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INTRODUCTION:
Research as Educational Paradigm

The annual journal Inquiry showcases abstracts of student research undertaken in the academic year 2013–2014 in the College of Arts and Science at New York University. These abstracts were selected by the faculty as representing some of the best work in the College. Inquiry is thus a celebration of the achievements of some of our most curious, driven students. It is also a testimony to our core mission: as part of a premier research university, the College has the responsibility to involve undergraduates in the production and expansion of knowledge, as they work alongside world-class faculty researchers who, with great dedication and much joy, share what they know and guide students to yet greater success.

Research takes many shapes. Students featured here worked in labs with teams of scientists in order to understand embryonic development; they scoured boxes in an archive, finding evidence to support literary analyses; they interviewed doctors in the developing world to understand global public health crises. They gained more than new perspectives on their own fields and the big ideas that motivate scholarship. Students began to explore possible future careers, worked independently with intense self-motivation, and honed skills crucial for success in the wider world (especially their abilities to write, define problems, respond to criticism, and communicate solutions). The greatest achievement for most of our students was in meeting the many challenges of a long-term project, and following a passion to a wonderful conclusion. Now, you hold those wonderful conclusions in your hands. The internal standard of excellence that our students discover within themselves lays the foundation for amazing things to come.

Most of the projects featured in Inquiry were supported by the Dean’s Undergraduate Research Fund, an endowment created through the generosity of alumni, parents, and friends. (A list of the research scholarships that have been established in the Fund appears on page 2.) This research was also presented at the annual Undergraduate Research Conference, which was established forty years ago. Keep in mind, as you read, that Inquiry represents only a fraction of the research undertaken by College students as they work under the close mentorship of faculty. Our students are doing brilliant things.

At the start of this issue is the “Faculty Perspective,” in which we publish the inspiring lecture delivered by Professor Shara Bailey at the closing award ceremony of this year’s Undergraduate Research Conference. Everything you will read between these covers underscores the crucial importance of independent inquiry in a twenty-first century liberal arts education. We are very grateful to the students, their faculty mentors, and the generous funders who have made this educational experience, and this journal, possible.

G. Gabrielle Starr
Seryl Kushner Dean, College of Arts and Science
Professor of English
FACULTY PERSPECTIVE:

Keep your eye on the road and not the mountain that lies ahead

Professor Shara Bailey

I am honored to have been asked here today to give the closing talk for the Undergraduate Research Conference. I cannot express strongly enough how impressed I am by the research that is being conducted by undergraduates here at NYU.

As the director of the Women in Science Program I read a lot of personal statements. I am always impressed by students who say they knew what they wanted to be from a young age. Now, I love what I do but had you asked me back in high school “what will you be doing 30 years from now?” I would have never guessed I would be here—a professor researching human evolution at New York University. Although I always excelled in math and science I was not encouraged to pursue these fields as a career. As pointed out in a recent New York Times article, which asked “Why are there still so few women in science?” I was not alone—girls of my generation were not, and many women today still are not, encouraged to pursue scientific research as a career. Another thing contributing to the underrepresentation of women in the sciences, the article went on to say, is the negative stigma associated with it. Take for example the popular show the Big Bang Theory. Nearly all the scientists are socially inept geeks. There is a definite message there “science is not cool…smart is not sexy”. This is largely a problem of the United States, I am finding out. In many other countries there is no need for a “Women in Science” program that provides support to women pursuing research. Scientific inquiry is culturally valued—by both men and women alike.

Having been encouraged to do something practical so I could get a good job, and being equally inclined to the arts as I was to the sciences, in high school I pursued a career in commercial art at the local tech school. As a college student I first pursued art, but later turned my interests to the social sciences with the idea of becoming a counselor. This seemed “practical” and I always liked the idea of sharing knowledge and experiences with others. But after two years, for personal reasons, I decided to experience the “real world” and worked in retail as an interior decorator and eventually a buyer for a large furniture store. And that’s what it took—three years in retail—to convince me that I had to go back to school and finish my degree. But there was a barrier—I was 22 and I would be 24 by the time I finished my degree. (That seemed so old to me then… It doesn’t now). And then someone close to me said something that changed my life. She said, “In two years you’ll be 24 anyway. Wouldn’t you rather be 24 with a degree than without one?” And so I quit my job and re-matriculated at Temple University majoring in cognitive psychology. Hearing in my head my mother’s recollection about how hard her chemistry class was, I decided, as many do, to enroll in a class called Biological Anthropology to satisfy my last lab science requirement. And like several of the students who take the Introductory Human Evolution Class here at NYU I decided that this was where my true passions lie. Two years later, at 24, I graduated Suma Cum Laude with a double major in Psychology and Anthropology.

My journey after Temple University took me to Arizona State University where I studied dental anthropology and eventually wrote a dissertation entitled “The Neandertal Dentition and its Implications for Modern Human Origins”. But not before I learned an important life lesson that has—as any of my students—become my mantra. This lesson is: “if you don’t ask the answer will always be no”. There are two books out there that everyone should read: They are “Women Don’t Ask” (Linda Babcock and Sara Laschever) and “Lean In” (Sheryl Sandberg). Too many times—men and women alike—do not step up to the plate and their careers suffer as a result. Either we do not ask because we are afraid someone will say no, or we do not try because we are afraid we may fail. But the fact is that the only way you can truly fail is if you do not make the attempt in the first place. Here are some examples of what I mean. In my third year at Temple University I had a GPA of 3.92. Having felt pretty lucky that Temple accepted me when my guidance counselor said I’d never be able to go to college after pursuing commercial art in tech school, it never occurred to me to ask for a scholarship. But after learning that other students with lower GPAs had significant funding, I sat down and wrote a letter to the Dean of my college. To my surprise I received a scholarship covering half my tuition costs. I recently told this story to one of my undergraduate advisees who had an equally high GPA and was struggling with affording her tuition. She followed my example and ended up receiving a significant scholarship for her senior year. One of my PhD students came to me last spring and asked if she should apply for National Science Foundation funding. We knew that chances were slim because NSF funding has been cut significantly in the recent past. Writing a grant is hard work but NSF is one of the most prestigious grants you can get in our field. It would have been easy to say no you don’t have to apply—especially because she had already submitted applications to two other agencies. Instead, I asked “what’s the worst thing that can happen if you apply?” She answered “NSF could say ‘no.’” “So they say no,” I replied, “you can always re-apply next year.” In the end, with my urging, she decided to apply. She was not only awarded an NSF grant but also funding from both other granting agencies. You may not always be this successful when you ask, but if you don’t ask I can guarantee that the answer will always be no.

