face. It refers to faces that are paired with behavioral sentences that are either consistent or inconsistent with stereotypes facing the target’s face. By examining how spontaneous trait inferences are formed about the elderly, we aimed to understand how these inferences are made subconsciously and spontaneously through the manipulation of how aged the faces look. We planned to study the relationship between elderly faces and the activation of negative stereotypes. We hypothesize that faces altered to look more elderly would subconsciously and spontaneously activate negative stereotypes.

East Side Coastal Resiliency Project: How New York City Plans to Adapt to Climate Change
Izzie Ramirez, Global Liberal Studies, Journalism
Sponsor: Professor Brooke Kroeger, Journalism

After Superstorm Sandy ravaged New York City in 2012, leaving 43 dead and destroying $19 billion in property, the city now aims to protect its residents from hurricanes and sea level rise through a series of unprecedented and ambitious “resiliency” projects meant to bolster the coast. The East Side Coastal Resiliency Project, the first of five such projects, will uproot 2.4 miles of coastline, rework electricity, gas and plumbing, and pack fill to elevate the land. By 2024, stretches of E. 25th St. to Montgomery St. along the FDR will be eight feet higher than everything else. This research explores what it means for nearby communities.

The Effects of Narcan/Naloxone in North Carolina
Evan Robinson, Politics
Sponsor: Professor Anna Harvey, Politics

One of the leading political issues in the United States is the drug epidemic; being so prominent this issue has affected almost all aspects of life. The goal of this project is to analyze the programs put forward to save lives and end the drug epidemic. More specifically, this project seeks to look at the effects Narcan/Naloxone has, when law enforcement officers carry it, on overdose mortality rates also when controlling for races and genders on two different models. The questions this project seeks to answer are: Does requiring law enforcement to carry drugs such as Narcan/Naloxone affect or reduce the overdose death rate? When controlling for race or gender do the effects change Narcan/Naloxone program? The aforementioned is addressed by looking at an array of data from North Carolina. The findings from the data will explain how, as the proportion of law enforcement carrying Narcan increases in any given county, the death rate decreases. However, the effects of the proportion of law enforcement officers carrying Narcan differ for each race and gender.

“Go Get the Ball!” How Infants’ Motor Behavior Shapes Their Language Environment
Annissa Saleh, Individualized Major
Sponsors: Professor Karen Adolph, Psychology; Dr. Kelsey West, Psychology

Previous work shows that caregivers tailor their moment-to-moment descriptive language—nouns and adjectives—to infants’ ongoing actions (e.g., caregiver says, “red ball” as infant plays with a ball). Consequently, when infants develop new motor skills, caregivers’ language may also change. I investigated whether mothers use more locomotion-relevant words (e.g., “bring”, “go”, “get”) to walking infants compared to same-aged crawling infants. I tested 32 mother-infant dyads (Ns = 8 13-month-old crawlers, 8 13-month-old walkers, and 16 18-month-old walkers) during two hours of naturalistic activity at home. I predicted that caregivers’ action verbs related to locomotion would be more frequent and diverse to walkers than to crawlers. The findings supported my predictions. The data provide compelling evidence that infants’ developing motor skills shape their language environment. Thus, the verbs that infants hear (as well as the nouns and adjectives) are related in the moment to infants’ motor actions.
Can Your Neighbor Swing Your Vote: Do Reservation Quotas Have Reputation Effects to Improve Female Political Participation?
Siyona Samuel, Economics, Politics
Sponsors: Professor B. Peter Rosendorff, Politics; Rafael Duran, Politics

Beaman et al. (2008) surveyed 495 villages in the district of Birbhum (across 165 Gram Panchayats) in West Bengal to gather data on household voter attitudes. They exploited the randomized distribution of reservation quotas in the village level Gram Panchayats to study whether these quotas can actually be useful in increasing female political participation. They did this over two election cycles to find that there were no significant results to prove that the quotas were effective boosters of female voter participation. Intrigued by this, the following research extends the scope of the aforementioned paper to see whether there were mobilization effects based on spatial contiguity. By looking at the data available through the previous authors’ continued work in the region of Birbhum, this paper seeks to find whether reputational effects might be heavily influenced by proximity to a village that was reserved to have a female head of the panchayat.

Fair Evasion? Varied Transit Enforcement in New York City
Nick Sawhney, International Relations
Sponsor: Professor Shanker Satyanath, Politics

Fare Evasion and its enforcement is an ever-more relevant issue in New York City. In this paper, a data set of fare evasion arrests and weighted census data is created and analyzed using a difference-in-differences regression model in order to understand the impact of the Manhattan District Attorney’s 2018 policy to curtail the prosecution of those arrested for fare evasion in the New York City Subway. It is found that, despite an overall reduction in arrests, Black and Hispanic communities still saw an increase in fare evasion policing. Furthermore, the proportion of Black arrests was found to increase following the policy, especially in areas which contain greater Black and Hispanic populations.

Money Talks: The Effect of McCutcheon v. FEC (2014) on Republican Vote-Share in State Legislative & Gubernatorial Elections
Kira Schumm, Politics, Psychology
Sponsors: Professor Christopher Dawes, Politics; Professor Anna Harvey, Politics

In McCutcheon v. Federal Election Commission (2014), the US Supreme Court ruled that aggregate individual campaign contribution limits, or limits on the amount of money a single donor may contribute in total across all candidates within a single two-year election cycle, were unconstitutional. A number of states removed or stopped enforcing limits on aggregate individual campaign contributions in state-level elections, while some states maintained forms of aggregate individual contribution limits that were not explicitly addressed by the McCutcheon decision, creating a natural experiment. Prior research (Harvey, 2019) has indicated the loosening of campaign contribution restrictions in earlier Supreme Court campaign finance decisions, specifically Buckley v. Valeo (1976) and Citizens United v. FEC (2010), resulted in an increase in Republican vote-share in gubernatorial and state legislative elections. However, no existing research addresses the impact of the McCutcheon decision and the subsequent removal of aggregate individual contribution limits on party vote-share. Accordingly, this project explores the effect of the McCutcheon-induced removal of aggregate individual contribution limits on Republican vote-share in state legislative and gubernatorial elections using two difference-in-differences models with the exogenous shock of the McCutcheon decision. This study finds the McCutcheon-induced removal of aggregate individual contribution limits in treatment states resulted in a significant increase in Republican vote-share in gubernatorial elections but had no significant effect on Republican vote-share in state legislative elections. Generally, this topic has broader normative implications on campaign finance legislation in American elections.

Information Seeking under Romantic Outcome Uncertainty
Kira Schumm, Politics, Psychology
Sponsor: Timothy Valshtein, Psychology

Ambivalence is defined as evaluative inconsistency comprised of mixed evaluative reactions towards a specific target or situation. Research has traditionally conceptualized ambivalence towards a romantic partner as problematic for relationship functioning. However, studies have also suggested ambivalence can serve as a self-protection mechanism in other contexts (Reich & Wheeler, 2016). This project fits into a broader plan of studies investigating ambivalence in romantic relationship pursuit. We have already established a nonlinear association between ambivalence and uncertain expectations, such that individuals whose expectations were most uncertain reported the most ambivalence. However, we do not know if ambivalence is actively sought in situations where the self is threatened. Accordingly, in an online study, we seek to examine the causal relationship between self-threat and ambivalence seeking by inducing self-threat in an imagined romantic situation and measuring ambivalence seeking behavior. To induce threat, we asked participants to generate reasons why someone would decline a date due to self-relevant reasons (threat) or irrelevant reasons (no threat). Subsequently, we measured ambivalence-seeking by asking participants to choose one of the three hypothetical ten
minute conversations with a neutral third party about their romantic interest containing positive, negative, or mixed information. If ambivalence serves as a self-protective mechanism in the context of romantic pursuit, participants in the threat condition should display higher ambivalence seeking behavior than participants in the no threat condition. While the manipulation check showed the treatment was successful, the participants in the treatment and control groups did not differ significantly in their information seeking behavior.

The Effect of Land Urbanization on the Indian Agricultural Sector: An Econometrical Approach
Shraman Sen, Economics and Mathematics
Sponsor: Professor Gerald McIntyre, Economics

This project presents an empirical data driven analysis of the impact of increased land urbanization rates in India on the Indian agricultural sector. Using World Bank open source time series data, the growth rate of India’s relative density of agricultural contribution to GDP was analyzed, followed by a closer look at the growth rates of the marginal product of labor and marginal product of capital in the agricultural sector of India. These findings were compared to a similar analysis performed on global data. Using unit roots structural break tests (Phillips and Perron, 1988), statistical discrepancies in the time series depiction of the growth rates were observed. An attempt has been made to implement a structural Vector Autoregression model in order to analyze the bidirectional causal impact between our system of three endogenous variables: 1) The gap between land urbanization rates and the percentage of ‘urban residents’ who are able to reap the benefits of urbanization, 2) Difference between the total number of Indian food imports and exports, 3) Domestic food production rates (pertinent to the agricultural sector). A comprehensive econometric analysis consisting of the methodologies delineated above will allow one to assess the impact that land urbanization rates have on the Indian agricultural sector and how that affects the Indian economy as a whole.

When Helping Your Own Group Could Be a Disadvantage
Mira Sharma, Biology, Psychology
Sponsors: Professor Madeline Heilman, Psychology; Yana Toneva, Psychology

Women who are successful in masculine fields are expected to help other women. In fact, research shows that women who don’t support their in-group face interpersonal derogation. There is an expectation that in-group bias will be strong when people are members of a minority group that has experienced biased treatment, which is the case for women trying to succeed in male gender-typed fields. Members of minority groups face pressure to support in-group members, particularly if they have overcome negative treatment (Ragins & Scandura, 1999). We propose that in male gender-typed fields women trying to help each other are set up for failure and their support for each other backfires. The goal of this research is to determine whether women’s support for other women carries less weight than the support of men; and whether women who assist other women are systematically penalized for their actions. In Study 1 we examine participants’ evaluations of a female candidate referred for a job in a masculine field by a current male or female employee. We show that despite high expectations for in-group help a woman’s support for other women carries less weight than the support of a man. In Study 2 we aim to show that women who assist other women in male-dominated spaces suffer negative consequences. Our study shows that when a male employee refers a female candidate for a position in a gender-typed company she is evaluated as more likely to succeed than a no-referral applicant by .51 standard deviations (p<.05).

Is Barefoot Really Best? Infants Walking Barefoot, in Bendy Shoes, and in Stiff Shoes
Anna Shin, Psychology
Sponsor: Professor Karen Adolph, Psychology

Parents, pediatricians, and shoe manufacturers have strong ideas about what footwear makes babies walk best. The current consensus is that barefoot is best, but a generation ago, a sturdy, supportive shoe was believed best for infant walking. We tested whether the stiffness of infants’ footwear affects walking—specifically, how well and how much infants walk. Fifty infants (12–20 months of age) walked for 10 minutes in each of three footwear conditions—barefoot, wearing a commercial shoe touted as bendy and flexible, and wearing an unusually stiff shoe (bendy shoe with carbon-fiber insole that prevented the foot from bending at heel strike or toe off). To assess whether footwear affects how well infants walk, we recorded the timing and distance of each footstep on a pressure-sensitive mat. To assess whether footwear affects how much infants walk, we scored videos of their locomotor activity during free play in a laboratory playroom. Results indicate that footwear has little effect on how well infants walk. Infants’ step length, step width, and speed were the same while walking in stiff shoes compared to bendy shoes and barefoot. Similarly, footwear has no discernible effect on how much infants walk. Infants took the same number of steps and spent the same amount of time in motion across footwear conditions. Infant walking is either so variable or so robust that it is impervious to the stiffness of footwear. Currently, we are studying whether shoe size (properly fitted shoes versus one or two sizes too big) affect infant walking.
Episodic Memory and Fairness Norms
Jena Sohn, Psychology
Sponsors: Professor Jay Van Bavel, Psychology; Dr. Philip Pärnamets, Psychology

Fairness is an important social norm, governing behavior in situations where a resource is shared or distributed. Norms of fairness are often examined in the context of the ultimatum game, as this game effectively highlights fair versus unfair allocations. Current theories propose that when responding to divisions of resources, people’s responses are governed in relation to an internalized fairness norm. The traditional view, based on reinforcement learning theory, is that individuals store a representation of an average value. However, recent work has suggested that people draw on episodic memories and use these memories to construct their choice-guiding value. Prior research has also shown that these expectations are relative to local norms. In this study, we examined if fairness norms are constructed according to similar cognitive mechanisms. Through an experimental paradigm in the context of an ultimatum game, we investigated how episodic memory interacts with the computation of fairness norms. Results indicate that giving participants episodic reminders influences their decisions to accept and reject offers, and likely, their computation of fairness norms. Importantly, the direction of this effect depends on whether the participants are playing with a high or low group proposer. Lastly, we find that participants’ expectations were not relative to local norms. These findings support important memory and decision-making literatures and are aligned with broader value-based frameworks for social and economic decision making.

Instrumental Learning of Traits vs. Rewards in Economically Scarce Contexts
Saianna Solomon, Neural Science
Sponsors: Professor David Amodio, Psychology; Jeffrey Berg, Psychology; Hyebin Kim, Psychology

Repeated interactions help us learn about others via a process called instrumental learning, in which we learn through our own actions and the feedback contingent upon those actions. In social contexts, for example, we can approach others and receive feedback in the form of reward—how much did the person we approach share with us? However, we can look beyond how much was shared, and encode that person’s generosity—how much did they share out of what they could share? Past research suggests that we rely on both reward and generosity when learning about others. But, does the way in which we learn shift depending on the context we are in? In particular, does the economic environment—whether resources are scarce or abundant—influence how much we rely on rewards versus generosity in our learning? Based on research that shows that scarcity creates a competitive mindset which guides decision-making towards advancing one’s own wellbeing, we hypothesized that, and tested whether, perceived economic scarcity promotes reward learning over generosity learning in a social context. This project is the first in the field of social psychology to investigate how an environmental factor like economic scarcity affects instrumental trait-learning. Its significance can extend to social contexts as our findings could provide insight into the aspects of social interactions that take precedence in scarce conditions—specifically, how learning might become less social. Accumulating as many resources as possible is important in a scarce context thus priority to reward-learning is useful but it may hurt our ability for social learning of others in terms of their traits like generosity which might be useful across a broader range of contexts.
If Boys Are Good at Nailing, What about Girls? What Generic Statements Communicate to Children about Unmentioned Gender Categories

Angela Sorensen, Psychology
Sponsors: Professor Marjorie Rhodes, Psychology; Kelsey Moty, Psychology

Adults frequently use generic language (e.g., “Girls wear dresses,” or “Boys like blue”) to communicate information about social kinds to children. These kinds of statements communicate explicit messages about what some groups of people are like (that girls wear dresses)—but they may also communicate additional meaning about what other unmentioned groups (boys) are not like. Recent research using novel social groups has found that generics can communicate information about unmentioned social kinds to children, but less is known about the inferences they make about unmentioned real-world social groups (e.g., the possibility that “Girls wear dresses” signifies that boys do not). The proposed study builds on previous work on generic language by examining what kinds of inferences children make about unmentioned gender categories from generic statements about gender kinds. Broadly, this project will contribute to our understanding of ways in which caregivers may inadvertently communicate social stereotypes about gender to children.

The Politics of Export Credit
Saylor Stewart, Politics
Sponsor: Professor Christopher Dawes, Politics

This project explores the broad influence of the Political Business Cycle (PBC) proposed by Nordhaus (1975): politicians, seeing the relationship between voting and good economic performance, use the influence and tools available to them to positively affect the economy. This paper will be one of few that applies this conceptual model to small-scale federal credit subsidies. I explore this question via the outcome of US Export-Import Bank’s (EXIM) “authorizations”, or the value of their financing. EXIM Bank was established in 1945 by the US government to fill gaps in the private export finance sector. EXIM authorizations refer to dollar-denominated insurance policies, finance guarantees, and other financial instruments issued by EXIM bank to US exporters. These policies range from trade credit insurance and working capital guarantees to bid bonds and letters of credit. EXIM bank is classified as an independent agency of the United States and thus claims to respond only to marketplace demand and not political pressures. The issue and controversy of EXIM’s independence, however, has come up prominently both recently and in the past. This paper uses public EXIM data and regression as well as regression discontinuity models to test this hypothesis. This research finds no statistically significant results to support the claim the US senate and/or presidential electoral calendar affected EXIM bank authorizations between 10/01/2006 and 03/31/2019.

Developmental Cascades: Does Locomotor Development Influence Object Play?
Erica Suh, Economics, Psychology
Sponsor: Professor Karen Adolph, Psychology

The theory of “developmental cascades” proposes that developmental changes in one skill can influence learning and development in other skills, sometimes far afield from the original accomplishment. Locomotor development is a strong candidate for instigating developmental cascades. For example, the developmental transition from crawling to walking increases infants’ access to distant destinations and may thus prompt a developmental cascade from locomotor development to object interaction (Adolph & Tamis-LeMonda, 2014). We tested whether infants take advantage of new opportunities for learning provided by developmental changes in locomotion, specifically whether the developmental transition from crawling to walking affects infants’ interaction with distant objects. We observed 12.5-month-old infants (half crawlers, half walkers) during free play in two toy conditions—with toys clustered in a single nearby location and with matched toys dispersed around the room. The dispersed toy condition was designed to privilege walkers, who travel faster and thus have an expanded field of view compared with crawlers. We predict that walking infants will interact more with objects and with a greater diversity of objects in the dispersed-toy condition but that both groups will display similar object interactions in the clustered-toy condition. If so, findings would provide strong, experimental evidence for a developmental cascade from locomotion to object interaction.