As a graduate student at Arizona State University I learned another important life lesson: “Make a plan/set a goal and then take advantage of opportunities that will help you reach that goal”. My plan was to pursue an academic career, which included teaching and research. So, immediately after receiving my master’s degree I obtained a teaching certificate so I could do adjunct teaching at community colleges. I applied for a summer job at the Museum of Northern Arizona where I honed my osteology skills and learned valuable information about the Native American Graves Protection and Repatriation Act. When a local community college asked me to teach “Magic, Witchcraft and Religion” I said “Yes! I can DO that!” even though I knew very little about the topic.

In my last year of dissertation writing I presented my work in a talk at the annual meetings of the American Association of Physical

Shara Bailey is the Director of the Women in Science Program at NYU and an associate professor in the Center for the Study of Human Origins, Department of Anthropology. Before coming to NYU she was a Research Scientist at the Max Planck Institute for Evolutionary Anthropology, in Leipzig, Germany, and she currently maintains an affiliation as Associated Scientist. Professor Bailey’s research focuses on dental perspectives on human evolution. She studies the later stages of human evolution especially Neandertals and early modern humans. Her books include a co-edited volume with Jean-Jacques Hublin on Dental Perspectives on Human Evolution with Springer Press and The Evolution of the Human Dentition (in progress).
Anthropologists. I was immediately approached by Bernard Wood who offered a postdoctoral position at George Washington University. Without really thinking I just said “yes”—Prof Wood is one of the preeminent scholars in my field and the opportunity to work with him and build a long lasting collaborative relationship was a once in a lifetime chance. While at George Washington University, Jean-Jacques Hublin, another senior scholar in our field, expressed interest in using my research methods to answer some questions he had about an enigmatic site where modern human tools were found with fragmented human remains—mostly teeth. He flew me to France where we worked together in Paris and Bordeaux on the problem, ultimately determining that it was Neandertals who had made the very modern-looking tools. Toward the end of the trip he invited me to visit the newly formed Department of Human Evolution at the Max Planck Institute in Leipzig Germany in the hopes that I would agree to be part of what he described as his “dream team.” I had already been offered a third year of postdoctoral funding and I had been also interviewing for tenure track jobs, several of which looked promising. This was a huge decision. It meant moving to East Germany for a minimum of five years, living in a place where I did not speak the language and being far away from everyone I knew. I thought hard about it, really hard, and then I said “yes.” And after saying yes I invoked the first lesson I mentioned—I asked if they would cover my moving expenses—and guess what, they said yes. Taking a job as a researcher at the Max Planck Institute was perhaps one of the best decisions of my life. I met many European scholars and built long-lasting collaborations. I traveled around the world—from South Africa to Indonesia. I also realized that while I love doing research I missed teaching, which led me to be open to the move to New York when the position at NYU became available. All of these experiences—all of this saying “yes” to opportunities—made me highly desirable to better universities than had been available to me before. Going back to that Magic, Witchcraft and Religion class I taught for a moment: I was even told that during the interview process at NYU that my Anthropology colleagues were particularly impressed I had taught classes outside my field. They knew that in a crunch they could count on me to step up to the plate.

I do not want my accounting of how I got to where I am to sound like it was easy. It was not. I faced a lot of obstacles along the way to getting here. There was my fifth grade teacher who forbade me from doing anything that had to do with horses after writing a “book” on the evolution of the horse. When I decided to pursue a commercial art career at North Montco Tech School, I was told I did so at the risk of never getting into college. But I have always been one to see obstacles as challenges rather than impasses. Ask anybody who knows me: If someone says to me “you can’t do that,” my response is “watch me!” But that does not mean there weren’t days when I wanted to give up. As I struggled in my final year, in which I spent most days alone in my apartment crunching numbers and writing my dissertation, my older brother, who I am sure meant well, insisted I didn’t need to get a PhD to get a “good” job and that it was OK to quit. I almost did quit after a confrontation with a prominent physical anthropologist who gave me a very public verbal lashing because my results did not agree with his hypotheses. You have to have a tough skin to be a woman in paleoanthropology. All I can say is thank goodness for my sister who offered me these words of wisdom that I will now share with you. She said: “Keep your eye on the road and not the mountain that lies ahead.” I put it on a post-it note. I put that post-it note on my wall. I looked at it every day. Honestly, I think that is what got me through that difficult year.

Many of you will also face significant challenges in the years that lie ahead, whether it is working on a senior thesis, starting graduate school, or entering the job market. For those of you women continuing in STEM fields, you will have your own unique set of challenges. But I stand here in front of you: Someone who never dreamt she could pursue a career in science. Someone who was told, in fact, that she would never go to college. Ultimately my success is due to a combination of pursuing what I love, having a goal and directing all my efforts to it, and of course, keeping my eye on that road and not on the mountain that lies ahead. In the end I have my dream job, in an awesome city. I have a supportive husband and a lovely daughter. For me, there is no greater reward for all this effort than knowing when I wake up every morning that I am doing what I love. Yes, you can have it all. And let me tell you, life is good.

Professor Shara Bailey (center) discussing dental health in fossil humans with CAS Anthropology majors Michaela Fitzgerald and Katherine Edwards.
There is today a good deal of confusion about the status of knowledge in the humanities. To some, the admission that we seek only an interpretation seems to allow all kinds of subjective opinion to count as knowledge. Or worse, it seems to endorse the principle that those with the power to impose “their” opinion define knowledge. Nothing could be further from the truth. Interpretation is a form of knowledge, not mere opinion. What distinguishes knowledge, even knowledge that makes no claim to absolute certainty, is evidence and rigorous analysis. That is the meaning of disciplined inquiry in any field.

—Thomas Bender, University Professor and Professor of History

**HUMANITIES**

**What is Terrorism? An Analysis of the Relationship between Terrorism, Political Violence, and Humanity**
Funmi Akinnawonu, History and Anthropology
Sponsor: Professor Joe Lee, History

In the modern international and domestic media, few subjects receive as much attention as terrorism. However, there is no universally recognized definition of terrorism within the academic community, media, or even among international organizations like the United Nations. This research attempts to understand when violence is considered terrorist and how individual bias plays into such designations. This study investigates two very different terrorist organizations, the Irish Republican Army and the Boko Haram in Nigeria. By examining the history of Ireland and Nigeria through the perspective of the IRA and Boko Haram we might come to understand why the members of these organizations turned to violence in order to meet their political goals, and why they are considered terrorists rather than rebels or revolutionaries. This study is very relevant to current events. Terrorism presents a threat to all nations and peoples. If we do not try to understand the logic of those who commit acts of political violence, or the circumstances in which that violence is celebrated or condemned we will never be able to resolve the circumstances that lead to such violence.

**Cross-language Speech Perception and Foreign Language Acquisition: Adult Perception of Thai and Mandarin Tonal Contrasts by Native and Mandarin-learning American English Speakers**
Samuel Alfieri, Linguistics
Sponsor: Professor Lisa Davidson, Linguistics

This study investigates the effects of adult second language acquisition on perception of non-native phonological categories. Specifically, monolingual American English speakers, and American English speakers who have learned Mandarin in adulthood were tested on perceptual discrimination of Thai and Mandarin tonal contrasts. This research question extends previous work by Wayland and Guion (2004) as well as Schaefer and Darcy (2013), who found that native Mandarin speakers perceive Thai tones significantly more accurately than native American English speakers. However, it remains an open question as to whether L2 acquisition of Mandarin would confer a congruent perceptual advantage on learners. If Mandarin learners form new phonological categories for tone, they should perceive both Mandarin and Thai tonal contrasts better than American English speakers who have no experience in a language with lexical tone. The findings indicate no significant difference in accuracy rates between native listeners and Mandarin learners for Mandarin or Thai tonal contrasts, suggesting that even if phonological categories for tone can be established, it is difficult to generalize them to a third language. However, differences in accuracy rates between individual contrasts are significant, and are interpreted in light of the Speech Learning Model (Flege, 1995), and the Perceptual Assimilation Model (Best, 1995). Strong performance on tone contrasts that differ markedly in contour shape and direction over level tone contrasts supports previous researchers’ claims that intrinsic differences between level and contour tones affect nonnative perception (Francis, Ciocca, & Ng, 2003; Lee, Vakoch, and Wurm, 1996; Qin & Mok, 2012; Wayland & Guion, 2004).
Stoicism and Imperial Philosophy in Trajan’s Empire
Conor Almquist, Classical Civilization and Religious Studies
Sponsor: Professor Michael Peachin, Classics

This study attempts to perform unique analysis on the Roman Empire during the reign of Trajan. As it stands, there has been little scholarship on the influence of Stoicism on the function and philosophy of the Roman principate. This study contends that the shift from Republican to Imperial government in Rome had a profound impact on the lives of Roman citizens, aristocrats, and governmental leaders. This shift disrupted traditional means of navigating social and political systems and proved to be very problematic. Stoic philosophy acted to allow for a shift in values that restored agency to the Roman aristocracy and created a framework within which the emperor and aristocracy could productively interact. In the period of Trajan, historically viewed as one of the best emperors of Rome, the positive influence of Stoicism becomes clear. This particular project offers a new framework of analysis for social interaction and governmental success in Roman imperial rule.

Intimate Association...is a Thing of Horror: Interracial Relationships, Rioting, and Anticolonialism in 1919 Britain
Jade Bettine, History
Sponsor: Professor Linda Gordon, History

British port cities saw a wave of racialized violence in 1919. Existing historiography attributes the riots to economic stress. Postwar demobilization and job competition intensified preexisting racial tensions, but it was interracial relationships between white British women and nonwhite men from the colonies that sparked the violence. This study demonstrates the importance of race to the imperial project through a discussion of racialized troop recruitment during World War I. Research also shows that a state interest in controlling women’s bodies and sexuality intensified during this period, particularly for working-class women. Interracial relationships combined these preexisting and growing anxieties, and provoked violence toward the men and verbal abuse of the women involved. A commonly proposed solution—repatriation—in turn raised questions of imperial loyalty and anticolonial agitation. This study proposes adding a fourth criteria of analysis—sexuality—to the triad of race, class, and gender in order to understand the riots and the growing anticolonial nationalism across the empire.

Segmental and Prosodic Effects on Intervocalic Voiceless Stop Lenition in Connected Speech
Dominique Bouavichith, Linguistics
Sponsor: Professor Lisa Davidson, Linguistics

Descriptions of English and other languages have claimed that voiced and voiceless intervocalic stops are often lenited to fricatives and approximants in connected speech. Few acoustic analyses of factors that affect this reduction have been reported for American English (Lavoie, 2001; Tucker & Warner, 2011). In this analysis, intervocalic voiceless stops produced in bisyllabic words during story reading are examined (participants N=19). The first result shows that speakers never lenite voiceless stops to approximants, except when /t/ is produced as the approximant implementation of a flap. This shows that voiced and voiceless stop reduction behave differently. Second, stress and vowel reduction play an integral role: 33% of stops are produced as fricatives when stress is on the preceding syllable (e.g. “taco”); 4% when stress is on the following syllable (e.g. “account”). The rate of reduction is significantly lower when stops are surrounded by two full vowels and higher when they are followed by schwa. Third, fricative reduction is most common for /k/, since full closures may be most effortful in the velar region. Research within the realm of connected speech examines the behavior of the human voice when no one is listening (versus speech that is careful or in a formal register). By studying these common phenomena, linguists are revealing more regarding the acoustic qualities of spontaneous speech. This study was created to build on a previous experiment to fully understand the breadth of lenition as a phonological process by examining both voiced and voiceless stops in American English.

Amelia Brackett, History
Sponsor: Professor Rachel St. John, History

The Migratory Bird Treaty of 1916 between the United States and Great Britain on behalf of Canada protects hundreds of birds and is a seminal example of wildlife conservation between 1890 and 1916. American and Canadian federal scientists proved that birds’ importance to the agricultural interests of these two countries warranted their federal protection. Their research combined ornithological and entomological methods and data towards the economic goal of protecting agriculture. These influences allowed federal scientists to make connections between agroecosystems and birds that encouraged the protection of hundreds of species, including previously maligned groups such as woodpeckers. Historians usually divide early wildlife protection into conservation—preserving nature for use—and...
preservation, or maintaining an unadulterated natural state. This division is an inadequate measure of bird protection, as the work of these scientists recognized that birds’ natural cycles benefited agroecosystems and advocated for their protection based on this relationship. In fact, the struggle between aesthetics and economics among treaty advocates obscured the original research, sacrificing birds like hawks and eagles to aesthetic sensibilities. This study shows that the federal, agricultural-based research was later subject to compromises between pragmatists and sentimentalists that determined which species received legislative protection.

I Moti del Cilento del 1828: The Cilentan Uprisings and Their Role in the Italian Risorgimento
Alexander Bruski, History
Sponsor: Professor Ruth Ben-Ghiat, Italian

The study of the Risorgimento, that is the unification of the Kingdom of Italy during the 19th century, has recently shown renewed interest in academia both in Italy and abroad. Some historians, such as Lucy Riall in her book The Italian Risorgimento: State, Society and National Unification, have recently begun to place the Italian unification process into a larger European context, tracing the connections between the Italian revolutionaries and liberal movements outside of Italy. Others, such as Bruno Giordano Guerri in, Il sangue del Sud. Antistoria del Risorgimento e del brigantaggio, have instead opted to retell the story of the Risorgimento from a Southern Italian perspective, which has up to now been disregarded in favor of the narrative of a Piedmontese bid for unification. After researching court documents in the state archives in Salerno and Naples, this study is a preliminary attempt to draw from both of these new historiographical trends. It thus focuses on a very limited, and very unsuccessful, uprising in the remote southern region of the Cilento in the year 1828. Yet despite its marginal place in the existing narrative of the Risorgimento, this particular uprising is quite remarkable, as it not only serves as an example of the continuing struggle of liberal movements in the south of Italy during the 19th century, but also had some interesting ramifications outside of Italy, particularly in the July Revolution of 1830 France. These connections between the obscure Italian revolutionaries and the more prominent July revolution, as well as the nature of Southern Italian liberal opposition against the Bourbons, will be the subject of this research.