H-1B Visa Policy Change and Foreign-Born STEM Workers in the US
Mengyue Sun, Economics, Sociology
Sponsor: Professor Katarina Borovickova, Economics

The US is the world’s center for science and technology and never stops attracting highly-skilled foreigners to seek training and employment in the country. Under the US immigration policy, the H-1B visa program provides a pathway for foreigners to work in the country for a fixed period of time. The visa is reserved for certain types of occupations only, the majority of which are related to Science, Technology, Engineering, and Mathematics (STEM). However, in 2004, the annual allotment of the visa was drastically decreased in order to limit the number of foreign-born workers in the country. While the policy certainly fulfilled its stated purpose, it also unexpectedly discouraged international students from seeking STEM education in the US. In this study, I investigate the unintended impacts of the policy change on foreign-born individuals’
academic choices. Using individual-level data from 2003 to 2010 National Survey of College Graduates, I look at the change in the propensity of Bachelor’s and Master’s degree holders to major in STEM due to the shift in their employment prospects. This study shows that foreign individuals are nearly 30% less likely to hold Master’s degrees in the STEM field due to the discouraging effect of the visa reduction, while Bachelor’s degree holders are not impacted. This study also shows that the decrease is mainly caused by people who pursue STEM degrees largely for employment purposes.

The Economic Efficiency of Hospital Mergers
Ruoying Tao, Economics
Sponsor: Professor Boyan Jovanovic, Economics

The US hospital industry has witnessed considerable consolidation after the passage of the Affordable Care Act (ACA) in 2010, colloquially known as “Obamacare”. Whether a hospital merger will increase public welfare remains debatable. For Federal Antitrust agencies, hospital merger is always a major concern. According to the market power theory, horizontal mergers of hospitals will reduce competition in the market and potentially harm consumers by raising prices or reduced quality of care in the local market. On the other hand, merging hospitals state that according to the efficiency theory, mergers triggers reduction in cost and improve the quality of care. Cost savings generated by economies of scale will offset the incentive to increase prices. The reorganization of facilities and the elimination of redundant services and departments after the merger will potentially increase healthcare outcomes for patients. The net effect of a merger is, therefore, a tradeoff between the welfare gains due to economies of scale and the welfare loss due to the increase in market power. My research aims to study the cost efficiency of hospital mergers after the passage of the Affordable Care Act (ACA). My research will be composed of two models: a model illustrating the relationship between mergers and hospital cost reduction, and a model depicting the effect of mergers on quality of care.

Izabela Tringali, Gender and Sexuality Studies, Politics
Sponsors: Professor Cristina Beltrán, Social & Cultural Analysis; Professor Julie Livingston, Social & Cultural Analysis

Abortion law has been debated in America for nearly half a century since the Supreme Court ruled Roe v. Wade in 1973. The abortion access we are struggling to maintain today is operating under a legal test—the undue burden standard—written in Planned Parenthood v. Casey (1992). This thesis examines the social and legal implications of the Casey decision in tandem to unravel how the anti-abortion movement utilized the legal opportunity the undue burden standard presented them with in 1992. I examine how Planned Parenthood v. Casey’s alteration of abortion rights delineated a shift from attacking abortion rights to attacking abortion access, arguing that Casey should be read as a distinct turning point in abortion law. Planned Parenthood v. Casey represents a monumental shift in the law, which was met with a social and rhetorical shift by the anti-abortion movement to achieve their goal of attacking Roe v. Wade through an administrative and bureaucratic strategy. The goal of overturning Roe v. Wade outright prior to Casey took a backseat to a quiet and incremental attack on abortion access that has seen widespread success with the proliferation of targeted regulation of abortion providers (TRAP laws) across America, which disproportionately impact lower-income women. Understanding the social and legal implications of Planned Parenthood v. Casey is necessary to comprehend our current fight to preserve abortion access in America and the problems we face going forward. This understanding is central to my argument that the undue burden standard was utilized by the anti-abortion movement to design an incremental structure of abortion regulation—one which allows the state to impose their judgment over the choices of women—creating a continual cycle of gendered harm.

Provision of Primary Healthcare by Backpack Health Worker Team (BPHWT) in Burma’s Internally Displaced and Vulnerable Populations
Tiffany Truong, Neural Science
Sponsors: Professor Chris Dickey, Global and Environmental Public Health, College of Global Public Health; Sakshi Ranjan, College of Global Public Health

The BackPack Health Worker Team (BPHWT) is a community-based health organization based in Burma that provides primary health care to displaced ethnic communities in conflict and remote zones, which are controlled by ethnic armed organizations (EAOs) fighting against the Burma Government. Their curative and preventative health care services are offered through a network of around 1,500 health personnel including community health workers, and village-embedded traditional birth attendants and village health workers. The BPHWT organizational, program model and mobile design may prove useful for special operations and medical actions in support of insurgent movements and conversely with a host nation’s counter-insurgency strategies which include the extension of its health services into areas which may be remote and/or inhabited by indigenous people and have insurgency potential. In the former respect, special attention is directed toward the humanitarian struggle that utilizes health care as a weapon against the counter-insurgency strategies of a country’s oppressive military. The BPHWT also enjoys the
respect of the ethnic armed organizations (EAOs) which allowed implementation of common protocols, policies, systems, and structures across its ethnically diverse Back-Pack network for the benefit of serving the ethnically rich populations. To conclude, the BPHWT has occupied and will continue to occupy, an important position in primary healthcare assistance to vulnerable ethnic populations in Burma until sustainable peace finally comes to the country.

Tragedy as a Mechanism for Political Change: Attribution of Party Blame for Gun Violence
Quentin Turner, History, Politics
Sponsor: Professor Christopher Dawes, Politics

Mass shootings remain a tragically frequent occurrence in the United States. Yet, little is known about the substantive impact of mass shootings on the electorate. In democratic systems, elections are intended to serve as a mechanism of accountability for leaders. Voters are expected to reward and punish leaders for their actions. This research study focuses on a series of mass shootings and state elections, combined with contextual effects and perceived threat, to underscore the significance of the issue of episodal gun violence on the public mind. This study found suggestive evidence that Republican candidates lose vote share when a mass shooting occurs in state districts. In contrast, this research study found that there is suggestive evidence that mass shootings carried out by Black shooters may actually lead to increased vote share for Republican candidates. The study hopes to provide insight into whether voters can be mobilized following events such as tragedies which raise the salience of a particular issue on the public mind.

Does Locus of Control Predict Emotional Responses to Economic Inequality?
Ana Varvara Trif, Psychology
Sponsors: Professor Eric Knowles, Psychology; Shahrzad Goudarzi, Psychology

The US is suffering from massive economic inequality, and research reveals that it is only getting worse. This study aimed to investigate what informs people’s reactions to economic inequality and approached this question through the lens of social comparison theory. Specifically, we tested the validity of a theory identifying perception of control as a potentially influential factor in determining our reactions to others and used this to study whether perception of control could predict participants’ reactions to exemplars of economic inequality. To achieve this, we conducted a two-part study in which we measured participants’ locus of control, showed them a video depicting either people living in extreme wealth, people living in extreme poverty, or a control, and then measured their emotional reactions to the videos. We hypothesized that locus of control would predict emotional reactions to economic inequality by moderating underlying social comparison processes.
MCII does not work for low-SES smokers, adaptations to follow-up survey 4 weeks later. If results suggest that (n = X). Participants were invited to complete an online MCII (n = X) or a government promoted control strategy were administered one of two brief self-help interventions: who expressed interest in changing their smoking behavior eligibility; those smoking at least fifteen cigarettes-per-day condition, would reduce smoking for high-SES smokers. In this online study, we explored re-analysis of these data indicates that this might hold only for high-SES smokers (Mutter, Oettingen et al., 2019), but an exploratory hypothesis of this paper predicts that there is a positive relationship between the number of social media posts and electoral vote shares (meaning that a higher number of social media posts would result in a higher vote share for the political party who curates said posts). The data illustrates this positive relationship with an increase in posts (in single increments) correlating to a significant .0364 rise in the party vote share for the Landesstimme (LS) vote during the 2019 Thüringen state election.

Mental Contrasting with Implementation Intentions and Smoking Reduction
Lizzie Voigt, Psychology
Sponsor: Professor Gabriele Oettingen, Psychology

Cigarette smoking has detrimental health consequences, and the effects are seen disproportionately in smokers of low socioeconomic status (SES). Effective interventions are needed to address these disparities and better understand barriers faced by low-SES smokers. Of particular interest is Mental Contrasting with Implementation Intentions (MCII): a self-regulation intervention strategy seen to promote behavior change across a variety of health domains. While limited research has explored the effects of MCII intervention in the smoking domain, a previous randomized controlled trial suggests that MCII enhances cigarette reduction among highly-dependent smokers (Mutter, Oettingen et al., 2019), but an exploratory re-analysis of these data indicates that this might hold only for high-SES smokers. In this online study, we explored whether the moderating effect of SES replicates, in a sample of heavy smokers who are looking to reduce or quit. We hypothesized that MCII, compared to an active control condition, would reduce smoking for high-SES smokers but not necessarily for low-SES smokers. Participants were recruited via Amazon Mechanical Turk and assessed for eligibility; those smoking at least fifteen cigarettes-per-day who expressed interest in changing their smoking behavior were administered one of two brief self-help interventions: MCII (n = X) or a government promoted control strategy (n = X). Participants were invited to complete an online follow-up survey 4 weeks later. If results suggest that MCII does not work for low-SES smokers, adaptations to the intervention may be employed in the future to better serve this population.

The Effect of Terrorist Attacks on Public Opinion: A Case Study on Opinion Polling during the 2017 French Presidential Election
Eric Wan, Politics
Sponsors: Professor B. Peter Rosendorff, Politics; Rafael Duran, Politics

My research will examine the effect of terrorist attacks in France on public opinion of presidential candidates during the 2017 French presidential election. Terrorist activity seems to have a clear and measurable effect on electoral outcomes, which suggests that public opinion is significantly swayed by the occurrence of terrorist attacks. When measuring the effect of terrorist attacks that occur in a given year on an election, isolating the effect of a singular terrorist attack on public opinion becomes difficult. This study will make use of day-to-day public opinion polling data during the 2017 French presidential election to measure reactionary shifts in support for candidates. As such, the study’s goal is to measure the direct impact of terrorist attacks on public opinion using France as a case study. In a linear regression research design, the study will compare polling numbers for candidates from the days directly preceding a terrorist attack with numbers a period of time directly following. Ideally, the research will expose a significant relationship between the occurrence of terrorist attacks and spikes and/or drops in candidates’ support. Such findings would contribute to the broader discussion on the impact of terrorist activity on public opinion, particularly on a domestic scale.

Self-Affirmation and Ambivalence Seeking in Romantic Relationship Pursuit
Ellen Wang, Psychology
Sponsor: Timothy Valshtein, Psychology

Ambivalence, the presence of an evaluative conflict towards a target, can produce a variety of negative relationship outcomes (McClure, Bartz & Lydon, 2013). However, some new research in non-romantic domains (Reich & Wheeler, 2016) suggests that cultivating ambivalence under outcome uncertainty can serve to protect the self from negative outcomes. We sought to investigate this self-protective role in the romantic context. In two earlier studies, we demonstrated that participants are most ambivalent towards their romantic interest under situations of outcome uncertainty. In one online experiment with psychology students, we now aim to show that if provided an alternative mode of self-protection, individuals will no longer generate ambivalence. To manipulate self-affirmation, participants were instructed to rank a list of 12 values according to personal importance and write for four minutes about either their first (affirmation) or seventh (no
affirmation) choice of ranking. Then to manipulate relationship threat, participants were asked to read a scenario about a specified romantic interest either going on a date with someone else (threat) or working on a school project with someone else (no threat). Participants then completed two measures of ambivalence—a forced-choice task wherein participants could learn of information about their romantic interest that was either positive or negative, and another measure where participants selected 8 out of 16 new facts about their romantic interest. Data collection is currently ongoing, but we anticipate that under relationship threat those given the self-affirmation manipulation will be less likely to cultivate ambivalence than those in the no affirmation condition.

Luisa Natalia Vittoria Weinberg, Economics
Sponsor: Professor Timothy Cogley, Economics

The objective of this research is to use Google search data to build the Google Trends Uncertainty (GTU) index, a weekly measure of uncertainty surrounding economic policy in the four largest economies in the European Union: Germany, France, Italy, and Spain. By obtaining the relative popularity of Google searches with economic policy uncertainty connotations given a specific timeframe and geographical area, the frequency with which people search for terms related to economic policy effectively serves as a proxy for actual economic policy uncertainty. In its entirety, the various elements of this research allow to accurately and unbiasedly measure economic policy uncertainty on a higher frequency than existing indices; gauge the extent to which Germany, France, Italy, and Spain influence each other with regards to uncertainty surrounding economic policy; produce a one-step out-of-sample forecast; and estimate the magnitude to which uncertainty impacts the rate of unemployment and industrial production.

Discursive Politics of Climate Planning: Territoriality, Sovereignty, and Statecraft
Benjamin Weinger, Individualized Major
Sponsor: Professor Mohammed Rafi Arefin, Gallatin School of Individualized Study

Drawing on the State of Palestine’s and the State of Israel’s respective National Communication reports to the United Nations Framework Convention on Climate Change (UNFCCC), I comparatively examine the unstable production of national environmental discourses around climate change. This comparative discourse analysis questions how climate planning, with its own set of immense uncertainties, operates within already uncertain political geographies of conflict amidst territorial struggles for statehood and sovereignty. While climate transcends political boundaries and invites cause for collective action, the assertion of territorial claims signals the highly calculated nature of climate planning in Israel/Palestine. Positioning these reports as discursive cultural productions subscribing to and reproducing national myths, or imaginative geographies, I set the narratives in dialectical tension to assess and ultimately defy the oppositional nation-state logics forged within the global institutional framework of the UNFCCC. I read these narratives through the lens of population, territoriality, consciousness, and narrative form. Under an apparatus that privileges the sovereignty of nation-states, these climate reports and the non-sovereign status of the quasi-State of Palestine begin to unsettle and expose the institutional inadequacies and constraints of climate planning. Situated in (geo)political ecological, settler colonial, and Indigenous climate justice literatures, this analysis pays particular attention to the historical and ongoing structures of erasure and occupation that precondition adaptation to climate change and decolonial struggles for justice. Contesting a liberal politics of representation and recognition, I ultimately seek to locate the inherent exclusions, limitations, and conditions under which climate planning has been forged to bring forth a new space for political futures and climate justice.

On Memory and Place: Rootedness in Zionist Tradition
Joseph Weinger, Individualized Major
Sponsor: Professor Michelle Lee, Gallatin School of Individualized Study

Considering the theoretical and symbolic implications of transforming land and discourses of peace in the construction of national identity, this project intends to navigate the linkages between nature and the State of Israel through the Jewish National Fund’s afforestation practices. An ethnographic reflection, this empirically derived but affective analysis consists of meditations on four landscapes in Israel/Palestine in which I conducted visits in August, 2019: Neot Kedumim, the Tzora Forest, the Forest of the Martyrs, and the United States Independence Park. At two sites, I performed the well-known Jewish ritual of tree-planting, framed both as a religious feature that fulfills a biblical commandment to cultivate the land of Zion and an ecological project. These lands serve as rich physical-cum-symbolic sites of historical and collective memory, nostalgia, and willful amnesia. This analysis takes up myriad discourses of Zionist praxis including knowledge of the land, rootedness, naturalization of the Jews, and memorialization through living nature. Through Israeli afforestation, the human/nature bifurcation is mediated through the lens of state-building. Meanwhile, Israeli scholars have identified various historical Arab villages that were acquired or confiscated for Jewish forestation but whose memory has been forgotten through discursive
and physical practices of erasure. I identify these residues of Palestinian life in an effort to locate the JNF’s ritual as a practice of colonial land management. Employing critical sociology, this paper considers the social structures of nation and religion and the discursive practices through which Zionism operates.

**Allocation of Resources across Time under Uncertainty**

*Esther Wi, Psychology*

*Sponsor: Professor Laurence Maloney, Psychology*

Over the course of a day, we repeatedly decide how to allocate limited resources—time, energy, money—to improve our position now and in the future. 32 players (16 in each of two studies) participated in a cumulative allocation game where the strategy maximizing instantaneous expected gain led to long-term disaster with high probability. The goal for the player was to “grow” his winnings as rapidly as possible by gambling a proportion of his current winnings on each turn. The game terminated after a random number of trials or when the player lost all points. The optimal strategy that maximized long-term expected gain was to bet the same proportion of the player’s total wealth every trial. We tested whether there was an effect of initial wealth in Study 2 by increasing the amount of initial wealth. In both studies, participants consistently bet much less than this gain-maximizing strategy would require. In Study 1, thirteen out of sixteen participants achieved a small fraction of the maximum expected, betting less than 10% of their wealth when 30% to 40% optimized gain. After losses, participants did not bet. In Study 2, seven out of sixteen participants bet more than 10% of their wealth but nine participants still achieved a small fraction of the maximum expected. Envisioning the consequences of exponential growth and the degree of uncertainty involved in long-term investment is challenging. The failures found may be connected to tendencies to save too little for retirement and similar goals.