SECRET: The Leaking and Withholding of Classified Information in America
James Carr, Self-Designed Studies
Sponsor: Professor Marilyn Young, History

In American politics, there is a strong tradition of leaking information to the press. Often, senior officials give reporters classified information in order to influence the political process and shape public opinion. Other leakers release massive amounts of information in order to expose what they perceive to be governmental misconduct. Daniel Ellsberg released thousands of pages of Top Secret information proving that the government had lied about the Vietnam War. Bush-era leakers exposed warrantless wiretapping programs. Bradley Manning gave Wikileaks hundreds of thousands of classified documents. Most recently, Edward Snowden has used classified documents to expose America’s global surveillance program. This research investigates the relationship between these leakers and the government whose secrets they have exposed. Based in a variety of primary sources—from memoirs and judicial opinions to chat logs and tweets—this study examines the motivations, methods, and goals of both leakers and government officials. It also evaluates the effects of various leaks. While noting similarities, this study finds that most leaks are scarcely comparable. The information exposed is usually vastly different, as are the goals of those responsible. The result, it concludes, is that Snowden’s recent leaks may affect America in ways previous leaks’ actions never could.

Woyzeck Revisited: Beyond a Foucauldian Approach
Junhao Chen, German
Sponsor: Professor Leif Weatherby, German

This study aims to fill a gap in current scholarly research. It will have two parts. The first part of the research argues that the conventional interpretations of the drama fail to investigate how the main character Woyzeck resists the power originating from higher social classes. It can be argued that the author Büchner transforms his historical source material, reimagining Woyzeck as a transgressive figure who resists power through his linguistic and spatial subversions of convention. The second part points out that literary criticism has ignored the element of biopower in the play. Biopower, as defined by Foucault, means the domain of life over which power has taken control. The play explores two radically different scales of biopower: regulation of individual bodies and the population-level social body. However, the notion of biopower does not sufficiently explain the sheer violence of the play’s later stages. To do so, a further concept was introduced: necropolitics. Necropolitics, defined by Achille Mbembe, delimits the right and the capacity to define who matters and who is disposable. This study argued that in a place rampant with biopower, the only way for Woyzeck to achieve subjectivity is through necropolitical acts—to undermine the structure that erases his subjectivity, and to reassert his individuality.
Turning On and Off the Post Racial Gaze
Anaíis Cisco, Film Studies
Sponsor: Professor Roopali Mukherjee, Media Studies, Queens College (CUNY)

Barack Obama’s historic election to the United States presidency in 2008 focused national attention on the first Black president and his family as living and unequivocal proof of the triumph of equal opportunity and the end of centuries of racial strife. The visible role of elite women like Michelle Obama and Oprah Winfrey has often been explored, while less well understood is the role of everyday portrayals of Black women as they normalize colorblind paradigms of post-racialism and “neoliberal multiculturalism” (Goldberg 2009). This research analyzes three media texts, all released in 2008—Neil LaBute’s Lakeview Terrace, Tyler Perry’s The Family That Preys, and Beyoncé’s If I Were A Boy music video—focusing on representations of Black women as sexualized objects involved in inter-racial relationships with white men. The study reveals that these ways of seeing serve the privileged white male gaze while falsifying racist and sexist realities. Offering key insights into the “post racial gaze,” the paper exposes how Black women are being positioned to normalize pleasurable post-racial fantasies and to facilitate discursive shifts toward neoliberal multiculturalism.

Cante Jondo: Written and Danced through the Choreography of Lorca and Graham
Lea Clay, Comparative Literature
Sponsor: Professor María de Lourdes Dávila, Spanish and Portuguese

This study explores Federico García Lorca’s Poema del cante jondo (Poem of the Deep Song), written in 1921 and published in 1931, and Martha Graham’s 1937 modern dance solo, Deep Song, through the lens of movement. While Lorca wrote his poem to reorient the identity of the cante jondo in the twentieth century and Graham choreographed Deep Song as a response to the inhumanity of the Spanish Civil War, both are guided by movement and musicality. To understand the ontological underpinnings of movement in each work, André Lepecki’s idea of the dancing body as a continuous mover and Alain Badiou’s notion of self-agency is referenced. It can be argued that Lorca creates a poetic natural and architectural world that moves unceasingly and Graham reifies. A personal interview with Terese Capucilli, who reconstructed and performed Deep Song in 1988, and highlights her own readings of Lorca is referenced. This study concludes that Lorca and Graham create permanency for the cante jondo by allowing it to move unceasingly and with self-agency. Both artists have been studied, but never in relation to one another. This research therefore offers an understanding of how both speak the same choreographic language through writing and embodiment.

On the Altar of Politics: Pope Francis in the Argentine Press
Carley Clement, Spanish and Portuguese
Sponsor: Professor María de Lourdes Dávila, Spanish and Portuguese

In this study, the reaction of the Argentine press to Pope Francis’ election is examined, looking specifically at the coverage of three papers: Página/12, Clarín, and La Nación. Specifically, a comparative study of the newspapers’ coverage of accusations that Francis had been involved in crimes of Argentina’s last military dictatorship is examined. Interviews with journalists from each newspaper to understand perspectives on the role of journalism and its relation to Argentine society and politics are also employed. With this analysis it is possible to broach questions of the politicization of memory in post dictatorial Argentina and the role of the press in this politicization. As questions of the strategic moves of each paper reveal their political affiliations and motivations in coverage, questions of individual complicity within complicit institutions need to be examined. This ultimately leads to an analysis of the role of the law in seeking justice and redress for the crimes of a dictatorship that can be described as cívico-militar for its complex ties to civic society. As trials of these crimes continue in Argentina today, an understanding of the role of the law in seeking redress proves to be of crucial importance to Argentina’s overarching processes of transitional justice.

Because She Was One of Us: Princess Diana and the Transformation of Nobility in Late Twentieth-Century Britain
James Clements, History
Sponsor: Professor Guy Ortolano, History

Diana, Princess of Wales was one of the most visible figures of the last century. Her image, even since her death and the vast wave of public mourning it wrought, is re-produced endlessly, and she continues to elicit strong emotional and intellectual responses in Britain and beyond. This study argues that the public’s intimate relationship with the Princess began with her marriage in 1981, and is rooted in the ideas of nobility she embodied—the literal nobility of her title, the visual nobility of her beauty, and the benevolent nobility of her compassionate performance of charity. As the “fairytale of the century” collapsed and her marriage ended, Diana’s deep unhappiness caused a shift in her performance of nobility as she battled the Establishment she had married into and created a form of
subversive, guerilla royalty. Study of the Princess’ own words, British media sources, public responses, and secondary literature concerning British culture all illustrate this shift. Her continued popularity suggests that Diana can be seen as a lens through which historians can discern a shifting consensus of what constitutes nobility in contemporary Britain, and illustrates that she must be afforded the academic significance that has been largely denied to her.

**A World By Itself: Geography, Otherness, and Hybridity in Shakespeare’s Cymbeline**
*Christopher Corbo, Dramatic Literature*
*Sponsor: Professor John M. Archer, English*

This research contends that Shakespeare’s 1611 romance *Cymbeline* best negotiates the anxieties of British national origin that were reigned at the turn of the seventeenth century. The play draws upon understandings of civility and barbarity as informed by contrasts between native British mythology and ancient Roman accounts of Britain, and explores these issues through constructs of space, perspective, and subjectivity. By means of these approaches, notions of identity that were linked to this dichotomy are deconstructed throughout the play. However, in the final scene, a new order is established that stresses the inherent hybridity of the nation and the necessity for peace and forgiveness in the face of violence. The structure of this study can be considered in three different phases: Foundation, Deconstruction, and Reconstruction. This argument is founded on the wealth of existing scholarship invested in the geographical and nationalistic elements of the play. To this, additional texts of spatial theory as well as critical frameworks that consider the fragile relationship of defining the self relative to Otherness are introduced. The work that has been done not only challenges previously held conclusions, but also furthers the arguments of this study regarding the development of a hybrid nation built upon internal heterogeneity.

**Out of Control: Sexual Danger and Female Adolescent Desire in Charlotte Temple, Forever..., and the Twilight Series**
*Meredith D’Angelo, English*
*Sponsor: Professor Patricia Crain, English*

This study examined Susanna Rowson’s *Charlotte Temple* (1791), Judy Blume’s *Forever...* (1975), and Stephenie Meyer’s *Twilight* series (2005–2008) together as works of female adolescent literature in order to examine how each text represents the sexuality of teenage girls. *Charlotte Temple* is a seduction novel that chronicles the downfall of a 15-year-old schoolgirl who runs away to America with a British solider. Her seduction results in social exile, pregnancy, and death—dangers from which Rowson endeavors to protect her young female readers by framing her novel as a tool of what we would now call sex education. In order to save girls from seduction and preserve new middle-class values, Rowson recommends that they learn from Charlotte’s tale, surround themselves with good friends, and defer sexual decisions to their mothers. Though she offers these clear solutions, Rowson has trouble ascribing blame for Charlotte’s seduction due to a reluctance to acknowledge Charlotte’s sexual desire and possible role in her own fate. *Forever...* tells the story of a teenage girl’s sexual relationship with her boyfriend in the 1970s. Blume performs the cultural work of defining new norms for female adolescent sexuality in a society that has been influenced by second wave feminism and the sexual revolution. The protagonist, Katherine, conforms perfectly to these norms, allowing her to successfully manage her sexual relationship with her boyfriend without falling victim to the threats of pregnancy or sexually transmitted infections. Blume constructs these norms by layering liberal ideology and sex education agendas to create what can be called the institution of Judy Blume: a defined discourse meant to control and manage teenage girls’ sexuality. In Meyer’s *Twilight* series, the supernatural elements of the narrative concretize the dangers of sex. Bella, the protagonist, experiences overwhelming desire for her vampire boyfriend Edward, but he refuses to allow her to act on it because doing so would mean putting her at risk for physical injury. The incapacitating nature of Bella’s desire necessitates that Edward control her sexuality, a deferral to patriarchy. Nevertheless, Meyer is the only author to explore female adolescent desire, allowing her readers to experience it for themselves through the text, whereas Rowson and Blume attempt to manage sexuality through sentimentality and education. Meyer also contends with the subject of sexual violence in her novels, which both Rowson and Blume fail to recognize as a threat. In all of these texts, female adolescent sexuality is dangerous. Though each author identifies different dangers based on her historical, cultural, and ideological context and prescribes unique (but equally simplistic) solutions, at the heart of each novel is an anxiety about unmanageable nature of female adolescent desire and a paradoxical understanding of girls’ sexual agency that simultaneously empowers them and undermines that power. This has significance for a number of disciplines, including literary studies and gender and sexuality studies, because it reveals cultural beliefs and anxieties relating to the sexuality of teenage girls, and it shows how popular literature can transmit these values and discourses to its readers.
Haunted Houses, Haunted Texts: Threatening Deviant Women and their Ghost-Children in the Victorian Domestic Sphere
Kelcie Des Jardins, English and American Literature
Sponsor: Professor Catherine Robson, English

This study deconstructs the haunted houses in Emily Brontë’s *Wuthering Heights*, Elizabeth Gaskell’s *The Old Nurse’s Story*, and Charles Dickens’ *Bleak House* to understand how Gothic conventions are deployed in Victorian literature to represent the deviant woman and her behaviors. Where the mid-nineteenth century realist text degraded and ultimately exercised women who threatened the domestic sphere, in these three “ghost” stories the women are able to rupture the text using the supernatural. Each text is examined individually, using three distinct features—the house, the domestic servant, and the ghost-child—to understand how deviant desires are expressed in a period known for its intense repression of sexuality. The research concludes that the ghost-child is the representation of deviant sexual desires, civil discord, and maternal rejection that constructs a space within the home for the deviant woman. This study offers an alternative way to read ghost stories, asking that scholars not dismiss the ghost-child as a Gothic trope; rather, ghosts are a viable way to reveal otherwise invisible women.

Purifying the Pharaoh: The Case for Pharonic Legitimation through Religious Art, and the Evolution of a Centralized Formal Egyptian Style
Claire Duleba, Art History
Sponsor: Professor Ann Macy Roth, Hebrew and Judaic Studies

Purification is an important aspect of Egyptian religious and royal art, central to scenes dating from as early as the fifth dynasty (2494 to 2345 BCE); the motif remained in use through the Greco-Roman period (332 BCE to 642 CE). This type of scene, which depicts two gods blessing a pharaoh by pouring water in the form of hieroglyphs over his head, has different gods performing the blessing depending on the era and location of the scene. Alan Gardiner hypothesized on the meaning of the switching of gods in 1950, but his hypothesis has come into question as new variations of the scene have come to light. In order to explain these newly found variations, one Middle Kingdom scene (from 2010–1640 BCE) and three scenes from the New Kingdom (from 1550–1069 BCE) will be analyzed to illustrate both the change in represented gods, and the change in the artistic representation of the pharaoh’s divine status through time, in the context of the changing power of religious institutions, and Egypt becoming a centralized empire.