**Redistributive Obligations of the Wealthy: Case of the Buffett-Gates Giving Pledge**

*Tytus Wilam, Sociology*

*Sponsor: Professor Carly Knight, Sociology*

We are living in a time of unprecedented inequality, where a few individuals control most of the world’s wealth. This gives rise to a number of questions on whether personal wealth creates redistributive obligations and what exactly those obligations could be. At the same time, we know relatively little about the world’s wealthiest individuals, with the Buffett-Gates Giving Pledge letters being one of only a few public documents that shed light on what billionaires themselves think their status and obligations are. This study centers on how elites legitimate their wealth, how they think about charitable giving, and how they moralize it. I analyze the moral background—people’s capacity to think, act, and reason morally (Abend, 2014)—of billionaires’ philanthropic giving. I focus on the case of the Buffett-Gates Giving Pledge in which a heterogeneous group of elite individuals achieve agreement on a core philanthropic principle (to commit at least half of their personal wealth to charity), reaching a unanimous first-order conclusion about what they take their redistributive obligations to be, while citing a variety of second-order reasons. I carefully analyze the Pledge, targeting the different explanations billionaires give for why they think committing at least half of their wealth to charity is good. I identify five distinct forms such explanations typically take. I find that while all may be successfully captured in terms of Abend’s moral background framework, they also provide reasons to expand this framework to include supposedly non-moral knowledge claims. A full explanation of individual philanthropic approaches is therefore only possible, I argue, once the interaction of moral background with knowledge claims is taken into account, furthering the discussion on the connection between personal wealth, knowledge, and redistributive obligations by examining the justificatory apparatuses invoked by those to whom such obligations potentially apply.

**Children of the Sea: Early Neolithic Maritime Networks in the Southern Adriatic**

*Dylan Winchell, Anthropology and Classical Civilization*

*Sponsor: Professor Pam Crabtree, Anthropology*

Despite decades of research, the precise nature of the initial spread of agriculture in the Southern Adriatic (modern-day Albania, Montenegro, Croatia, and Italy) is still understudied and poorly understood. Previous studies observing the initial Neolithic settlement throughout the region have failed to observe enough combined evidence to form a conclusive model for the spread of agriculture by sea or have passed over this crucial moment in southern Europe’s prehistory, favoring the subsequent Early Neolithic as a more stable society for archaeological examination. The present project aims to describe a model for this spread into the Southern Adriatic, which was mainly a maritime phenomenon. It draws on archaeological evidence for the Initial Neolithic in the Adriatic alongside evidence from the Stone and Bronze Ages of Greece, Anatolia, and Southwestern Asia, as well as comparative ethnographic evidence. What emerges is a picture of a society or group of societies which had altered its use of the seascape alongside its subsistence practices, leading to new seafaring practices which were previously impossible in the region. Neolithic communities at the start of this period were not discovering seafaring; they were inventing new ways of utilizing established skills to fit their new economy and socio-cultural order.
“Is It Just Us”: First- and Second-Order Perceptions about Income Inequality
Era (Songzhi) Wu, Sociology
Sponsor: Professor Siwei Cheng, Sociology

Persisting income inequality has become a major societal issue in America over the past decades and a crucial step toward reducing the widening income gap is to ensure that members of society acknowledge its existence because the awareness facilitates a collective endeavor to tackle the issue. The current study is based on a survey experiment distributed in 2019, aiming to investigate people’s first- and second-order perceptions about income inequality, namely their views about the statement that income inequality is too large in the US and their estimation of their fellow citizens’ attitude about the said statement. It is discovered that contrary to some existing literature in social sciences, the majority of participants acknowledge the existence of a large income inequality in the US and believe that others hold a similar opinion. Participants’ second-order perception in general correspond to their first-order perception, which confirms the existence of false consensus effect in income inequality. Besides, differential political identification, perceived absolute mobility and self-identified socioeconomic class are associated with the extent to which one agrees about the existence of income inequality.

The Mood Effects of Facilitating Emotional and Instrumental Support Giving over Writing for Individuals with Chronic Illnesses and Disabilities
Zhi Xun, Psychology
Sponsor: Professor William Tsai, Applied Psychology, Steinhardt School of Culture, Education, and Human Development

Supporting others in daily life has been linked to psychological well-being. What is less known is whether support giving, facilitated over writing, is beneficial for mood. The present study investigated the change in state affect following two types of support giving facilitated over writing: emotional and instrumental support giving. 56 participants (Mage = 39.18, SDage = 12.78; 58.9% female) with a self-reported chronic illness and/or disability were recruited from Amazon Mechanical Turk and randomly assigned to one of two 20-minute writing conditions using Qualtrics. Participants in the instrumental support condition were asked to generate a list of strategies that would be helpful for managing their medical condition than those in the emotional support condition. Emotional support condition rated their writing to be more helpful for managing their medical condition than those in the emotional support condition, t(54) = 2.45, p < .05. In contrast, participants in the emotional support condition rated their writing to be marginally more emotionally comforting than those in the instrumental support condition, t(54) = 1.70, p = .1. Across both conditions, participants experienced increased positive affect (t(54) = 3.72, p < .001) and reduced negative affect (t(54) = 3.46, p < .001) after completing the writing intervention. Both emotional support and instrumental support facilitated over writing led to immediate improvements in mood. Future studies are needed to examine long-term benefits of support giving writing.

A Geocoded Approach to Examine Chinese Foreign Aid Effects on Chinese Images in Africa
Tianmu Yang, Economics, International Relations
Sponsor: Professor B. Peter Rosendorff, Politics

This research aims to examine the effects of Chinese Official Development Assistance projects on how the recipients from different African regions and provinces think about China through sentimental survey responses. The research adopts the birthplace of African leaders as the instrumental variable and discovers that additional Chinese ODA project indeed lead to an increase in the percent of people who think positively about China through question surveys. The regression results have shown specifically that one unit of increase in the log of average Chinese ODA project total commitments (measured in US dollars) lead to on average more than one percent increase of respondents who think positively about China.

72 Years of Siege: Diasporic Kashmiris and Their Concept of Identity, Home, and Belonging
Manahil Zafar, Journalism, Psychology
Sponsor: Professor Brooke Kroeger, Journalism

Nestled between India and Pakistan is Kashmir, a Himalayan region occupied by both countries that has been a contentious issue since the division of land and assets of British India in 1947. Kashmir was granted special autonomous status under Article 370 of the Indian Constitution in 1954, allowing it to be a separate state with an independent government. Now, after the revocation of Article 370, Kashmir is suffocating under a partial media blackout, curfews, and Indian military presence in the Jammu and Kashmir region. India and Pakistan are at another impasse and Kashmiris everywhere find themselves grappling with the looming threat of nuclear war. Over the years, immigration from Indian-administered Kashmir and Pakistan-administered Kashmir has created diasporic communities, predominantly in the United States and the United Kingdom. These desi pockets have added another layer to the nuanced sense of Kashmiri identity, or “Kashmiriyat”, and what home means for those who reside overseas. This
project aims to investigate what home means to Kashmiris in the diaspora and whether Kashmiri expatriates think of home based on borders, faith, or culture. Kashmiri communities deserve to have their voices permeate mainstream media and their narratives amplified for sophisticated general audiences in a way that shifts the default focus from the impact of Kashmir tensions on India-Pakistan relations to how Kashmir’s 72 years as a region without self-determination has an impact on both Kashmiri expatriates and those who remain within its borders.

**Use of 3D Methods in Determining the Vertebrate Wedging Angle**

*Iris Zeng, Anthropology*

*Sponsor: Professor Scott Williams, Anthropology*

The concavity at the lumbar part of the spine, or the lumbar lordosis, is a key adaptation in hominins to achieve upright posture and bipedal locomotion. Lumbar lordosis enables our body to position the center of mass of the upper body above hips to maintain balance while walking. For our close relatives, nonhuman primates, the lumbar lordosis angle is much smaller compared to 30–80 degrees exhibited in humans. When and exactly how that transition from a small lordosis angle to a large one occurred is not fully understood. Our understanding of this transitional process in lordotic angle requires estimation of the lordosis of fossil hominins. Previous work utilizing traditional methods (wedging angles calculated from caliper measurements or estimated from photographs) has shown that known fossil hominins produce similar, although generally lower degrees of lordosis compared to modern humans. Here, I aim to develop and test a 3D approach to estimate the wedging angle in a large sample of modern humans, which can be potentially applied to hominin fossils.

**A Colonial Metaphor: Xinjiang Reeducation Centers and Indian Boarding Schools**

*Boheng Zhang, Individualized Major*

*Sponsors: Professor Elizabeth Ellis, History; Professor Jane Anderson, Anthropology*

As two letters were sent to the UNHRC, representing two distinctive international opinions regarding the Xinjiang Reeducation Centers, it became clear that the frameworks of human rights and religious freedom were no longer sufficient nor accurate in understanding the Centers in a relatively objective manner. The common presumptions of the government’s hostility towards religion and hatred against the ethnic minorities are also, based on my previous research on Hui and Muslims in China, contested and biased. Therefore, to provide a different and, hopefully, more holistic picture of the Reeducation Centers, their roles in the larger religious scene in China, and their likely political intentions, this paper aims to provide a comparative analysis between the Centers and the Indian Boarding School system in the US. Preliminary readings of the Reeducation Centers show surprising similarities between the measures taken by the Chinese and US governments. Even though the paper has no intention to frame the Uyghur situation as one of colonization (though it could and has been framed that way by some), the indigenous framework and the historical context of the Boarding School system will provide useful tools for understanding the current situation in Xinjiang. Just as Ojibwe scholar, Brenda Child, theorizes Boarding Schools as a metaphor of the broader colonial experience, this paper also wishes to use the situation in Xinjiang as a metaphor not only for the wider ethno-politics within the territory of China but also for the ambition of the Chinese government to assert more control over the land, culture, socioeconomies, and geopolitics of the region internationally.

**Infrastructural Afro-Modernity under Chinese Transnationalism: Narratives Surrounding the Kenyan Standard Gauge Railway**

*Duo Zheng, Social & Cultural Analysis*

*Sponsor: Professor Angela Wu, Media, Culture & Communication, Steinhardt School of Culture, Education, and Human Development*

The Kenyan Standard Gauge Railway is a transnational infrastructure project financed by the Chinese government. Infrastructure serves as tools for material connection and narrative building. The new railway allowed new opportunities of storytelling. In fact, storytelling becomes a field of contestation between the states and the public in shaping how we define nations. Through comparative narrative studies, my thesis investigates the types of SGR stories told by the Chinese government, the Kenyan State, and the Kenyan public. How do these narrative infrastructures inform us about Afro-modernity and a global China?

**Cognitive Control in Maintaining Biases in Racial and Political Contexts**

*Victoria Qi Wen Zheng, Psychology*

*Sponsor: Professor Jon Freeman, Psychology*

When do individuals engage in cognitive control to maintain biased evaluations of group members? People are often motivated to inhibit negative bias toward racial outgroup members. However, given increasing political polarization, they may be motivated to maintain negative evaluations of political outgroup members and positive evaluations of political ingroup members. We predicted that people engage in cognitive control to make motivationally consistent evaluations of targets identified by either their racial or political identity. When evaluating racial outgroup targets, we predicted participants would inhibit a negative bias towards racial outgroup members. This prediction is consistent with previous literature on the regulation of automatic racial bias. When evaluating
political targets, though, we predicted participants would recruit control to maintain positive evaluations of ingroup members and negative evaluations of outgroup members above and beyond conflicting evaluative cues. Participants (n=79) completed a social evaluation task using Mouse Tracker, during which they “liked” or “disliked” targets described with a positive or negative trait as well as their group identity. Our results suggest that participants recruit control to inhibit negative bias toward racial outgroup members, to the extent they also report weak negative attitudes toward racial outgroups. By contrast, responses from participants who report strong negative attitudes toward political outgroups suggest that control is only engaged when making motivationally inconsistent evaluations.

Can Speech That Mimics Major and Minor Scales Convey Positive and Negative Emotion?

Fabian Zurita, Psychology

Sponsor: Professor Lawrence Ian Reed, Psychology

Past research has shown that music and emotions evoked have been found to exhibit strong associations. However, can speech evoke the same emotions music can? The relationship between music, emotion, and speech has been limited. We assessed the perceived emotional valence associated with a recording of human speech. We predicted that speech, expressed as a sentence or as syllables, mimicking major and minor musical scales, would convey positive and negative emotions respectively. Results showed that happiness had significant ratings for both vocalization (sentence and syllable) and key (major, minor, and monotone) conditions. Also, sadness and excitement ratings were only significant for key conditions, whereas subduedness ratings were only significant for vocalization conditions. Our findings suggest that language, when integrated with musical characteristics, is associated with perceived emotional valence.
Effects of Adenosine A2A Receptor Stimulation on Human Chondroprogenitor Cells
Diana Abraham, Biology
Sponsor: Professor Lukasz Witek, Biomaterials, College of Dentistry

This study investigated the effects of adenosine A2A receptor (A2AR) stimulation on human pediatric cartilage tissue-derived chondroprogenitor cells (CPC). Characterization of CPCs reveals that these cells exhibit mesenchymal stem cell (MSC) properties. MSCs are multipotent stem cells that can be derived from a variety of tissues and can self-renew and differentiate into multiple skeletal lineages such as, osteocytes, adipocytes, and chondrocytes. Previous studies on MSCs have indicated their skeletal regenerative potential and possible use in designing new and effective clinical treatments. One particular area that would greatly benefit from this study is the treatment of cartilage defects which may be caused by congenital, traumatic or degenerative diseases and where current gold standard treatment requires the use of autologous tissues which are limited in size and require invasive surgery. The aim of this study is to compare the effects of direct and indirect A2AR stimulation on CPCs in a two-dimensional monolayer cell culture model in order to understand how the A2AR mechanism is stimulated to promote chondrogenesis. And so, with a further developed understanding of A2AR stimulation on CPCs, this mechanism can then be translated into clinically relevant three-dimensional cell culture models and then later can be incorporated into clinical applications. CPCs were isolated from surplus cartilage tissues from consented pediatric patients and expanded in cell culture for experimentation utilizing biomolecular tools and techniques such as quantitative PCR (qPCR), Western Blot, and Immunocytochemistry (ICC). CPCs were treated with both direct and indirect A2AR agonists, CGS21680 (CGS), and Dipyridamole (DIPY) respectively. The initial results from the ICC indicate that CGS upregulates chondrogenic differentiation in CPCs. Although further replicates are necessary to confirm the findings, these preliminary results are helpful in guiding the next steps of the study.

The Effects of Cohabitation on Social Behavior during Infection
Ayo Adewakun, Neural Science
Sponsors: Professor Robert Froemke, Skirball Institute of Biomolecular Medicine, NYU School of Medicine; Saba Fadaei, Skirball Institute of Biomolecular Medicine, NYU School of Medicine; Dr. Christian Ebbesen, Skirball Institute of Biomolecular Medicine NYU School of Medicine

Parasympathetic responses in the body are regulated by the vagus nerve—10th cranial nerve—in response to external sensation and stimuli. It is thought that cognition and behavior can be affected by vagus nerve activity and that infected subjects exhibit sickness behaviors when the vagus nerve is active while in recovery. Lipopolysaccharide (LPS) can be used as an inflammatory agent and induce sickness behavior, thereby activating vagus nerve afferents within the parasympathetic nervous system. We hypothesized that the presence of a partner would reduce the amount of time an infected subject exhibits illness behavior. We recorded the freely moving behavior of both a target mouse and a non-injected partner mouse from 24 hours before LPS injection through 48 hours after LPS injection. Once finished, we annotated the recording to
determine trends in behavior and track changes in behavior in regards to the progression of time since LPS injection. We repeated the same process using saline as the injection vehicle as a control to determine baseline behavior and how it compares to illness behavior. Our preliminary findings show that in social co-housed recordings, the injected mouse appears to recover faster than when single-housed. The partner mouse engages with the injected mouse regularly, often exhibiting protective behaviors and interacting directly with the target mouse. More data gathering and analysis is in progress, which will further elucidate differences in baseline social behavior and social behavior during illness. Future aims under this project include head-fixed vagus nerve recording and providing a diverse diet of food high in fats, carbohydrates, or protein in order to determine how the vagus nerve responds to feeding behavior.

**Relationship between Forest Fragmentation in Dutchess County and Infected Tick Prevalence Using Landscape Analysis**

**Gowri Anand, Biology**

**Sponsor: Professor Mary Killilea, Biology**

Due to the increased rate of global urbanization, concern over the fragmentation of natural landscape and habitats continues to grow (Gaston, 2010). Studies have shown that a major consequence of forest fragmentation is an increase in suitable habitats for white-footed mice *Peromyscus leucopus* (Donahue, Piesman et al., 1987). As this species is a particularly competent reservoir for the Lyme bacteria, *Borrelia burgdorferi* (*sensu stricto*), public health is at risk if effective models aren’t created to mitigate risk. Given that Dutchess County has one of the highest rates of Lyme disease in the nation, analyzing the abundance of ticks in correlation with land fragmentation is essential (Schwartz, Hinckley et al., 2017). Older studies began to analyze the effect of forest fragmentation on tick abundance in Dutchess County with success, but given the advancement in technology concerning spatial data, more research is being conducted using spatial analysis software (Allan, Keesing et al., 2003). Some studies have used landscape analysis and concluded landscape fragmentation has no effect on the prevalence of infected nymphs (NIP) (Zolnik, Falco et al., 2015), but others have concluded that landscape fragmentation is involved in the increase in NIP (Ferrell and Brinkerhoff, 2018). Because of the uncertainty in conclusions for modelling landscape fragmentation in relation to NIP, more research still needs to be conducted in this area. This project will use tick abundance data from Dutchess County and land cover data from the NLCD database using the landscapemetrics package in RStudio to study the relationship between tick infection prevalence and forest fragmentation.

**Towards the Total Synthesis of Pyxidicycline B**

**Melissa Barrera, Chemistry**

**Sponsor: Professor Dirk Trauner, Chemistry**

Topoisomerases are a class of enzymes critical for DNA transcription and replication. DNA topoisomerases and their effective inhibition have been well studied, posing them as optimal targets for cancer and antibiotic therapy (Jain et al., 2013). The natural product family of pyxidicyclines was found from activating genes within the myxobacterium strain *Pyxidicoccus fallax* and was identified to act as effective topoisomerase inhibitors (Muller et al., 2018). Our current work has been towards the synthesis of one of these analogs, pyxidicycline B. Further optimization of this synthetic route will allow for easy access of the entire natural product family and further analogs thereof. This approach will allow for an efficient structure activity relationship study in order to enhance the selectivity of inhibition of human or bacterial topoisomerases.