Language of Chaos
Irakli Eliashvili, Physics
Sponsor: Professor Friedrich Ulfers, German

Scientific thinking has always depended on a neutral scientific discourse, a direct language that would not indulge in metaphors and therefore escape bias. This research investigates how introduction of Quantum Physics revolutionized the understanding of the scientific discourse, making language “unable” sometimes to express the true nature of things and escape this very bias. From the uncertainty principle of Heisenberg to particle-wave duality, notions of quantum physics are explored to express the whys? and hows? of such phenomena. The likes of Suzanne Langer and Friedrich Nietzsche are employed to understand the foundations of our Language and man-kind’s innate need to understand the world he/she lives in. Finally, the study introduces Quantum Physics as the product of a careful application of the scientific method, logic and empiricism, arguing that we need to develop a new understanding of our relationship with the universe as orderly and our language as built on binary oppositions as we seek to explore “[something] standing in the middle between the idea of an event and the actual event, a strange kind of physical reality just in the middle between possibility and reality” (Heisenberg). This contains a unique angle on viewing Language as the “best” (not ultimate) medium of exchange ideas possible.

The Humor of Samuel Beckett
Jane Excell, Dramatic Literature
Sponsor: Professor Julia Jarcho, English

What makes us laugh in the theatre? What makes us laugh while reading a novel? The question of what we find funny in a piece of fiction may seem so basic that we rarely give it much thought, but a closer look at the “comedy” of certain writers shows that the issue is vastly more complex than it may at first appear. Samuel Beckett is one example of a writer whose works push humor to its utmost limits. His plays and stories often explore such dark topics as the apocalypse, the inescapability of suffering, and the pointlessness of life, and yet somehow he still manages to make audiences laugh. This project explores how Beckett achieves this laughter variously in his plays and novels, how his use of humor is affected by genre difference, and how it impacts his readers and audiences. To do this, this study compares and contrasts the humor in two specific works by Beckett: the play *Waiting for Godot* and the novel *Murphy*. In order to get closer to the heart of Beckett’s comedy, it is important to go back to some of the most essential and influential critical theories of drama, prose and humor, including Freud’s *The Joke and Its Relation to the Unconscious*, Martin Esslin’s *The
Theatre of the Absurd and Verna Foster’s The Name and Nature of Tragicomedy as well as the relevant critical works dealing specifically with Beckett, including Ruby Cohn’s Samuel Beckett: The Comic Gamut, Wolfgang Iser’s The Art of Failure: The Stifled Laugh in Beckett’s Theatre, and Carla Locatelli’s Comic Strategies in Beckett’s Narratives. Beckett once commented that his humor works to “reinforce that from which it relieves” and these sources will be used in conjunction with a close reading and comparison of the two primary texts in order to get at the heart of what Beckett’s humor relieves and reinforces, how it does this, and how the relief and reinforcement it provides influence its recipients. While Beckett’s works have enjoyed a great deal of international acclaim and critical study, the comedic aspects of his work are ripe for further investigation. The darker concepts at work in his pieces, such as the nature and inescapability of suffering, have historically been given the lion’s share of critical and popular attention. By comparing the humor in his plays to that in his novels, this project seeks to expand this area of Beckettian critical study, and results in a more specifically unique insight into the laughter that he manages to produce in both cases.

A Study in Simultaneous Authorship
Christopher Gellert, French
Sponsor: Professor Eugène Nicole, French

This past summer I wrote the same short story in English and in French. The short story was the same, but its form varied—each a variation on a theme, where theme was narrative. The goal of the project was both to write a good short story—though after I finished it I realized it was more of a prose poem—and also to demonstrate the limits of translation, that the very act of translation is a betrayal. Rather than seeing this as a limit, or by using a foreign language as prism to focus my mother tongue (as Beckett did by writing Waiting for Godot first in French), I exploited this opportunity to explore the same themes through the idiom and syntax of a particular culture. I believe that form and function are intimately tied and that expression speaks directly to the function, or content of a work of art. In order to achieve this goal, and avoid translating myself, I wrote each piece concomitantly with its twin. In this project, I believe that I not only wrote a fine piece of literature, but was able to explore language in a way not yet attempted.

Teaching Rock Nacional: Rock Music as Alternative Narrative in Argentina
Caroline Getz, Comparative Literature
Sponsor: Professor Eduardo Matos-Martín, Comparative Literature

The focus of this investigation is Argentine rock music (rock nacional), with a focus on how the politically charged songs written during and directly after the military dictatorship help transmit the history of that particular period in Argentina (1970–1983). This study is structured around the lens of pedagogy: how is music used to teach the history of social movements? How can rock nacional specifically be an effective teaching tool? The project includes historical background on the dictatorship and the rise of rock music in Argentina, with the ultimate goal of demonstrating how songs communicated the violent and unjust acts perpetrated on the citizen body by the Argentine government. The research examines the music itself as well as interviews with artists, politicians, music critics, and scholars who focus on the importance of cultural memory in a post-dictatorship society. With this study it is possible to join the conversation regarding how rock nacional acts as an alternative narrative and an important teaching tool, and ultimately provide inspiration to educators to include the music of rock nacional in their curricula.

Male Fears of the New Woman in Paintings by the New Objectivity
Agathe Gindrey, Comparative Literature and German
Sponsor: Professor Alys George, German

During the German Weimar Republic (1919–1933), the New Woman laid claims to emancipation on social, political, and economic fronts. She cut her hair short in styles that actresses like Louise Brooks popularized, and adopted practical clothes that suited thin, athletic frames. Conservative men disapproved of modern women’s break from tradition. They feared that New Women were “masculinized” by their androgynous appearance. This look is illustrated in Rudolf Schlichter’s 1923 Woman with Tie, which portrays a woman with a ubiquitous page-boy haircut wearing typically masculine clothes. The New Woman’s disassociation of sex from the idea of childbearing through the use of birth control and abortions made men fear her sexuality, which they perceived as both non-reproductive and voracious. Christian Schad’s 1928 Two Girlfriends, a double portrait of women masturbating, represents this anxiety. These fears culminate in revenge as it is depicted in Otto Dix’s Sex Murderer: Self-Portrait (1920), in which the artist paints himself mutilating his female victim. Yet these works do not solely illustrate negative responses to New Women; the artists’ ambiguous positions translate the time’s complex situation between tradition and modernity. This research presents a complete image of the New Woman by comparing and contrasting Weimar’s artistic and literary depictions of her.
Kingship and Political Sanctity: Edward the Confessor and Edmund the Martyr in England, 1216–1399
Kelsey Haver, History and Art History  
Sponsor: Professor Brigitte Miriam Bedos-Rezak, History

The relationship between the cults of St Edward and St Edmund to later post-Conquest English kings has been explained and discussed by scholars focusing on particular instances of the cults’ literary and artistic advancements throughout the medieval period. However, there has been little examination of the long-term trajectory of these cults through the reigns of distinct monarchs in the later Middle Ages. This study addresses the growth of these two saints from the 1216–1399, focusing on the reigns of Henry III and Richard II. The kings’ promotion of Edmund or Edward was a mutually beneficial enterprise whereby kings were able to harness the symbolic qualities that each saint represented in written Lives and images in order to fashion them into saints specific for royal use. Examining St Edmund and Edward the Confessor from the rule of Henry III until the disastrous end of Richard II’s reign grants greater insight into how monarchs affected the manifestation of these saints’ cults over time, and how saints could be utilized as valuable and appropriate political tools for the benefit of individual kings in late Medieval England.

Devon Hersch, Art History  
Sponsor: Professor Pepe Karmel, Art History

Academic criticism of videogames remains nascent, making it unsurprising that most scholarship focuses on broad definitions over detail. Moreover, the struggle to create a new academic field, Game Studies (GS), led to prolonged dispute over whether it should follow ludology (studying a game by its rules) or narratology (studying a game by its story, appearance.) Unfortunately, these developments hindered scholarship with the task of superfluous qualification. Fortunately, later writers revealed a synthesis of these approaches, which improved scholarship drastically. Nevertheless, insular GS parameters still favor “new” and technical modes of analysis. Such inflexibility impedes understanding and allows problematic assumptions to remain unchecked. This research disrupts the commonly held assumption that the medium is of American origin. An analysis of historical, cultural, and game scholarship about postwar Japan demonstrates videogames are fundamentally non-western. Further, this research allows for the unprecedented act of identifying trend over time. In describing the complex exchange between Japanese and American culture, and thus games, this study reveals the greatest threat to videogames is corporate America’s newfound dominance over them (late 2000s). Its fixation on profit has increasingly homogenized and simplified games. This research seeks to expose this trend and provide insight to rectify it.

The Spectre Across American Socialism: Eugene V. Debs and African American Labor
Emily Hirsch, History  
Sponsor: Professor Daniel Walkowitz, Social and Cultural Analysis

In the early 20th century, labor unions and radical political movements, such as socialism, communism, and anarchism, gained prominence in the American public and political spheres. Simultaneously, recently enfranchised African Americans began moving north en masse to escape the racial violence and lack of economic opportunity of the South, drawing the resentment of many white industrial workers who viewed them as a threat to strike solidarity and to white workers’ positions in the labor market. Many prominent socialists of the time shared this prejudice, favoring exclusion of African Americans from the Party. At the head of the growing Socialist Party stood Eugene V. Debs, a former union leader who participated in several notable strikes. Debs went on to run in five presidential elections representing the Socialist Party. Unlike many of his associates, however, over the course of his political career Debs developed a progressive view on racial equality for African Americans. As the Party’s most recognizable figure for several decades, Eugene V. Debs, by holding an increasingly tolerant position on race, facilitated the Socialist Party’s development toward the more inclusive stance it took toward African American workers after his death.

Reading Kafka’s Windows: Friendship, Writing, and World
Tycho Horan, Comparative Literature  
Sponsor: Professor Avital Ronell, German

Architecture plays a critical role in Franz Kafka’s stories. Kafka’s stories are set within complex and confusing spaces that challenge the very laws of architecture. This study tracks specifically the architectural structure of the window in Kafka, paying particular attention to his stories The Judgment, The Metamorphosis, and The Test as well as Kafka’s letters to Max Brod from 1921–1922. The window in Kafka also opens questions of friendship, family, writing, and the world. The window acts as a failed boundary between the inside and the outside. It give the writer a view into the world, a comforting connection, but the threat looms of closing and plunging the room into darkness. This study also probes the many impossibilities that Kafka’s windows present, like the impossibility of shutting out the intrusive and violent forces of the world or the impossibility of letting in the fresh air, or perhaps the most pressing impossibility: reading the Other in Utopia. The research also engages
narrowous philosophers and critical thinkers, most notably Walter Benjamin, Paul Celan, and Emmanuel Levinas and explores the relatively unexplored avenue of architecture in Kafka, but grapples with much larger questions of modern life and urban dwelling.

The Muslims of New York’s Jewish Communities, 1893–1964
Sabeel Jameel, History
Sponsor: Professor Hasia Diner, Hebrew and Judaic Studies

Muslims have resided in North America since the first “immigrants” came as African slaves in the 17th century. By the early twentieth century, pockets of visible Muslim communities began sprouting around New York City. This project focuses on the Muslims who arrived after the 1890s to settle in and around New York’s predominantly Jewish communities, namely the Lower East Side, Harlem, and the numerous communities found within Brooklyn. Based on original research unearthed from New York City’s various archival collections, the findings point to a diverse array of Muslim residents who lived and interacted with Ashkenazi, Sephardic, and Black Jewish populations, whether in shopping at their kosher meat markets, negotiating housing costs, or establishing some semblance of interfaith efforts. The current literature of American immigrant history essentially ignores the important role that Muslim immigrants played in the greater American narrative. On top of providing a crucial new chapter to Islamic, Jewish, and American histories, this research evolves our understanding of how different immigrant groups related with one another in true “melting pot” fashion, thereby adding an important new lens for examining the immigrant experience.

I Hate School: Finding Voice in the English Language Classroom (And Actually Listening to It)
Tabatha Johnston, Global Liberal Studies
Sponsor: Professor Ifeona Fulani, Liberal Studies

As globalization connects the people of the world, the demand for learning English is growing. Many schools are creating English language programs that focus on communicative competency—the ability to use English to communicate with others—that employ Communicative Language Teaching (CLT). Unfortunately, the implementation of CLT has not been easy, because it is an unfamiliar teaching approach to most classroom cultures. Many classrooms are labelled CLT when the actual teaching practices are far from communicative. This research addresses how to solve this conundrum by presenting solutions on how to make CLT lessons work. These solutions are based on extensive research, conversations with fellow teachers, and my own experiences as a teacher in Florence, Osaka, and New York. In the end, the solution is sensitivity. Teachers must be sensitive of their students’ needs to support the learning process, and schools and governments must be sensitive of their teachers’ needs to expedite the teaching process. With this heightened awareness, students will be able to successfully learn how to communicate in English. This will not only enable them to use English but also find a voice to share a new English-speaking identity in their interactions.