**Optimization of Feature Selection**

**James Choi, Computer Science & Mathematics**

**Sponsor: Professor Esteban Tabak, Mathematics**

In machine learning, computers combine different pieces of information (attributes) to make decisions (e.g., wind speed and precipitation to predict temperature). The goal of this project was to examine if one were to limit the number of these attributes, how the best combination of them can be picked in order to produce the most accurate prediction. The algorithm developed and described in the paper involves a few different steps. Firstly, given a dataset, the computer compares and examines the correlation between the attributes and the quantity of interest in the dataset. The result is a model of prediction built based on what is described in the paper as “Alternating Method”. Having a model of prediction, the algorithm then creates dummy variables that are convex combinations of the original attributes. Using a penalty function and the gradient descent method, the algorithm forces each dummy to converge to one of the original attributes. The converged dummies become the limitation of the original attributes as desired. Such limitation may be needed if resources are scarce. Also, by reducing the number of attributes, it allows one to focus on the few of the more important attributes, increasing the explainability of the data.
The Integrated Stress Response Mediates Melanoma Chemoresistance
Noshin Choudhury, Biochemistry
Sponsor: Dr. Prashiela Manga, Dermatology, NYU School of Medicine

Metastatic melanoma is the deadliest skin cancer and BRAF activating oncogenic mutations are present in more than 50% of tumors. Although treatment of melanoma with the BRAF inhibitor vemurafenib (VMF) initially led to significant tumor shrinkage, metastatic melanoma is highly refractory to treatment (Bollag et al., 2012). Over time, melanoma develops chemoresistance to VMF allowing for recurrence. The integrated stress response pathway (ISR) is a survival pathway that has been implicated in melanoma chemoresistance. The ISR is initiated by one of four kinases (PERK, GCN2, HRI and PKR). These kinases phosphorylate EIF2α in response to proteotoxic and oxidative stress, nutrient deprivation, heme deprivation and bacterial infection respectively. Increased EIF2α phosphorylation decreases protein synthesis by inhibiting cap-dependent translation (Tan et al., 2001). This research aims to determine how vemurafenib impacts the ISR and investigate whether this specific pathway contributes to melanoma chemoresistance. We developed two VMF-resistant cell lines by dosing VMF-sensitive, BRAF-mutant SK-MEL-19 and SK-MEL-28 melanoma cells with 3µM and 6µM VMF for six months. We then compared ISR activation in our parental and resistant line. In the SK-MEL-19 chemosensitive lines, phosphorylation of EIF2α only occurred after 24 hours of treatment. However, in VMF-resistant cell lines, there was phosphorylation and dephosphorylation of EIF2α in 1 to 3 hours suggesting differential ISR activation. To determine if VMF sensitivity correlated with EIF2α phosphorylation, we determined VMF-sensitivity in the presence of Guanbenz (GB) an FDA-approved alpha-2 adrenergic receptor agonist that prevents de-phosphorylation. The addition of GB significantly increased VMF toxicity in resistant lines.

RPTPγ Localization in the Mouse Kidney and Brain
Abhi Deverakonda, Biomolecular Science
Sponsors: Dr. Walter F. Boron, Physiology and Biophysics, Case Western Reserve University School of Medicine; Dr. Fraser J. Moss, Physiology and Biophysics, Case Western Reserve University School of Medicine

The integral membrane protein, receptor protein tyrosine phosphatase γ plays an important role in acid-base homeostasis: sensing extracellular [CO2] and [HCO3−] via its extracellular carbonic anhydrase-like domain (CALD) and regulation of HCO3− reabsorption (JHCO3) in renal proximal tubules (PT) from its intracellular phosphatase activity. We present the differential expression-pattern of RPTPγ in the mouse nephron and brain. We counter-stained kidney sections with antibodies against the anion exchanger 1 (AE1), Na-K-Cl cotransporter (NKCC1/2), Erb-B2 receptor tyrosine kinase 2 (ErbB2), and Sodium Potassium ATPase (Na+/K+-ATPase). RPTPγ staining is stronger in tubules in the cortex than in the medulla localizes primarily to the epithelial basal membranes. In the medulla, we observe some apical staining particularly in NKCC counterstained tubules in the medulla. RPTPγ colocalizes in the basal membrane with AE1-positive tubules. However, AE1-positive staining was much greater than anticipated compared to examples in the literature using the same Ab. Further investigation is required. In the brain, we determine that in the cortex, hippocampus and cerebellum, RPTPγ expresses primarily in neurons, as determined by extensive colocalization with the neuronal marker MAP2.

To Eat or Not to Eat: The Role of Layer V Pyramidal Neurons from Medial Prefrontal Cortex in Regulating Anorexic Behaviors in the Activity Based Anorexia Mouse Model
Andrew Du, Neural Science
Sponsor: Professor Chiyu Aoki, Neural Science

Anorexia Nervosa (AN) is an eating disorder with the highest mortality rate but no approved pharmacological treatment. The core of AN lies in the voluntary decisions to not eat but to exercise excessively instead. Different groups of neurons in dorsal raphe (DR) have been found to regulate the feeding behaviors of mice. Interestingly, DR does not receive direct input from primary sensory or motor cortices but substantially from the medial prefrontal cortex (mPFC), suggesting that its regulation of feeding might be driven by motivation instead of the direct sensory stimulation from foods. This project used chemogenetic tools to study the roles of layer V pyramidal neurons in mPFC that project to DR (the mPFC-DR pathway) in the anorexic behaviors of mice. Those behaviors were captured through the Activity Based Anorexia (ABA) model. It was found that DREADDs-mediated (i.e., chemogenetic) activation or inhibition of the mPFC-DR pathway did not significantly alter the food intake or body weight gain during the limited hours of food availability. This suggests that a negative feedback network in mPFC might be recruited to cancel the chemogenetic modulation of the mPFC-DR pathway. Indeed, electron microscopic immunohistochemistry revealed that there was a strong correlation between the GABAergic innervation of DR-projecting neurons and the animals’ food intake only during the period when the mPFC-DR pathway was chemogenetically activated. Besides, GABAergic innervation of non-DR-projecting neurons in layer V also slightly correlated with the running distance of mice. Overall, those results point to the existence of two non-overlapping populations of layer V pyramidal neurons—one regulating food intake and another regulating exercise in the ABA model—but also imply
the dynamic interaction of neural circuits within mPFC via GABA interneurons.

Understanding the Role of Candidate Temporal Transcription Factors in the Development of Drosophila Optic Lobes
Aristides Escobar, Biology
Sponsor: Professor Claude Desplan, Biology

In the Drosophila optic lobes, the medulla processes visual information from 40,000 neurons belonging to over 70 different types. The interplay of three different mechanisms allows for this neuronal diversity to be established during development: spatial patterning, temporal patterning, and a Notch binary cell fate decision. Temporal patterning of the neuronal progenitors relies on the successive expression of five transcription factors—Homothorax, Eyeless, Sloppy-Paired, Dichaete, and Tailless. However, these five transcription factors fail to account for the observed neuronal diversity. Moreover, genetic data indicated the presence of more transcription factors present in the temporal series. We used single cell sequencing of aging neuroblasts to identify all the possible temporally expressed transcription factors and identified 6 candidates: Escargot, Scarecrow, Bar-H1, Homebrain, Odd paired, and Oaz. We verified their temporal expression in the neuroblasts of the developing optic lobe using antibody staining. We then used RNAi to inhibit their expression during neurogenesis and identified new genetic interactions between the temporal factors. In conclusion, we were able to identify all the temporal factors that are responsible for generating the neuronal diversity in the Drosophila optic lobes for the first time in a neuronal tissue, thereby establishing a pipeline that can be exploited in other neuronal systems.

A Phosphoproteomics Approach to Identify Downstream Effectors of PKR-Like Endoplasmic Reticulum Kinase (PERK)
Md Fahim, Biology
Sponsors: Professor Christine Vogel, Biology; Dr. Shuvadeep Maity, Biology

Proteins, once translated by ribosomes, are shuttled into the endoplasmic reticulum (ER), where calcium-dependent chaperones promote the formation of disulfide bonds and general protein folding. A protein’s structure and 3D conformation are essential in maintaining protein function, since interactions between proteins and access to binding sites are spatially-dependent. Because the ER must maintain a highly oxidative environment for optimal activity, it is highly sensitive to disruptions of ER homeostasis, subsequently causing the accumulation of misfolded proteins. The PKR-like endoplasmic reticulum kinase (PERK) is one of the key regulators of protein misfolding stress. It is known to phosphorylate EIF2alpha, a translation initiation factor, in response to stress of the endoplasmic reticulum (ER). ER stress has been implicated in the pathophysiology of several chronic conditions, such as diabetes, neurodegeneration, hypertension, and cancer. While EIF2alpha is a well-studied PERK target, little is known about other direct targets beyond EIF2alpha. However, evidence indicates the existence of proteins that can directly be phosphorylated by PERK. Our lab’s preliminary data also indicates that several mitochondrial proteins could be potential targets of PERK. The goal of this project is to define new phosphorylation targets of PERK and elucidate these downstream pathways. Specifically, we will quantitatively map previously unknown PERK-mediated phosphosites at different points upon ER stress through the use of isobaric tag based quantitative mass spectrometry.

Analysis of the Applications of Machine Learning and NLP in Chatbot
Fahy Gao, Mathematics; Eric He, Computer Science & Mathematics
Sponsor: Professor Guido De Philippis, Mathematics

Nowadays, the methodology of machine learning has been applied to all kinds of fields to improve the efficiency of computer-human interaction, especially in chatbots. With necessary algorithms, chatbots can have enough capability to cover general daily needs, such as weather reports, GPS tracking, and remote control of other electronics. Siri built-in Apple products and the Alexa of Amazon are the exceptional examples leading the new era. However, there are still many drawbacks and potential impacts of chatbots being ignored for most of users. Therefore, it is necessary to make a precise analysis from technical aspects and further discussion of social issues.

Acoustic Imaging and Topological Sound
Hillary Gao, Art History, Physics
Sponsor: Professor David Grier, Physics

My undergraduate research project aims to characterize and control matter using the information, forces, and torques carried by sound waves. These holographically structured sound waves, created using techniques from the Grier lab for projecting optical holograms, have applications for long-ranged micromanipulation and remote sensing. My project will use the work I did last year, which was published as Gao, Hillary W., et al. “Flexible wide-field high-resolution scanning camera for continuous-wave acoustic holography,” Review of Scientific Instruments 89.11 (2018): 114901. Acoustic holograms recorded with this camera can be used to reconstruct the volumetric sound field projected and provide feedback for the proposed experiments. The acoustic camera, made up of a simple scanning microphone that records the signal from a standard audio speaker, collects data with which we were able to visualize dynamic properties of certain objects. In addition to opening a new research field in remote sensing
by acoustic holography, this camera provides the feedback needed to design and project structured sound fields that can trap objects and move them in three dimensions. My pilot program imposes structure on sound waves using balloons filled with helium and sulfur hexafluoride. Appropriate arrangements of balloons act like holograms to create sound fields with specified variations in amplitude and phase that I can verify with my camera.

**Generation of a T Cell Receptor Mutant Library with Higher CD3 Interaction Capacity without Losing Specificity**

**Danielle Grazette, Biochemistry**

Sponsors: Dr. Yogambigai Velmurugu, Perlmutter Cancer Center, NYU School of Medicine; Dr. Aswin Natarajan, Perlmutter Cancer Center, NYU School of Medicine

T cell receptors (TCRs) are heterodimeric protein molecules found on the surface of T lymphocytes, which recognize antigenic fragments displayed on the major histocompatibility complex (MHC) of the acquired immune system cells. When a TCR binds to a MHC-bound antigenic fragment, it triggers the association of the TCR dimer with the cluster of differentiation 3 (CD3) subunits which facilitate the activation of the T cell. The important details regarding the TCR is obscured by the lack of atomic detail structural information of the TCR and the structural details, and orientations of the TCR-CD3 complex have been a topic of scientific discourse such as the one-sided vs two-sided models of CD3 binding. To expand on the structural understanding of the TCR-CD3 complex and its subsequent signalling pathways, this theme aims to construct a TCR mutant library by mutating an amino acid in key regions of the TCR, that interact with the CD3, with every other amino acid. Previous research done at Krogsgaard Laboratory has identified interacting regions of the TCR by NMR and also observed altered T cell effector function upon antigen stimulation when mutations were introduced in these regions. Through using CD3 subunit tetramers as a means of TCR detection and affinity, TCR mutants showing increased binding affinities will be sent for further testing, and it is expected that mutations will result in either a higher or lower binding affinity between the TCR and CD3 subunits resulting in an overall effect on signal transduction. The results of this experiment will determine, therefore, if both affinity and biophysical nature of the bonds forming the TCR-CD3 interaction are vital for quantitative transmission of signaling.

**Towards Detecting Temporal Relations Implicitly Conveyed in Text**

**Yuling Gu, Computer Science, Language & Mind**

Sponsor: Professor Ernest Davis, Computer Science

One important part of text comprehension is understanding the temporal properties of the different events that are described. For example, looking at the level of individual events, a war typically lasts years or decades, while the action of looking at something lasts seconds or minutes. Such implicit semantic understanding is a very natural part of our day-to-day communications but are challenging to Artificial Intelligence (AI) systems, because the duration properties of the events are not explicitly spelled out. At a sentence level, a simple sentence like “John left.” clearly conveys the meaning that the action of leaving took place before the time at which this sentence is uttered, but all this information is implicitly carried in the tense and aspect in the expression. More complexity is introduced when one has to process shifts in semantic types when processing some sentences like “The writer began a book.” where the reader has to infer that he began writing a book. All these are potentially challenging for an AI system in understanding the rich temporal information in expressions. As such, in this work, I have investigated how an AI system could estimate the duration of individual events in text, given contexts such as their subject, object, and part of speech, by experimenting with different classifiers (Max Entropy, Support Vector Machine (SVM), Naive Bayes) and
Pulmonary hypertension is a type of high blood pressure that affects the arteries in our lungs and the right side of our heart, making de-oxygenated blood keeps flow over our body without getting oxygenated through the lungs. The main goal of this research is to design computer models to lower pulmonary resistance adapting three proposed surgical treatments of this disease. The suggested connections are creating a hole in the atrial septum, ventricular septum, or connecting the main pulmonary artery with the aorta to create a right-to-left shunt to allow some blood to bypass the lung. These flows will only be right-to-left in order to lower the pulmonary artery pressure. Two tests are computed in the model. The first test is observing the relationship between the shunt size and the pulmonary artery pressure in each proposed surgery. The second test is looking at the relationship between the shunt size and the oxygen saturation in the systemic artery. Finding the optimal pulmonary artery pressure and oxygen saturation level in the systemic artery is important to determine the shunt size for each surgery. With these two tests, the model can be applied to real patient’s data to see how the treatments will actually affect the prognosis of the patient after the surgical operations.
Transduction of N-Terminal Truncated T1 Tyrosine Receptor Kinase B Isoform Transforms NIH-3T3 cells in Soft Agar Colony Formation Assay
Nikolas Holland, Neural Science
Sponsor: Dr. Francis Lee, Weill Cornell Medical College

In recent studies, TrkB-T1, an isoform of Full-length Tyrosine Receptor Kinase B (TrkB-Full length), has been implicated as a driver of oncogenesis both in vivo and in vitro. TrkB-T1 differs from TrkB-Full length with the expression of a unique intracellular 11 amino acid tail rather than a tyrosine kinase domain. A second isoform also possessing this tail, N-Terminal Truncated TrkB-T1 (TrkB-TT1), has also been discovered. However, no oncogenic role has been established for this newly discovered isoform. We aimed to uncover an oncogenic role for TrkB-TT1 and the unique 11 amino acid tail by transduction of NIH-3T3 cells with the three isoforms of TrkB for in a Soft Agar Colony Formation Assay. NIH-3T3 cells transduced with TrkB-T1 and TrkB-TT1, but not TrkB-Full length, were capable of colony formation, suggesting a transformative function for TrkB-T1 and TrkB-TT1. Because these two isoforms contain the unique 11 amino acid tail, the transformative effect of these proteins can be attributed to this domain. We predict that the 11 amino acid tail’s oncogenic properties can be attributed to over-stimulation of Platelet Derived Growth Factor (PDGF) driven cell survival pathways. These results begin to uncover the mechanisms of a novel oncogenic pathway for PDGF driven cancer which may serve as a future drug target for clinical treatments.

Fitting Smiles with SABR
Derek Huang, Computer Science & Mathematics
Sponsor: Professor Shizhu Liu, Mathematics

The world of options trading changed in 1973 when Black and Scholes published their seminal paper on option pricing. That paper contained the eponymous analytical formula for pricing stock options under a complete market and would later win the authors a Nobel prize. However, despite being a simple, intuitive, and elegant formula for the price of a stock option, the Black-Scholes formula produced prices inconsistent with those observed in the market. In addition, after the 1987 stock market crash, the model was unable to justify the existence of or calibrate to a non-flat volatility surface, where the value of implied volatility varied across option strikes and maturities. Subsequently, to fulfill both the practical and theoretical void the Black-Scholes model left unfulfilled, more sophisticated models were developed, namely local and stochastic volatility models. One of these newer models, the SABR model developed by Hagan et al., has been widely adopted by practitioners, especially those in interest rates/FX, where forwards can be close to zero or negative. In this report, we discuss the SABR model and use it to price short-maturity European options on equity index and natural gas futures.

We elaborate on the purpose and dynamics of the model, motivating its introduction by briefly surveying the subject of volatility modeling after providing a quick introduction to futures and options. We then directly compare the SABR model to the CEV forward model it succeeds, test both on CME implied volatility quotes, and discuss implementation details and experimental results.

Acute Effects of an Exercise Class in High Fit Young Adults on Executive Function
Meena Jain, Neural Science
Sponsors: Professor Wendy Suzuki, Neural Science; Dr. Douglas J. Oberlin, Neural Science

Although there is evidence showing that long term exercise is a way of protecting cardiovascular as well as cognitive health, there is limited evidence showing the benefits of acute exercise on executive function in young healthy high fit individuals exercising in a gym setting. Executive function was assessed through analysis of the percent correct scores using a novel modification of the Stroop test, a task of prefrontal cortex dependent cognition, which produces a cognitive conflict in the decision-making process. Using a controlled experimental design, the first part of the study has been completed where 24 adults (mean age, 33.3 years) completed a sequence of cognitive tasks as well as a mood questionnaire before and after a 30-minute exercise session in a gym setting on two separate days (n=9). Heart rate was monitored throughout the exercise (Mean Max heart rate reserve 0.832, Mean Average heart rate reserve during exercise 0.431). Currently, the study continues with control data collection. Analysis of preliminary data suggest that the percent correct on the Stroop task significantly increased after an acute exercise session compared to before exercise however this has not yet been compared to control data. These findings provide preliminary support for acute exercise in high fit individuals in a real world setting as being associated with improvement in executive functioning.

Evaluating the Utility of an Ultrasensitive qPCR Assay for the Detection of Plasmodium Infections in Patient Blood Samples
Kaitlyn Julian, Global Public Health/Biology
Sponsor: Professor Jane Carlton, Biology

Malaria is a major global health problem and is caused by the Plasmodium parasite. India carries 4% of the global malaria burden and contributes 87% of the total malaria cases in Southeast Asia. As a result, surveillance is crucial in order to implement control measures and assess the extent to which malaria is affecting the population. The goal of this project was to develop and validate a quantitative polymerase chain reaction (q-PCR) method for diagnosing the malaria parasite species Plasmodium falciparum and Plasmodium vivax in order to detect small
numbers of parasites in patient blood samples. First, we adapted the method published in Adams et al., Malar J. 2015, and validated our refined protocol using lab samples of Pf and Pv DNA and RNA as positive controls. Next, we tested the assay on 1,295 human samples collected from field sites in the Indian state of Meghalaya as part of an NIH-funded Center for the Study of Complex Malaria in India (CSCMi). After the PCR was performed, we obtained a Ct value for each sample. The numerical Ct value told us precisely at which cycle fluorescence occurred. If the fluorescence appeared sooner (lower Ct value), it indicated high concentration of Plasmodium DNA in the sample. We found 21 positives, all with high Ct values compared to the controls, indicating a false positive. Our results were uploaded into a RedCap epidemiology database and used in statistical analysis to determine the prevalence and risk factors of malaria in Meghalaya.

**A Catalog of the Most Compact Galaxies**
*Mitchell Karmen, Physics*
*Sponsors: Dr. Sjoert Van Velzen, Physics; Professor Glennys Farrar, Physics*

Compact galaxies can yield unique transient phenomena. Tidal disruption events are found preferentially in galaxies with a relatively high central surface brightness. Additionally, the centers of very compact galaxies could produce a special class of black hole binaries that merge with significant eccentricity. However, these compact galaxies have not been cataloged over the whole sky. To produce such an all-sky census of compact galaxies we combined Gaia DR2 with 2MASS photometry. Gaia provides imaging over the entire sky at an angular resolution of ~0.1 arcsec, an order of magnitude higher than ground-based seeing-limited observations. Therefore, the ratio of the Gaia flux and the 2MASS flux provides a clean separation of stars (i.e., point sources) and galaxies (i.e., extended sources). For each of the ~100 million sources detected by both Gaia and 2MASS we compute two such compactness measures (CMs). One CM is based on the ratio of 2MASS to Gaia G-band photometry and a second CM is based on Gaia photometry alone (using the BP+RP and G-band flux). We found that known stars are tightly clustered around CM≈1. Selecting sources with larger CM we identify 5 million extended sources with an estimated stellar contamination rate of a few percent. The median redshift of our galaxies is z≈0.1. While our catalog is incomplete for very extended sources, because these will not be detected by Gaia, we provide an unprecedented view of compact galaxies. Due to the high resolution of Gaia, we can securely identify compact galaxies that were previously misclassified as point sources based on ground-band imaging surveys such as SDSS or DES.

**Capillary Assembly of Liquid Particles**
*Brandon Kim, Biochemistry*
*Sponsors: Cicely Shillingford, Chemistry; Professor Marcus Week, Chemistry*

Naturally occurring materials are all fabricated from the hierarchical self-assembly of smaller and simpler building blocks. While these building blocks as individual units are uninteresting, diverse chemical and physical properties emerge when they are assembled into structural crystal lattices. To broaden our ability to synthetically fabricate and imitate materials found in nature, researchers have been using a method known as capillary assembly to construct superstructures out of colloidal particles. However, nearly all examples of capillary assembly to date use solid colloids as the basis for building more complex structures. We’ve recently shown that liquid particles, composed of oligomerized 3-(trimethoxysilyl)propyl methacrylate, can also be used to create complex structures of various shapes and sizes via capillary assembly. Because capillary assembly of liquid particles provides fine tunability and controllability, it vastly expands our ability to synthesize faceted polymer particles that have never been seen before, including Janus particles in the form of prisms, ellipsoids, and trapezoids.

**Analysis of Classification Algorithms**
*Derrick Kim, Computer Science*
*Sponsor: Professor Mutiara Sondjaja, Mathematics*

This paper is an analysis of some traditional linear classification algorithms and some non-linear classification algorithms. Starting with K-nearest neighbors and Support Vector Machines, it deals with the problems and insufficiencies of simple basic classification algorithms and tries to introduce Karush-Kuhn Tucker conditions to handle the constraints in a more elegant matrix form of Ax =b, given a non-linearly separable data set. Instead of traditional gradient descent to find the optimal vector, this paper looks into the application of Newton’s method or the repetition of Newton’s method to generate the optimal point given matrix Ax =b form. This is possible with the application of dot products and slack variables. Due to the introduction of slack variables, there are 17 equations at hand, and the output vector is generated using a Jacobian matrix. This equation is projected to be tested on multiple data sets and will display its accuracy, precision, and recall compared with other popular algorithms.

**Quantitative Analysis of Photoreceptor-Bipolar Cell Synaptogenesis in Human Retinal Organoids**
*Justin Kim, Neural Science*
*Sponsors: Dr. Aaron Nagiel, Ophthalmology, Children’s Hospital Los Angeles; Dr. Sunitha Bharathan, Ophthalmology, Children’s Hospital Los Angeles*

The development and maintenance of specific neuronal connections between retinal neurons is required
fluorescence-activated cell sorting (FACS), a cell line that es cell death. Through a retroviral expression system and which is a type of potential tumor suppressor that manag-
the murine Polyomavirus small t antigen (PyST) protein, indication of protein stability. The substrate under study is actions with its substrate using fluorescence intensity as an

Lisa Kim, Biochemistry

Molecular Pharmacology, NYU School of Medicine; Professor Marc Walters, Chemistry

Ubiquitin proteasome system (UPS), as an intri-
cately regulated process of intracellular protein degrada-
tion, mediates cellular pathways that are fundamental to
the mammalian cell homeostasis. When the regulatory
mechanisms become aberrant, the affected protein activity
or availability may consequently induce serious human
diseases, particularly various types of cancer. Because
E3 ligase and kinase provide specificity to the concerted
actions of the UPS enzymes, determining their substrates
is a novel method of developing cancer treatment. This
study focuses on developing a real-time, live cell imaging
system that can assess target protein’s dynamics and inter-
actions with its substrate using fluorescence intensity as an
indication of protein stability. The substrate under study is
the murine Polyomavirus small t antigen (PyST) protein,
which is a type of potential tumor suppressor that manag-
es cell death. Through a retroviral expression system and
fluorescence-activated cell sorting (FACS), a cell line that

stably expresses GFP-tagged PyST protein was generat-
ed. The preliminary data achieved from measuring GFP
expression of the infected cells over time after treatment
with MG-132, a known proteasome inhibitor, suggested
that PyST protein stability is regulated by UPS. Applying
siRNA library screening to the live cell imaging system
can reveal specific enzymes responsible for PyST protein
survival and therefore provide a novel target for cancer
therapy.

Observing Mismatch Negativity in Adults with ASD
Sue Kim, Psychology
Sponsors: Professor Jennifer Foss-Feig, Psychiatry, The Mount Sinai Hospital; Professor Laurence Maloney, Psychology

The predictive coding framework suggests that the
brain uses prior expectations about the world as a lens
through which to make predictions and, therefore, detect
discrepancies in incoming sensory stimuli. According to
previous research, predictive processes may be disrupted
in individuals with autism spectrum disorder (ASD). Spec-
ifically, those with ASD are thought to have inflexible
and consistently high weighting of prediction errors, making
small deviations in bottom-up sensory input especially sa-
lient (Van de Cruys, 2014). To observe whether individuals
with ASD display similar neural responses to statistically
likely and unlikely stimuli, this study used electroencepha-
lography (EEG) to observe Mismatch Negativity (MMN),
an event-related potential evoked when an auditory event
deviates from an acoustic pattern. High-functioning adults
with ASD and neurotypical controls (NC) passively lis-
tened to a series of pseudorandom tones, with the first tone
of a given frequency representing the novel “deviant” and
each consecutive tone of that same frequency denoting
the repeated “standard”. MMN amplitude was measured
by subtracting the average waveform for each standard
type—defined by sequential position in a trial—from
the average deviant response. If the difference between
the standard and deviant neural signals were decreased
in ASD, the resulting MMN signal would be attenuated
across standard types. Preliminary results show that the NT
group displayed a significant increase in MMN in the last
versus first standard, reflecting increased “surprise” with
unexpectedly long standard sequences. However, the ASD
group did not. These findings suggest reduced flexibility in
weighting of prediction errors in ASD.

Molecular Abnormalities in Human Pluripotent Stem
Cell-Derived Neurons
Michael Kitiashvili, Neural Science
Sponsor: Magdalena Kalinowska, Neural Science

Fragile X syndrome (FXS) is the leading inherited
cause of autism and intellectual disability. FXS is caused by
trimethylene repeat expansion in the 5’ untranslated region
of the X-linked FMR1 gene. This leads to gene silencing and the absence of its product, fragile X mental retardation protein (FMRP) which is an mRNA-binding protein involved in mRNA translation, localization, and transport. In FXS mouse model, key proteins of mTOR pathway show increased levels of translation and phosphorylation (Richter et al., 2015). Dysregulated mTOR signaling leads to abnormal molecular, synaptic, and behavioral phenotypes. Our lab has previously shown that genetic removal of one of the proteins involved in mTOR pathway (S6K1) can rescue synaptic, morphological, biochemical, and behavioral phenotypes in FXS mouse model. However, mouse models may not fully recapitulate human neural development. Here, we investigate neurons derived from human induced pluripotent stem cells (which were in turn derived from fibroblasts) of FXS patients and control subjects to study mTOR signaling and underlying cellular deficits in human neurons. Our results indicate that multiple S6K1 effectors show increased phosphorylation. To treat or cure FXS, it is imperative to understand the underlying cellular mechanism that has gone awry.

Enhancing Visual Discriminability through Occipital Alpha Rhythm Stimulation by Rhythmic Visual Flicker and a Single-Flash

Zanetta Kovbasuyk, Neural Science
Sponsor: Dr. Yong-Jun Lin, Psychology

Neural oscillations are ubiquitous throughout the brain and contribute to many cognitive processes such as attention and perception. One such brain rhythm is characterized by fluctuations in the electroencephalographic (EEG) frequency spectrum of the visual cortex between 8–12 Hz. This oscillatory neural activity is known as the alpha rhythm and has a significant influence on human visual perception. Characterizing the role of oscillatory activity on visual sensitivity requires that oscillations be directly manipulated apart from cognitive directions. It has been demonstrated that direct manipulation of the visual alpha rhythm is possible through visual stimulation (Spaak et al., 2014) which modulates the phase of alpha oscillations (Mathewson et al., 2012) thereby altering perception (Spaak et al., 2014). However, it remains largely unknown whether human visual perception, and more specifically, visual sensitivity can be enhanced by manipulating internal rhythms. The hypothesis is that visual stimulation can modulate visual sensitivity periodically. Human subjects participated in an orientation discrimination task with simultaneous rhythmic stimulation in the alpha range or single-flash stimulation. The goal is to discern whether visual sensitivity oscillates in a phasic manner and, if so, if this pattern can be observed following rhythmic flicker or single-flash visual stimulation. The results here show that periodicity in visual sensitivity exists within the alpha- and beta-band frequency range (8–28.5 Hz). We also achieve, for the first time, phase-reset in the visual modality using single-flash stimulation which drives behavioral periodicity as demonstrated by the changes in visual sensitivity. These results suggest that fluctuations in visual sensitivity can be controlled not only to elucidate the role of brain rhythms underlying human visual perception but also to provide a means of improving it.

Investigating Coupled Replication Fork Stalling at Common Fragile Sites in Saccharomyces cerevisiae

Daphne Kramer, Biology
Sponsor: Professor Duncan Smith, Biology

Each time a eukaryotic cell divides, it must replicate its entire genome efficiently and with as few mistakes
as possible or else genomic rearrangements and genome instability may result, which are the underlying causes of many diseases including cancer. One major precursor to genome instability is a stalled or arrested replication fork, which may result if the replisome encounters an obstacle while it replicates its genome such as another protein bound to the DNA or a repetitive sequence including those often located within common fragile sites (CFS). While the consequences of a replication fork stall have already been well characterized, little research has focused on the effects of a stall at the reciprocal site, where the sister replication fork would be located. Past studies have suggested that sister replisomes remain coupled together during DNA replication as opposed to the conventional view that the two forks are independent and move away from each other bidirectionally. Therefore, we hypothesized that if sister replisomes are coupled, we should see coupled replication fork stalling at the reciprocal site of an obstacle, despite the lack of any impediment there. Using the deep-sequencing of Okazaki fragments in *Saccharomyces cerevisiae*, we show that insertion of a ~300 base pair subregion, referred to as Flex1, of the human CFS FRA16D, containing 14 AT repeats, is not a significant enough obstacle to stall the replication fork at either the obstacle or the reciprocal site. Further completion of our study will hopefully shed new light into the spatial and temporal organization of DNA replication in eukaryotes and provide new insight into the consequences of fragile sites in our genome and the acquisition of genome instability, a hallmark of cancer.

**Efficiency of GeneXpert in Testing Rifampicin Resistance in North Korean Tuberculosis Patients**

Hojeong Kwon, Global Public Health/Anthropology  
*Sponsor: Dr. Sungyeon Ryoo, Clinical Research Center, Masan National Tuberculosis Hospital*

This study aimed to investigate GeneXpert in diagnosing rifampicin resistance among South and North Koreans. X-pert tested both sputum and cultured bacilli specimens of South and North Koreans for rifampicin resistance and compared the result to that of drug susceptibility tests as gold-standards. The results from X-pert and drug susceptibility tests were analyzed to determine its diagnostic efficiency through statistical measures. Data analysis showed that X-pert showed remarkably high consistency, sensitivity, and specificity of MDR-TB/RIF diagnosis for South Koreans. X-pert, however, showed limitations in MDR-TB/RIF diagnosis for North Koreans. While investigating the reasons behind inconsistent results of *M. tuberculosis* bacilli samples from North Koreans, we found that there was a unique mutation in gene outside the X-pert target region. This unique mutation has not been found nor explored in previous researches. The unique mutation might be specific to North Korean populations and could have had an influence on developing rifampicin resistance. Further research is required to confirm the relationship between this novel mutation and rifampicin resistance. If the relationship is confirmed, this mutation could be targeted to efficiently identify rifampicin resistance among North Koreans in the future.

**Magnetoresistance in Ferromagnetic Thin Films**

Ya An (Audre) Lai, Mechanical Engineering  
*Sponsor: Professor Andrew Kent, Physics*

In magnetic thin films, the electrical resistance depends on the material’s magnetization with respect to the orientation of a passing current. This anisotropic magnetoresistance (AMR) effect stems from the changing net direction of electron spins in the material under the influence of an external magnetic field. We have studied the AMR of permalloy (a nickel-iron alloy with high magnetic permeability) as a function of ferromagnetic (FM) layer thickness and magnetic field. AMR manifests itself in the presence of a voltage difference perpendicular to the current direction, known as the planar Hall effect. This is in contrast to the usual Hall effect in which a field perpendicular to a film plane leads to a transverse voltage signal. In this study, we applied the van der Pauw (vdP) method to measure the AMR in a series of Py film grown on an oxidized silicon wafer in various external magnetic fields. The extended vdp method utilizes the symmetry of the sample (typically close to a square) and Ohm’s Law to determine the Hall resistivity. By making 4-point electrical contacts at the corners of the films, current is passed diagonally and the voltage difference is measured in the transverse direction. The result demonstrates that when the applied magnetic field is strong enough, the voltage difference can be described as a sinusoidal function of the angle and the field; otherwise, it deviates from the sinusoidal wave. At low fields, even though the voltage strays from the sinusoidal wave, it still peaks with similar amplitudes and at the same angle about 90 and 270 degrees.

**Melanoma-Secreted Amyloid-Beta Promotes Brain Metastasis and Suppresses Neuroinflammation**

Grace Levinson, Biology  
*Sponsors: Professor Eva Hernandez, Pathology, NYU School of Medicine; Dr. Kevin Kleffman, Pathology, NYU School of Medicine*

Stage IV melanoma patients with brain metastasis have the most severe morbidity and mortality and lowest overall survival rates of all melanoma patients. Due to the toxicity and aggressiveness of brain metastases, these patients are often excluded from clinical trials. Meanwhile, the mechanisms behind melanoma brain metastasis are poorly understood. Preliminary data showed 1) that amyloid-β precursor protein (APP) is required for late-term survival and proliferation of melanoma cells in the brain parenchyma in one melanoma cell line, 2) that amyloid-be-
I intend to aid professors in this field by sharing my concepts and improve student retention. Moving forward, eleven food-biochemistry demonstrations to support con-
demonstrations and implement them into the Biochemistry My goal this year was to develop a series of short lecture ways to do this in a cost-effective and time efficient way. biochemistry and food science, there is no formal list of and demonstrations to make the connections between solving. While some professors have developed lectures so that they can translate their understanding to problem solving. The nucleolus is the largest structure in the cell nucleus and is responsible for stress response. The nucleolus in human cells behaves as a liquid droplet and can serve as a mechanical probe of the surrounding chromatin, the functional form of DNA (Caragine, Christina et al., 2018; Caragine, Christina et al., 2019). With that discovery, we used the nucleolus to probe chromatin exposed to local DNA damage in the form of DNA double-stranded breaks (DSBs). Interestingly, many DNA repair proteins were found to be involved in the nucleolus physiology, while many nucleolar proteins were found to play a role in DSB repair. To investigate their relationship further, we analyzed the chromatin dynamics near the nucleolus under DNA damage. Specifically, we studied the interactions between chromatin and nucleoli by comparing the movement of DSBs at the nucleolar bound-
dary, the nuclear boundary, and inside the bulk chromatin. A recent study found that DSB mobility near the nuclear boundary is almost twice as much as the DSB mobility in the bulk chromatin (Eaton and Zidovska, 2019). Our analysis revealed that DSBs near the nucleolus boundary move slower than the DSBs in bulk chromatin, yet faster than DSBs near the nuclear boundary. We also observed that in undamaged chromatin, chromatin mobility near the nuclear and nucleolus boundaries are the same—unlike what was observed in damaged chromatin. This suggests that the nucleolus plays an important role in DNA damage repair and aids our understanding of chromatin dynamics within the cell.

Broadening the Perspective, Application, and Understanding of Biochemistry Curriculum through Food Science Demonstrations
Evan Lindley, Chemistry
Sponsor: Professor Kent Kirshenbaum, Chemistry

The scope of Biochemistry curriculum at the University level is often very limited. Students may not gain exposure to the broader applications of biochemistry that could further their understanding and spark interests in related subject matter. Professors are left with the challenge to contextualize coursework in a way that improves students’ comprehension while fitting in the time constraints of the course. One area that professors often relate to biochemistry is food science due to its familiarity and relevance. Making connections between curriculum and food science reinforces concept matter with familiar objects. Also, it is important for students to contextualize their coursework with pressing issues like food waste, feeding the growing population, and consumer miseducation in corporate food so that they can translate their understanding to problem solving. While some professors have developed lectures and demonstrations to make the connections between biochemistry and food science, there is no formal list of ways to do this in a cost-effective and time efficient way. My goal this year was to develop a series of short lecture demonstrations and implement them into the Biochemistry 1 curriculum at NYU. I drafted, practiced, and performed eleven food-biochemistry demonstrations to support concepts and improve student retention. Moving forward, I intend to aid professors in this field by sharing my ob-
servations on student engagement, and revisions to the demonstrations through chemistry education publications such as the Journal for Chemistry Education.

The Effect of DNA Damage on the Physical Properties of Nucleolar Droplets in the Human Cell Nucleus
Christina Liu, Computer Science, Physics
Sponsor: Professor Alexandra Zidovska, Physics

The nucleolus is the largest structure in the cell nucleus and is responsible for stress response. It was recently shown that the nucleolus in human cells behaves as a liquid droplet and can serve as a mechanical probe of the surrounding chromatin, the functional form of DNA (Caragine, Christina et al., 2018; Caragine, Christina et al., 2019). With that discovery, we used the nucleolus to probe chromatin exposed to local DNA damage in the form of DNA double-stranded breaks (DSBs). Interestingly, many DNA repair proteins were found to be involved in the nucleolus physiology, while many nucleolar proteins were found to play a role in DSB repair. To investigate their relationship further, we analyzed the chromatin dynamics near the nucleolus under DNA damage. Specifically, we studied the interactions between chromatin and nucleoli by comparing the movement of DSBs at the nucleolar boundary, the nuclear boundary, and inside the bulk chromatin. A recent study found that DSB mobility near the nuclear boundary is almost twice as much as the DSB mobility in the bulk chromatin (Eaton and Zidovska, 2019). Our analysis revealed that DSBs near the nucleolus boundary move slower than the DSBs in bulk chromatin, yet faster than DSBs near the nuclear boundary. We also observed that in undamaged chromatin, chromatin mobility near the nuclear and nucleolus boundaries are the same—unlike what was observed in damaged chromatin. This suggests that the nucleolus plays an important role in DNA damage repair and aids our understanding of chromatin dynamics within the cell.

Variance Reduction Techniques for Policy Gradient Estimators and Mixture Policy in Reinforcement Learning
Jingyu Liu, Computer Science
Sponsor: Professor Rajesh Ranganath, Data Science

Despite the popularity of the policy gradient (PG) method in reinforcement learning, PG still suffers from sample inefficiency and high variance, leading to poor performance in some practical tasks where deployment of the policy and the interaction with the environment is dangerous and expensive. This project aims to reduce the variance of the gradient estimator such that the policy can converge with fewer samples and achieve a higher level of training stability in the existence of noisy signals. Actor-Critic is
a solution that applies a parameterized function of states (critic network) as a zero-expectation control variate to the estimator. But unfortunately, the role of the critic network is still not fully understood. Besides the policy gradient, deep Q learning (DQN) also gained its reputation in many challenging benchmarks. However, both DQN and PG have their limitations, and therefore, this research project tries to obtain a mixture policy which takes advantage of the policies trained with PG and derived from DQN, and then use the new policy to collect trajectory data for updating the policy networks and Q networks in parallel. Instead of approaching the problem from the perspective of reducing the variance, this method considers PG and DQN as implicit trust-region constraints for each other, which can stabilize the early training process when the exploration is not enough. Besides the comparison with benchmarks, ablation experiments are conducted to show that the combination can yield better results in OpenAI Gym environments.

**Cholinergic Modulation of Motor Behavior in Mice**

*Katherine Lynch, Neural Science*

*Sponsor: Anne Krook, Neuroscience Institute, NYU School of Medicine*

Proper control of locomotion is a vital, complex behavior required each day. The striatum, within the basal ganglia, is a subcortical brain area which controls voluntary movement mainly through GABA-ergic spiny projection neurons (SPN’s). Cholinergic interneurons (CIN’s) are dispersed uniformly within the striatum of the mouse brain and have been observed to alter the firing rate of SPN’s through muscarinic receptor activation. CIN firing has been observed at the onset and termination of movement bouts, but the exact parameters by which they refine movement remain uncharacterized. This research, using a novel combination of optogenetics and DeepLabCut kinematic body tracking, seeks to examine such parameters. Our goal is to dissect the role of acetylcholine (ACh) in modulating motor behavior and striatal activity; we hypothesized that fluctuations in ACh alter striatal activity through muscarinic ACh receptors on SPN’s, promoting the continuation of movement. Our results have shown that optogenetically stimulating CIN firing during movement did not significantly affect any parameters of locomotion. In addition, a genetically encoded striatal loss of key ACh-producing enzymes did not significantly affect stride; however, dopamine fluctuations were observed concurrently with hind limb displacement. Our results led us to conclude that CIN’s require a more targeted form of stimulation and inhibition and that their role may not be essential for maintaining fluidity of motion.

**Design and Self-Assembly of a 3-Turn Tensegrity Triangle with 7 Interjunction Nucleotides**

*Yinglun Ma, Chemistry*

*Sponsors: Professor Nadrian Seeman, Chemistry; Professor Yoel Ohayon, Chemistry*

A current issue in the field of protein crystallography is whether a general procedure could be utilized to produce crystals out of proteins that are difficult to crystallize properly for X-ray diffraction analysis. DNA as a polymer with highly specific and programmable interactions with its complements allows for a macromolecular crystal to be produced in order to assist with protein crystallography. We can manipulate DNA to self-assemble into a cage-like structure that can aid in the protein crystallization process by forcing the binding of the proteins into the organized periodic lattices of the DNA cage. A tensegrity triangle nanostructure was made utilizing DNA duplexes containing about 31 base pairs, with 7 of the bases contained between each junction of the triangle. This structure has not been properly formed before and is critical in altering the dimensions of the DNA cage to properly fit proteins within each unit cell. Previously, only the two-turn tensegrity triangle has been produced with the same number of bases contained between the junction, which is why an expanded version of this triangle would allow for an increased cage size to bind proteins within. The crystal’s properties have been confirmed via crystallographic data using x-ray diffraction and molecular replacement.

**Determination of Overlap of Three Distinct Dopamine Receptor Subtypes (D1, D2, and D5) within Individual Neurons of the Prefrontal Cortex (PFC) and Striatum to Explore Dopamine Modulation in These Neural Circuits in *Mus musculus***

*Sumaita Mahmood, Global Public Health/Chemistry*

*Sponsors: Professor Adam Carter, Neural Science; Dr. Corey Baimel, Neural Science*

The main purpose of this project is to explore dopamine-receptor expression within cortical and striatal neurons of the mouse brain. Specifically, I will determine the overlap of three distinct dopamine receptor subtypes (D1, D2, and D5) within individual neurons of the prefrontal cortex (PFC) and striatum. The PFC and striatum have been chosen due to their dense dopaminergic innervation and known dopaminergic deficits in these brain regions in neuropsychiatric disorders. Previous studies indicate that D1-receptors influence both excitatory and disinhibitory micro-circuits in the PFC. Similarly, the striatum D1 receptors are highly expressed in a subset of medium spiny neurons (MSNs). This project will test overlap of other subtypes of dopamine receptors with D1-receptors, providing mechanistic insight into dopamine modulation of these brain regions. By focusing on the overlap between receptor types and the mechanism of dopamine modulation, the
Predicting Specific Language Impairment in Children Using Machine Learning

Josh Mendelsohn, Computer Science & Mathematics
Sponsor: Professor Adam Meyers, Computer Science

Specific Language Impairment (SLI) occurs when slow language development impairs a child’s daily life functioning and cannot be accounted for due to factors such as autism or hearing loss. Currently, SLI is diagnosed using a standardized language test. We aim to detect SLI automatically by analyzing previously collected speech transcripts (Gillam et al., 2004). These transcripts consist of children, ages 5–12, retelling a story that was told to them. Additionally, to determine the stage of language development, we aim to create a general prediction of age based on a speech transcript. To complete these tasks, we used machine learning algorithms to test the performance of various features, including those commonly used in younger child language development such as Mean Length of Utterance (MLU) and classical Natural Language Processing features such as Parts of Speech n-grams. In the impairment prediction task, we surpassed our baseline of picking the majority class by 19% in accuracy (85%) and 20% in F-measure (68%). In the age prediction task, we surpassed the baseline of picking the mean age by a Mean Absolute Error of 4 months (15 months error). This suggests that even at older ages, features such as MLU are still well-correlated with age. Thus, this expands theoretical knowledge regarding the usage of features to detect impairment at different ages. Further, this technology will provide an accessible and rapid way to first-screen for language impairment. Future experiments will test more features such as average grammar tree depth to determine their predictive value of SLI.

Investigating Reactive Oxygen Species as a Prenatal Therapeutic Target for Barth Syndrome

Paighton Miller, Global Public Health/Chemistry
Sponsors: Professor Colin Phoon, Pediatrics, NYU School of Medicine; Professor Mindong Ren, Cell Biology, NYU School of Medicine

Barth syndrome is a rare X-linked mitochondrial disorder caused by mutations in tafazzin. The tafazzin knockout (TAZKO) mouse is currently the best model for Barth syndrome. Preliminary data indicates significant lethality in the pre-/perinatal phase and a postnatal cardiomyopathy, mirroring clinical Barth syndrome. Excess reactive oxygen species (ROS) may contribute to this lethality as well as to the cardiomyopathy. Prenatal antioxidant therapy which targets excess ROS may be a viable treatment route. Two compounds with antioxidant properties were administered in drinking water to pregnant mice: 1) N-acetylcysteine (NAC), a nonspecific free radical scavenger, and 2) MitoQ, a conjugated molecule that selectively enters the mitochondria to reduce mtROS. Survival
of TAZKO mice was determined at weaning. The expected Mendelian ratio of TAZKO to wildtype males is 50%. In the untreated cohort, out of 74 males at weaning only 11 were KO’s (14.9%), suggesting significant survival loss (p = 0.000008*). Only 1 KO male out of 18 (5.6%) survived to weaning with NAC treatment, suggesting no significant difference (p = 0.45) from untreated litters and no recovery of prenatal loss. While not significant (p = 0.19), there is a higher percentage of MitoQ KO males surviving to weaning (6/20; 30%) compared to both the untreated and NAC treated cohorts. Functional (echocardiography), ultrastructural (histology, electron microscopy), and biochemical (ROS) assessments are being performed on the male survivors to determine if ROS are truly reduced prenatally by these therapies and if the lack of significant benefits is accompanied by persistent subcellular abnormalities.

Modifying Oxo-Guanine Glycosylase as a Detector of Oxidized D.N.A. Damage
Bearach Miwatani-Minter, Chemistry
Sponsors: Professor Michele Pagano, Biochemistry, NYU School of Medicine; Dr. Gergely Rona, Biochemistry, NYU School of Medicine

Oxo-Guanine Glycosylase is the primary enzyme responsible for the removal of oxidized bases. Base oxidation is caused by reactive oxygen species, emerging from both endogenous and exogenous sources in the cell, and these mutagenic lesions contribute to a wide range of diseases ranging from neurodegenerative diseases to cancer. While a number of commercial antibodies exist for oxidized DNA, we found these antibodies to be aspecific and unreliable. Using an engineered recombinant protein that has two point mutations affecting the catalytic activity of OGG1, we created a modified version which is able to bind to sites of oxidation without removing the oxidized base. A 3x Flag Tag was added to the modified protein in order to probe it using commercial antibodies. This construct was shown to detect oxidized bases both by in vitro dot blotting and in situ immunohistochemistry.

CBD Exerts an Anti-Seizure Effect by Targeting the LPI-GPR55 Signaling Axis
Erica Nebet, Neural Science
Sponsors: Professor Richard Tsien, Neuroscience Institute, NYU School of Medicine; Dr. Evan Rosenberg, Neuroscience Institute, NYU School of Medicine; Dr. Simon Chamberland, Neuroscience Institute, NYU School of Medicine

Information processing in the brain relies on coordination between excitatory (E) and inhibitory (I) activity. Uncoordinated activity may lead to the development of epilepsy, and 1/3 of patients experience seizures that remain inadequately controlled by current anti-epileptic drugs, requiring improved treatments. Recently, cannabidiol (CBD) has emerged as a potential treatment for epilepsy, but its mechanism of action remains generally unknown. A promising target is blockade of an endogenous lipid lysophosphatidylinositol (LPI) at the receptor GPR55 at excitatory terminals in the hippocampus. To assess the role of GPR55 in the anti-seizure mechanism of CBD at diverse synaptic targets, we performed electrophysiological recordings in acute hippocampal slices following the application of LPI and CBD. We find that LPI acts as an agonist of this receptor, leading to an increase in excitation and decrease in inhibition. Encouragingly, pre-treatment with CBD blocks this effect. We also used immunohistochemistry/immunocytochemistry to assess GPR55 levels at various types of synapses throughout the hippocampus. We show that GPR55 is most commonly expressed on parvalbumin-positive and somatostatin-positive interneurons, and it is also most often found in excitatory presynaptic terminals or both excitatory and inhibitory postsynaptic terminals. Additionally, we discovered a seizure-induced positive feedback loop wherein in vivo seizures increase GPR55 expression in both an acute model of seizure and a chronic model of epileptogenesis. CBD, however, reduces the amount of tonic-clinic seizures that animals experience by acting through a GPR55-dependent mechanism. Altogether, our data establish synaptic mechanisms by which CBD targets the receptor GPR55 to produce an anti-seizure effect.

Extremal Length of Winding Curves
Max Newman, Mathematics
Sponsor: Professor Dylan Thurston, Mathematics, Indiana University Bloomington

For regular polygonal tessellations of the plane, there are interesting collections of curves and weighted multicurves which minimize area for a fixed lower bound of the lengths of curves under a flat metric. Curves around two of the punctures of the thrice-punctured sphere with winding numbers 2 and -1 have the same area-minimizing metric as the hexagon with straight lines moving edge to opposite edge and opposite edges glued together, resolving a classical problem of Ahlfors. For a fixed lower bound of the lengths of curves in any given hexagonally punctured hexagonal torus, the minimal area under these constraints is approximated very closely by the reciprocal of a quadratic equation related to the size of the puncture and the corresponding metric engenders regions of positive and flat curvature. These results are primarily significant because, though extremal length of simple closed curves is well-understood, there are very few non-simple closed curves for which this is the case.
Enhancing Genome Editing by CRISPR/Cas9 in the Model Organism Ciona robusta
James Ng, Biology
Sponsors: Professor Lionel Christiaen, Biology; Dr. Naoyuki Ota, Biology

Genome editing, particularly targeted knock-ins, potentially enables the creation of stable, transgenic lines of animals. In the model organism, Ciona robusta, these transgenic animals would provide a means of studying the gene function in physiological conditions, without having to take into account complications regarding gene dosage and endogenous gene expression that is often encountered when utilizing current, plasmid driven transgenic animals. GFP fusion proteins are commonly used tags which enable the visualization and manipulation of endogenous proteins in vivo. Knocking-in a GFP tag at a particular locus is a technique that could be used to create a stable GFP mutant line, which can subsequently be used to observe cellular processes during development. In Ciona, a previous study suggested that CRISPR/Cas9 could be used to achieve a targeted gene knock-in of a full GFP protein via homology directed repair (HDR) with a plasmid donor. Here, I demonstrated that a split GFP system can be adapted for use in Ciona research. I achieved a targeted gene knock-in of the smaller GFP11 fragment with a single-strand oligonucleotide donor in the F0 Ciona embryo. We not only showed that the gene knock-in of a smaller GFP11 fragment may be easier to knock-in than a full GFP, but that different lengths of the homology arms of the donor DNA have an impact on how effective they are in HDR. Overall, this study sets to improve the present understanding of genetic engineering using CRISPR/Cas9 in Ciona by providing a powerful new tool to tag and modify any gene of interest for studying protein localization during animal development.

Engineering of CTCF DNA-Binding Domain
Ken Onyebeka, Biology
Sponsor: Dr. Marcus Noyes, Biochemistry and Molecular Pharmacology, NYU School of Medicine

While the CTCF protein’s function is still under research, studies have indicated it plays a critical role in gene regulation, and it is known to be essential for embryonic development (Phillips and Corces, 2009). More specifically, studies have found CTCF homodimerization to be a major contributor to chromatin looping (Splinter, Heath et al., 2006). These loops have been shown to block gene expression activation or repression in different contexts. However, the majority of CTCF-bound sites are not known to form chromatin loops, and the underlying regulation that determines looping at some sites but not others is poorly understood (Sanyal, Lajoie et al., 2012). My objective has been to engineer an orthogonal CTCF protein that recognizes an alternative binding site not found in the human genome and not recognized by wild type CTCF. If successful, it would allow for de novo interactions to be generated by inserting the orthogonal binding site at different locations in the genome and, in turn, allow the function of CTCF’s DNA-binding interactions to be more rigorously examined across a range of expression levels.

Synthesizing Silver Selenide Thin Films via the Cation Exchange Process for Thermoelectric Applications
Shlok Paul, Chemistry/Chemical & BioMolecular Engineering
Sponsor: Professor Ayaskanta Sahu, Chemical & Biomolecular Engineering, Tandon School of Engineering

Thermoelectric (TE) devices are unique semiconductor devices that can directly convert heat to electricity and vice versa to serve applications such as waste heat recovery and solid-state cooling. Bismuth-Tellurium and other commonly used alloys have been shown to be high performance TE materials but are composed of elements that are toxic, rare, and expensive to process. To accelerate the widespread adoption of TE devices, safe and abundant materials need to be integrated into TE devices at an economical cost. Prior research has involved synthesizing Ag2Se nanoparticles. However, this is an energy-intensive and time-consuming technique with poor yields. To tackle this problem, we optimize the TE performance of Ag2Se by producing it via a low-cost, solution-processable approach relying on the cation exchange of Cu2-xSe to Ag2Se. Cation exchange has recently emerged as an extremely versatile tool that allows manufacturing of a variety of materials whilst maintaining the morphology of a known anionic structure. We report a maximum power factor (PF) of ~800 $\mu$Wm$^{-1}$K$^{-2}$ achieved via a simple thin film soak. This PF is the highest value reported to date for a solution-processable Ag2Se thin film at room temperature. This soaking technique allows for a safe, economical and scalable solution to using Ag2Se in a variety of TE applications.

An Investigation of Subconscious Learning in Virtual Reality
Sam Phelan, Computer Science, French
Sponsor: Professor Ken Perlin, Computer Science

This study investigates the possibility of subconscious learning by participants of Virtual Reality (VR) experiences designed primarily for non-educational, entertainment purposes. To scientifically determine this, the use of two common VR-effectiveness measures—presence and immersion—served as the independent and dependent variables for this experiment, respectively. While the latter is commonly optimized for educational VRs (EVRs), being a measure of believability in a change of physical space by the user, the former is commonly optimized for cinematic VRs (CVRs), being a measure of believability in the plot and entertainment of the experience itself. With this in...
mind, the investigation was designed so as to establish a bridge between the two categories of VR, creating a third, new form of VR that is both educational and cinematic. If the two could be proven to be directly correlated through a proven relationship between immersion and presence, this third VR could theoretically be achievable. In the case of this experiment, users were put into an experience resembling a CVR, but were given a distinctly interactive component to provide users with a feeling of control over the story unfolding before them. This interactive component involved giving the users the ability to draw in a virtual space, therefore distinguishing drawing as the skill meant to be subconsciously developed by the completion of this experience. In the end, though a positive correlative relationship between presence and immersion was proven by the data, failures in the experience’s design regarding the implementation of the drawing mechanic led to overall low recordings in both metrics. Therefore, though the successful execution of this third form of VR has not yet been implemented, this project proves that its implementation is theoretically possible.

**Protein Interaction in P Granule Formation in Caenorhabditis elegans**

*Leel Prishtina, Biology*

**Sponsor: Professor Kris Gunsalus, Biology**

Reproduction is essential for the survival of a species. In metazoans, reproduction depends on specialized cells known as germ cells, which develop into the mature gametes that fuse to initiate the development of a new organism. The maintenance and development of germ cells require cytoplasmic, non-membrane-bound RNA-protein organelles named germ granules. In the roundworm *Caenorhabditis elegans*, germ granules are known as P granules for their segregation to the P (posterior)-cell lineage during embryogenesis. While it is known that P granules are essential for the fertility of *C. elegans*, details of their formation, their exact protein and RNA composition, and their molecular mechanisms of action remain poorly understood. A major P granule component is the protein MEG-3, which is essential for the redistribution of many P granule components to the posterior of the developing embryo. The Gunsalus lab immunoprecipitated GFP-fused MEG-3 and identified three novel, paralogous LOTUS-containing proteins that we call MIP-1, MIP-2, and LOTR-1. The goal of this study is to determine the function of LOTUS-containing proteins in germline development using *C. elegans* as a model system. Specifically, functional motifs within the three LOTUS-containing proteins will be examined using yeast two-hybrid and in vitro pull-down assays to determine how these proteins interact with each other and with other P granule components. The results from these structure-function experiments will be used to design specific genetic mutations in the mip-1, mip-2 and lotr-1 genes in order to further study the roles of these proteins in germline development.

**Understanding the Involvement of the Cerebellum in Timing**

*Ramia Rahman, Neural Science*

**Sponsors: Dr. Eric Lang, Neuroscience Institute, NYU School of Medicine; Dr. Billur Avlar, Neuroscience Institute, NYU School of Medicine**

Studies suggest that transcranial electrical stimulation (tES) of the cerebellum can be used as a treatment for neurological disorders and can lead to improvement of learning deficits. Therefore, we will investigate the effect of tES on the learning and performance of rats doing a time perception task, as this seems to be a function impaired by cerebellar damage. We will use an operant conditioning paradigm that involves the association of long or short signal durations with either a left or right lever. Once this association is learned, the rat is provided with a range of intermediate tones to test time perception ability. Additionally, the difference between short and long tones can be varied to test the limits of time perception. Preliminary data suggests wild-type rats are able to learn the task with anchors of 300 and 1200 ms and are able to differentiate between tones of 300 and 500 ms. We plan to apply tES to the cerebellum and quantify the changes on the learning rate as well as the precision and the accuracy of timing. In addition, neuronal recordings will be performed to assess the effect of tES on neuronal activity and correlate these changes with behavioral changes caused by tES. Finally, we plan to test a model of Fragile X Syndrome, Fragile X Mental Retardation 1 gene (FMR1) mutated rat, as this gene is normally highly expressed in cerebellum. We will test whether tES can alleviate learning and perceptual impairments that we have found in these animals.

**Mass Independence of a Markov Model for Mitosis with Random Branching, Linear Growth, and Diffusion**

*Rahul Rajkumar, Mathematics*

**Sponsor: Professor Srinivasa Varadhan, Mathematics**

A recent paper by Derfel et al. introduces a model for mitosis. In the model, cells are particles with growing mass undergoing diffusion in space and split into daughter cells according to a random clock. The system is subject to a Markov condition (i.e., the process is “memory-less” in a technical sense). A number of large-deviation results are then proven under this regime. In the original model, a constant, uniform drag coefficient is used as a parameter for the diffusion process. In principle, however, the drag force experienced by a particle ought to be a function of mass. In this project we investigated the influence of introducing a mass-dependent drag coefficient on the model. We found that, for a large class of reasonable mass-dependencies,
the results of the original paper hold. Suggestions for further investigation include introducing spatial-dependence for drag forces, mass-dependence for splitting times, and time-evolution of the random laws governing the system.

**Effect of Anthropogenic Forcings on Wildebeest Migration in Serengeti and Masai Mara**

Riyaz Vachani, Mathematics, Physics

**Sponsor:** Professor Sonali McDermid, Environmental Studies

Every year, approximately 1.2 million wildebeest complete a circular migration that spans the Serengeti Mara and Ngorongoro regions of Eastern Africa. This iconic migration, often called “the great migration”, also includes hundreds of thousands of zebras and gazelles that seek the safety provided by the huge numbers of wildebeest; making for a total of 2 million migratory ungulates. Recently, climate change has been qualitatively reported to be affecting the migration pattern itself. In particular, one can identify a “browning spot”—a negative trend vegetation growth—in the domain of the migration. According to literature, vegetation distribution/availability is the most significant factor in determining the specifics of the ungulates’ migration and is central to our examination of the changing migratory patterns (Boone et al., 2006). One of the largest land-mammals migrations observed by man, the “great migration” provides an invaluable case study on the effects anthropogenic forcings have on species’ behavior, as the issue will become undoubtedly more prevalent in the future. With a migration of this magnitude, even small perturbations could have resounding effects on the local flora and fauna populations as wildebeest, zebras, and gazelles are a significant factor in the ecology of the Serengeti Mara and Ngorongoro regions. By accurately modelling the changes, our research aims to provide conservationists and policy-makers with a more accurate idea of the role that humans play, both directly and remotely, on the ecological systems that are reservation areas, as well as providing a jumping off point for further research in mitigating these effects in a practical way.

**The Effects of Activity-Based Anorexia on Avoidance Behavior in Female Rats**

Jaelin Rippe, Psychology

**Sponsors:** Professor Joseph LeDoux, Neural Science; Professor Chiye Aoki, Neural Science

Though women represent the majority of emerging anorexia nervosa (AN) cases in adolescence, the long-term behavioral consequences of AN have not been adequately studied. The current study seeks to explore the impact of AN on long-term avoidance behavior in young adulthood through exposing adolescent female rats to the activity-based anorexia (ABA) paradigm followed by signaled active avoidance (SigAA) training. Adolescent subjects (postnatal day 35) were randomly assigned to one of two conditions: wheel plus food restriction (ABA, N = 8) or no wheel plus food ad libitum (CON, N = 8). Following 13 days of recovery post ABA, subjects’ avoidance behavior was observed through SigAA acquisition, extinction, and renewal performance. It was found that ABA rats ran significantly more during food restriction, replicating earlier findings. ABA rats acquired signaled active avoidance faster, showed less extinction of avoidance behavior, and retained a higher average memory of avoidance training than CON rats. While these findings were not significant, they illustrate behavioral differences in mammals exposed to anorexic-like conditions and support theories of heightened threat sensitivity and abnormal defense responses in female anorexic patients. This study furthers our knowledge of the impact of AN on anxiety-related behaviors through empirically demonstrated differences in avoidance acquisition and renewal in young adult females.

**DIAPH1 Regulates Calcium Homeostasis in Ischemic Heart Disease**

Mira Sharma, Biology, Psychology

**Sponsor:** Dr. Gautham Yepuri, Endocrinology, NYU School of Medicine

Cardiovascular disease (CVD) including ischemic heart disease (IHD) caused due to blockage in coronary artery represents a major cause of morbidity and mortality in various pathophysiological conditions. Human diaphanosin 1, member of formin family, is a protein encoded by the gene DIAPH1. DIAPH1 has been known to play an important role in actin polymerization. However, not much was known about the elevated role of DIAPH1 in IHD and calcium regulation until our recent study, which clearly highlighted the importance of DIAPH1 both in vivo and in vitro (KM. O’Shea et al., 2017). Calcium homeostasis, dynamic interplay of calcium between the mitochondria (Mito) and endoplasmic reticulum(ER) is vital for efficient functioning of cardiomyocytes and IHD prevention. In our present study, we demonstrate the importance of DIAPH1 in regulating mito-ER calcium in vitro. Rat myoblast cell line H9C2 cells were used for all our studies. Silencing DIAPH1 and respective control was achieved using short-hairpin (sh) approach in lentiviral system. Cells were exposed to 0.1% O2 for 30mins in hypoxia chamber (BioSpherix) to induced hypoxia followed by 1hr reoxygenation to mimic ischemic injury in vitro. Both ER and Mito calcium were measured florometrically using Fluo-4 AM and Rhod-2 AM dyes respectively. Our results clearly demonstrate that silencing DIAPH1 in H9C2 cells under normal conditions significantly increase both Mito and ER calcium levels (expressed as AUC). However, under hypoxic conditions only ER calcium levels were elevated as measured by respective florescence dyes. It is evident that silencing DIAPH1 regulates calcium homeostasis in
an in vitro cardiomyocytes model. We believe that elevated DIAPH1 in ischemic heart injury model as demonstrated in our recent study impairs dynamic calcium equilibrium. However, the mechanism remains unknown and warrants further investigation.

Are Dbx1-Derived Cells Sufficient for the Generation of Innate Social Behaviors?
Govind Shekaran, Biology
Sponsor: Dr. Julieta Lischinsky, Neuroscience Institute, NYU School of Medicine

Innate behaviors such as aggression, mating, and parental behaviors are critical for survival of the individual as well as the species. Due to the fact that these behaviors are unlearned, they could potentially be preprogrammed in the brain during embryonic development; however, the mechanisms required to generate them are not well understood. Prior studies have demonstrated that different neuronal subpopulations marked by the expression of distinct developmental transcription factors within the medial amygdala (MeA) may regulate different innate behaviors. One of these subpopulations is characterized by the embryonic expression of the developmental marker Dbx1, which, very interestingly, responds to multiple social sensory stimuli such as male, female, and pups. Thus, I aim to determine the sufficiency of this subpopulation in generating innate social behaviors. I will utilize the designer receptor exclusively activated by designer drugs (DREADDs) approach which will allow me to selectively activate the Dbx1-derived cells on alternate days for behavioral assays. During these assays, the experimental mouse is introduced to a newborn pup, a juvenile, an adult male intruder, and an adult female intruder, and then the various behaviors are quantified. Based on preliminary population recording results, I hypothesize that the Dbx1-derived subpopulation will be sufficient for the generation of aggressive behaviors as well as reproductive behaviors.

A Novel Screen for Analyzing Dosage Compensation via Male Lethality in C. elegans
Geet Shukla, Biology
Sponsor: Professor Sevinc Ercan, Biology

Dosage compensation is a fundamental gene regulatory mechanism responsible for equalizing expression of sex chromosomes in higher-level metazoans. However, while this mechanism has been studied from a cellular perspective, the cofactors that mediate this process remain poorly understood. Elucidating this mechanism would provide insight on sexual dimorphism, chromosome organization, and diseases with sex chromosome anomalies. Regulation of chromosome structure is done in part by condensing, a ring-like DNA-binding complex. In C. elegans, condensin constitutes the core of the X-specific dosage compensation complex (DCC). This complex balances gene transcription from sex chromosomes between two sexes: hermaphrodites (XX) and males (XO). In hermaphrodites, the DCC decreases expression of each X chromosome by 1/2 in order to match male sex chromosome expression. SDC-2 is a hermaphrodite-specific component of the DCC that independently recruits to the X chromosome. SDC-2 is predicted to improve chromatin accessibility by mediating nucleosome removal and help the DCC bind to the X chromosome. The purpose of this research was to generate a novel construct to express SDC-2 in an inducible manner and determine if male lethality could be used as a tool to measure this overexpression. This was done through CRISPR insertion of a heat shock promoter upstream of the endogenous sdc-2 gene. Our results show that the percentage of males did not decrease significantly under induced expression of SDC-2 and is thus not a viable model for DCC overexpression. These results direct further probing into the mechanism of SDC-2 and provide insight into molecular mechanisms of condensin action.

Concentration Invariant Odor Coding and Spatiotemporal Patterns of Glomerular Activation
Lavanya Shukla, Neural Science
Sponsors: Professor Dmitry Rinberg, Neuroscience Institute, NYU School of Medicine; Dr. Hirofumi Nakayama, Neuroscience Institute, NYU School of Medicine

The perceptual quality of an odor is preserved across a wide range of concentrations or intensities. This is referred to as concentration-invariant odor identity perception. How animals have the ability to recognize an odor regardless of its concentration in the air (within a certain range) remains unclear. In this project, the spatiotemporal dynamics of olfactory bulb glomeruli in mice were studied using calcium imaging with the odor butyric acid for concentration magnitudes from $10^{-8}$ to $10^{-11}$ M in an effort to determine how concentration-invariant odor identity is encoded. I hypothesized that the earliest activated glomeruli were also the highest affinity glomeruli and that they encoded a concentration-independent identity for the odor. The rank order of glomerular latency activation was calculated and compared to the rank order of affinity (EC50) determined by multiple methods. Spearman’s R correlation between latency and affinity ranged from 0.36–0.78 based on method and concentration level, suggesting a moderate to strong relationship. High affinity glomeruli were highly represented among the earliest activated glomeruli across multiple concentration levels. Investigating such computations underlying olfactory perception ultimately provides us with new insights about sensory information processing.
Development of Low-Cost, Open-Source Technology for Application in Field Studies of Spatial and Thermal Ecology with Particular Focus on the Study of the Eastern Box Turtle
Luke Stuntz, Environmental Studies
Sponsor: Dr. Suzanne Macey, Center for Biodiversity and Conservation, American Museum of Natural History

Understanding the spatial ecology of threatened wildlife species enables conservationists to make management decisions that will actively protect species in the most efficient manner possible. Unfortunately, the currently available technology available for field studies of animal movement is fundamentally insufficient—it is either labor intensive and lacking in temporal resolution (radio telemetry) or inaccessibly expensive (commercially available GPS loggers). This project aimed to create affordable, open-source technology that would empower scientists to undertake previously unfeasible large-scale projects studying the spatial or movement ecology of wildlife. The author designed and constructed automated GPS loggers which can be deployed on a variety of wildlife to collect spatial data over an extended period at a high temporal and spatial resolution. The GPS loggers were designed with an integrated temperature sensor to allow for simultaneous study of spatial and thermal ecology (providing a unique insight into the multi-dimensional thermal landscape available to wildlife). All designs (including modular 3D printed casing) and build tutorials will be shared publicly, allowing ecologists to construct animal tracking units comparable to commercially available products at less than 5% of the price. Using the study of Terrapene carolina carolina (eastern box turtle) as a model, the author hopes that this newly available technology will result in a proliferation of studies into the fine-scale movement ecology of terrestrial wildlife thereby widely expanding our understanding of animal movement and providing new insight into wildlife conservation.

Crystallizing an Adenosine Targeting Aptamer within a Self-Assembling DNA Lattice
Dennis Tang, Chemistry
Sponsor: Professor Yoel Ohayon, Chemistry

DNA is a genetic material that is most commonly known in the form of the double helix formed by Watson and Crick base pairing. Precise control of DNA is enabled by the ability to control the base pairing of single stranded DNA to spontaneously assembly into stable, complex target structures. The main investigation of this project is to manipulate a DNA tensegrity triangle structure, a platform for self-assembling rhombohedral lattices, by attaching an aptamer to one of the arms. This aptamer, a small single-stranded nucleic acid, has a high affinity and specificity for a target molecule and specifically targets adenosine. Crystals for this design have been constructed and data analysis is currently being done on the crystals. Assuming these crystals have the appropriate symmetry, we can then move on to resolving the structure of the system.

Examining the Relationship between Pigment Dispersing Factor (pdf) and Aggression Behavior in Drosophila melanogaster
Grace Tang, Biochemistry
Sponsor: Professor Maria Fernandez, Neural Science, Barnard College

The circadian clock, one of the most conserved features across organisms, affects an organism’s physiology and behavior according to the time of day to maximize their success in mating, finding food, and surviving. A total of about 150 neurons in 9 clusters uses pigment dispersing factor (pdf) to modulate circadian rhythms. Pd, produced by the small and large lateral neurons (s-LNvs and l-LNvs), maintains synchronicity, so all the cells are set to the same period. Ablating pd production leads to arrhythmic activity. Aggression between Drosophila melanogaster is one behavior under the control of circadian rhythms. We aim to study the effects of ablating of the circadian clock regulation in Drosophila by silencing pdf and resulting patterns of aggression and the mechanism behind such effects.

Sickness Behavior in Mice and Vagus Nerve Activity
Haohan Karen Wei, Biology
Sponsor: Professor Robert Froemke, Neuroscience and Physiology, NYU School of Medicine

We are not brains in a jar. Getting sick changes our behavior—why and how does this happen? Recent results have identified the role of the vagus nerve in the bidirectional communication between the enteric nervous system (ENS) and the central nervous system (CNS). An emerging hypothesis is that brain function and behavior can be influenced directly by enteric input from the intestine through a nervous pathway mediated by vagal afferents. However, little is known about the relation between the vagus nerve activity and these behavioral changes. We hypothesized that vagus inputs are recruited in affecting behaviors during an infection. To test this hypothesis, we obtained vagus nerve recordings from mice subjected to lipopolysaccharidd (LPS)-induced inflammation. To this end, we obtained video recordings that monitor behavior from freely moving mice 24 hours prior to LPS-injection and 48 hours following injection. Then we annotated the video recordings and analyzed the temporal progression of behaviors. We surgically implanted custom nerve cuff electrodes onto mice vagal afferent nerve and assessed the vagus neural activity in freely moving mice isolated in the cage before and after LPS administration. We tested whether there was a direct relationship between the behaviors and vagus neural activities. Our results showed...
that LPS administration reduces locomotion behaviors and induces hunching behaviors in single-housed mice. We observed changes in the vagus neural firing patterns following injection of LPS and assess how vagus activity relates to various home-cage mouse behaviors. The study confirms that LPS-induced inflammation modifies behaviors in single-housed mice. Future studies will be aimed at clarifying how and when vagus signaling affects behavior during and after infection.

Investigation of Relative Rates of Additions in the Reactions of Grignard Reagents with Compounds Containing Carbon–Nitrogen Double Bond
Carmen White, Chemistry
Sponsor: Professor Keith Woerpel, Chemistry
The reactions of allylic Grignard reagents with carbon–oxygen double bonds are unselective because additions occur at rates approaching the diffusion limit. Additions of allyl Grignard reagents to carbon–nitrogen double bonds were investigated because no previous research had examined their reactivity. Additions of allylmagnesium reagents to imines, oximes, and sulfonylimines were studied. Competition experiments demonstrated that allylmagnesium halides react competitively with both aldehydes and imines. Additions of allylic Grignard reagents to imines and sulfonylimines showed almost complete conversion after thirty minutes.

Modulation of DNA Crystalline Triangle Lattices by Insertion of Double Helical Segments
Karol Woloszyn, Chemistry
Sponsors: Professor Yoel Ohayon, Chemistry; Professor Nadrian Seeman, Chemistry
One of the main objectives of the field of DNA nanotechnology is to design and form 3D DNA crystalline lattices to serve as hosts for various macromolecules. Here, we provide a modulation of one such lattice by the insertion of duplexes between adjacent 2-turn tensegrity triangles. Four duplex lengths were employed, ranging from one turn of DNA (10–11 nucleotide pairs) to two turns of DNA (20–21 nucleotide pairs). Such pairings, treating one turn of DNA to consist of 10 nucleotide pairs, would be analogous to 3-turn and 4-turn tensegrity triangles respectively. Another motif, incorporating both 1-turn and 2-turn duplexes (analogous to a 2,3,4-turn tensegrity triangle), was also considered. This modulation of the standard crystalline triangle lattice was further extended to the co-crystallization of the restriction endonuclease BAMH1 within the DNA lattice. We report the successful formation of rhombohedral crystals that diffract to 7.88 Å resolution based on the 2-turn triangle/10-nucleotide duplex combined motif and observe similar unit cell dimensions and volume compared to the estimated values of a 3-turn tensegrity triangle containing seven nucleotide pairs per edge. We furthermore report the successful crystallization of the 2-turn triangle/21-nucleotide duplex combined motif, and the 2,3,4-turn triangle. Work is still needed on these last two motifs, as well as the co-crystallization of BAMH1, but we are optimistic that this work will allow for the creation of larger and more complex 3D DNA crystalline lattices.

Neurobiology of Maternal Regulation of Mesolimbic Dopamine
Joyce Woo, Neural Science
Sponsor: Professor Regina Sullivan, Child and Adolescent Psychiatry, NYU School of Medicine
A hallmark of infant altricial species, such as humans and rodents, is attachment to a caregiver, even if the caregiver is maltreating the infant. However, maltreatment decreases the infant’s attachment and social behavior towards the caregiver. Although we know the infant’s attachment behavior is an early life biomarker of later life pathology, we know little about the neural circuits that underlie the infant’s maternally directed social behaviors. Using infant rats, the main purpose of this proposal is to better understand the brain circuitry supporting social interactions with the caregiver. The central hypothesis is that dopaminergic (DA) input from the ventral tegmental area (VTA) to the basolateral amygdala (BLA) determines the “value” of the caregiver to control infant social behavior. To test this, we will use two examples of declining social behavior in early life: typical social behavior waning during maturation as pups approach independence and atypical social behavior induced through maltreatment.

Are Class I Genes Dosage Dependent?
Justin Yeung, Biology
Sponsors: Professor Christine Rushlow, Biology; Dr. Shigehiro Yamada, Pathology, The Johns Hopkins University School of Medicine
The embryos of Drosophila melanogaster (fruit fly), a model organism used in the Rushlow lab to study transcriptional mechanisms, go through 14 nuclear cycles during their development and many different genes are activated during this time. Zelda is a transcription factor that increases chromatin accessibility at enhancers. Zelda has two types of targets, Class I and Class II genes. For Class I genes, Zelda alone is sufficient for gene activation, but for Class II genes, Zelda needs help from other transcription factors for gene activation. I am focusing on the mechanism of activation of Class I genes. Class I genes are short genes with a TATA box in their promoter, and Zelda binding sites directly upstream of the promoter. This setup is conserved across Drosophila species. Class I genes are important for early developmental processes such as cellularization and sex determination and are very highly expressed in the early embryo. My project addresses the question of whether the strict arrangement of Zelda binding sites just upstream
of the promoter is required for both early and high-level expression. This project aims to answer this question by manipulating the amount of Class I gene expression and assaying the effects this has on development in the embryo.

**The Role of Layer II of Medial Entorhinal Cortex on Different Modes of Spatial Memory**

*Mayu Yoshikawa, Neural Science, Psychology*  
*Sponsor: Dr. Eun Hye Park, Neural Science*

Spatial memory is how animals are able to determine their position within an environment and find their place and way around the world. The pathway from the medial entorhinal cortex (MEC) to the hippocampus, particularly layer II of the MEC to the hippocampus, is known to be relevant to spatial memory. However, the type of spatial memory encoded by this pathway is not well understood. The objective of this study is to investigate the type of spatial memory encoded by the pathway from layer II of the MEC to the hippocampus, specifically on the place avoidance task, object-mismatch task, and place-mismatch task. Behavioral studies taking advantage of novelty preference in rodents were used to see whether inactivation of layer II of the MEC affected rodent ability to recognize locations in their environment, change in the identity of objects in a familiar environment or change in the position of objects in a familiar environment. There was no significant effect of inactivating layer II of the MEC on any of the three spatial tasks. However, we observed a difference in performance in the object-mismatch condition between the group with inactivation of MEC layer II and the group without inactivation of MEC layer II. This implies that the pathway from the MEC layer II to the hippocampus has a complex involvement in memory processing that requires further study.

**Identifying Novel Meiotic Mutations Involving Defective Break-Repair in S. cerevisiae**

*Nadja Zhakula-Kostadinova, Biology*  
*Sponsor: Professor Andreas Hochwagen, Biology*

Meiosis is a form of cell division that is essential for chromosomal alignment and segregation in sexually-reproducing eukaryotes. Meiosis produces gametes (egg and sperm cells) which engage in fertilization to construct genetically distinct organisms. Meiotic recombination involves crossovers between homologous chromosomes to yield unique genetic markers that preserve diversity and trait variation among species. To facilitate recombination, double-strand breaks (DSBs) are created, monitored, and resolved by checkpoints and signaling pathways to prevent break accumulation that causes genomic instability, chromosomal abnormalities and birth defects, and cancer susceptibility. Dmc1 is an essential meiosis-specific recombinase that performs DSB repair to promote meiotic progression and cellular integrity. Dmc1-deletion mutants are expected to arrest with unrepaired DSBs before completing meiosis. However, prior studies have shown that *S. cerevisiae* strains with a Dmc1-deletion are able to undergo meiosis (Hochwagen, Tham et al., 2005). Mutations in genes involved in the following proposed mechanisms are implicated in bypassing the Dmc1-deletion: lack of DSBs, Dmc1-independent break-repair, and deficient checkpoints. To identify the genes involved in bypass, a forward mutagenesis screen isolated point mutations that permit bypass in a Dmc1-deletion strain. Functional complementation testing and sequencing were used to further study the genes involved in the three bypass categories by mapping mutations to specific loci in the yeast genome. This work is beneficial in identifying potential routes to promote recombination in the presence of defective break-repair and in the analysis of uncharacterized genes or gene interactions and functions that are conserved in other species. This knowledge will lead to potential applications in studying the genomic basis for chromosomal abnormalities in other organisms and characterizing gene function, recombination pathways, and developmental disorders in the future.

**Characterization of Putative Enhancers in Drosophila**

*Tom Zhang, Biology*  
*Sponsors: Professor Christine Rushlow, Biology; Peter Whitney, Biology*

In the Rushlow lab, we seek to identify enhancers of genes of interest and study how they function in *Drosophila*. My project focuses on a new enhancer of the short gastrulation (sog) gene called the “mystery” enhancer. Up until now, sog was known to have two enhancers, each of which drive expression in the embryonic neuroectoderm of *Drosophila* embryos. When we put the mystery enhancer in a reporter transgene, the reporter gene product was localized only to the anterior region of the embryo, rather than in the characteristic sog lateral stripes. After gastrulation, the reporter gene product localized to the neuroectoderm and the expression pattern resembled that of sog but was broader, indicating that repression elements are missing from the mystery enhancer. The reporter gene product could also be detected past the stage when sog expression normally ceases. As a next step, we will remove the endogenous copy of the mystery enhancer by CRISPR/cas9 editing technology. The resulting consequences of deleting the mystery enhancer on sog expression as well as embryonic viability will shed light onto the role of the mystery enhancer in regulating sog expression.
Understanding the Function of Uncharacterized Genes YOR338W and FUN19 during Meiosis in *S. cerevisiae*

William Zhang, Biology  
*Sponsors: Funda Kar, Biology; Professor Andreas Hochwagen, Biology*

Over two decades since the collaborative effort of Goffeau and his colleagues to fully sequence *Saccharomyces cerevisiae* in 1996, there are still roughly 11% of the organism’s genes that we do not fully understand (Goffeau et al., 1996). These uncharacterized genes have unknown functions in yeast cells, but from a previous large-scale study, one particular gene, YOR338W, has been shown to be necessary for meiosis (Enyenihi et al., 2003). Coincidently, a large-scale proteomics study from the Hochwagen lab found phosphorylation events on YOR338W dentally, a large-scale proteomics study from the Hochwagen lab found phosphorylation events on YOR338W during meiosis. These phosphorylation sites are within SQ/TQ sites which are targets of DNA damage response kinases Mec1/Tel1. Interestingly, in previous works, yor338wΔ mutants had high levels of sporulation but ended up with a reduced number of spores per ascus (Enyenihi et al., 2003). Another feature was discovered when yor338wΔ mutants failed to induce detectable expression of an early-meiotic transcription factor IME1 but still performed high levels of nuclear division (Enyenihi et al., 2003). The goal of our research is to better understand the functional role of YOR338W and its paralog, FUN19, during cell division. After establishing both mutant strains (fun19A and yor338wΔ), we observed that in the presence of the DNA damaging drug methyl methanesulfonate (MMS), only fun19A mutants showed modest defects in their growth compared to wildtype. Surprisingly, yor338wΔ mutants showed no growth defects on complete medium for yeast growth or in MMS. Additionally, the fun19A mutants also displayed an interesting branching phenotype after meiotic induction, typically observed when cells fail to divide properly. We suspect this phenotype is the formation of pseudohyphae, but more work is needed to understand it fully. Nevertheless, our current evidence suggests that these genes may play a role in cell division. Elucidating FUN19 and YOR338W’s pathways can illuminate new mechanisms important for DNA damage response and cell cycle.

Molecular Mechanism of Leukemia Initiation, Proliferation, and Survival in Acute Myeloid Leukemia by CD97

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Acute Myeloid Leukemia (AML) is a form of leukemia that starts in immature myeloid cells, progresses rapidly, and is often fatal. Among AML cells exists a subpopulation called Leukemic Stem Cells (LSCs) that have the capacity to propagate and continue the AML phenotype. The elimination of these LSCs is critical during leukemia treatment to help prevent relapses. Our work has identified CD97, a member of the adhesion class of G-protein-coupled receptors (GPCRs), as being frequently up-regulated on AML blasts and as a critical regulator in LSC function. Higher levels of expression for this protein are correlated with poorer outcomes for AML patients and, in primary human AML samples, CD97 is expressed 10-fold in LCS-enriched blasts when compared to cord blood hematopoietic stem cells from all 30 patients that were tested. Our results show that mice transplanted with knockdown (KD) of CD97 in human AML cell lines using lentiviral vectors survive significantly longer than control counterparts. CD97 KD cells also have reduced engraftment and leukemic initiation when transduced with the MLL-AF9 leukemogenic oncogene. Furthermore, colony formation assays indicate that CD97 KD cells show a reduction in self-renewal compared to wild type. These results demonstrate that CD97 plays an important role in the initiation, proliferation, and survival of AML, making it a promising therapeutic target.

Effects of Nutrient Depletion on Tissue Growth in a Tissue-Engineering Scaffold Pore

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Cell proliferation within a porous tissue engineering scaffold perfused with nutrient solution depends sensitively on the choice of pore geometry, flow rates, and nutrient concentration. Regions of high pore curvature encourage cell proliferation, while a critical flow rate is required to promote growth. Moreover, the dynamics of the nutrient culture medium consumption influence the cell growth. In experiments, such factors should be chosen meticulously to match the characteristics of the underlying cells and the particular goal of incubation. However, determining these factors poses a significant challenge that cannot be addressed by experimentation alone. In this paper, we present a first-principle mathematical theory for the nutrient concentration coupled to the growth of cells seeded on the pore walls, which is driven by the fluid flow within a tissue engineering scaffold pore. In addition, using asymptotic analysis based on the pore small aspect ratio, we derive a reduced model that enables a comprehensive analysis of the system to be performed. This approach reduces the numerical burdens, captures the experimental observations, and suggests improvements to the design of a tissue engineering scaffold and the appropriate operating regime.