Universal Principles and Native Language Influences and Deterrents on the Perception of Minimally Distinct Sounds
Avital Kaplan, Linguistics
Sponsor: Professor Gillian Gallagher, Linguistics

While all human vocal tracts have the physical capability to produce a range of sounds, no natural language utilizes every possible sound in its phonology. Additionally, different languages that employ the same sounds may categorize some of those sounds differently: sounds are characterized by multiple aspects of their production and articulation, and if two sounds differ only minimally within these aspects, languages may categorize them as variants of the same sound. Two such sounds are the voiced uvular fricated rhotic, /ʁ/, and the voiceless uvular fricative, /χ/. While these are two distinct sounds in Hebrew, it is posited that in French, the /ʁ/ devoices in certain environments and is realized more like the /χ/, despite the latter’s lack of rhoticity. To test this, native speakers of French listened to recordings made by a native Hebrew speaker of pairs of nonsense words that were identical but for these two sounds, followed by a repetition of one of the two words of the pair. In asking the French speakers to choose which word of the pair was repeated, it was found that they had the most difficult time with the fricative, /χ/, when preceded by another voiceless consonant, which is the environment in which the fricative-like variant of the /ʁ/ is realized. Additionally, native speakers of American English (AE) took the test. English employs neither of these sounds, and it was of interest to investigate their innate relation when untouched by a native phonology. It was found that AE speakers had significantly more difficulty with /χ/ than with /ʁ/, suggesting that a rhotic, even a non-native one, is an easier manner to assimilate to native categories than a fricative.

Poor Land Makes Poor People: Rexford Tugwell’s Resettlement Administration and the Rural New Deal
Sara Katz, History
Sponsor: Professor Kimberly Phillips-Fein, History

The economic, political, and social realities of the Great Depression presented President Franklin D. Roosevelt with a unique opportunity to enact wide-reaching initiatives that improved the material condition of thousands of ailing Americans. While the popular narrative of the Roosevelt
Administration celebrates its commitment to enacting progressive legislation, recent scholarship has questioned the origins and forces behind the New Deal and proposed that the end goal may not always have had the well-being of ordinary individuals at its core. The Resettlement Administration and its founding administrator, Rexford Tugwell, challenge the assertion that in the aftermath of the Great Depression the Roosevelt White House was solely focused on restoring business confidence and improving the economic climate. Tugwell and his administration espoused anti-poverty rhetoric that emphasized alleviating human suffering over restoring profit to business. Through original research in the National Archives and FDR Presidential Library, this study articulates the significance one individual with the ear of the president—Rexford Tugwell—had on implementing policy that was genuinely meant to alleviate poverty. It examines the role of the individual actor within a larger government administration, and sheds light on an often ignored, yet significant, project of the New Deal.

Collective Beliefs in Corporate Morality
Solon Kelleher, Philosophy
Sponsor: Professor Kendy Hess, Department of Philosophy, College of the Holy Cross

As Margaret Gilbert opens her article on *Modelling Collective Belief*, “It is natural to distinguish between the beliefs of groups, or collective beliefs, and the beliefs of individuals” (185). In her discussion, Gilbert raises significant questions such as What is the nature of this distinction? and What is a collective belief? In this research, four theories are examined and compared which propose answers to these questions. Although each of these theories lies moderately between individualism and holism, each takes a distinct approach to defining collective belief. Creator of the Corporate Internal Decision Structure, Peter French suggests that all aspects of a corporation (as a particular type of collective) can be defined by the organization of its members, corporate policy, and sanctioned corporate acts. In her discussion of collective beliefs, Margaret Gilbert proposes her Joint Action Theory, which requires individuals to share or jointly accept beliefs. Michael Bratman presents his list of seven qualifications for a collective to achieve a group intention which has implications for a theory on collective belief. Lastly, the theory of Kendy Hess, who avoids discussing the individual by comparing the systems at work in forming collective beliefs to the systems at work in forming individual beliefs is explored. The first three theorists are grouped as individualist, and the benefits of a more wholist approach such as the approach taken by Hess are identified. This research topic has important implications for understanding corporations’ beliefs, actions, and responsibilities.

Resisting Consumable Fictions: a Play-Centric Approach to Reading Postcolonial Formal Collapse in the Ludic Century
Mehak Khan, English & American Literature
Sponsor: Professor Toral J Gajarawala, English

Pakistan literature has seen a burgeoning of fiction in English in the past decade. These texts are typically historical and realist, seeking to work through postcolonial paradigms via diegetic constructions; characters that are representative of the state, protagonists that are liminal figures in the strata of culture being depicted, or even representations of historical figures. However, in order to access the problems of contemporary Pakistani society without creating texts that can be consumed, some novelists have taken on the project of experimenting with form instead of narrative. These texts might offer elaborate conceits, but intentionally fail to hold up said conceits, or they might be digital yet have illegible narrative, and thus only make meaning through formal play. In order to read these moments of formal collapse as aesthetic failure, this study looks to the paradigm of video game and play studies to comment on the ambivalence these texts appear to present; on the one hand, they are anti-universalist, but via their use of structural play for political critique, they depend on abstracting or universalizing failure to convey the specificity of their engagement.

Tanaquil at the Window: a Near-Eastern Trope at Archaic Rome?
Daniel Peter Kosasa, Classics
Sponsor: Professor David Levene, Classics

T.J. Cornell makes the claim in the *Beginnings of Rome* that the appearance of Tanaquil at a window at Livy’s *Ab Urbe Condita 1.41* “recalls” the Near-Eastern ritual of the sacred marriage rite, and that this is evidence that the late Roman kings employed Near-Eastern methods of political legitimation. Cornell’s assertion is based largely on the work of Cristiano Grottanelli, whose article *Servio Tullio, Fortuna, e l’Oriente* identifies Tanaquil with the sacred prostitutes of the Near-Eastern Ishtar-Mylitta cult, who are depicted peering out of a window in a number of ivories. Grottanelli does so by pointing out that Tanaquil shares a number of similarities with these sacred prostitutes and other women in classical literature associated with windows and sacred prostitution. Grottanelli’s methodology for demonstrating a relationship between Tanaquil and sacred prostitution is faulty because similarities do not guarantee a genuine relationship. Despite this, arguments based on parallels and similarities are often used in scholarship on early Rome and classical mythology, and these render unreliable conclusions. Tanaquil’s appearance at the window is certainly mysterious, but another approach is necessary to make sense of it.
The Body in Psychoanalytic Literature

Larissa Lai, Psychology

Sponsor: Dr. Jacqueline Carleton, Private Psychotherapy Practice, New York City

Modern psychotherapy has evolved from classic psychoanalysis. While undergoing substantial revisions and transformations since their original form, psychoanalytic theories continue to significantly influence therapy practice. But it is still easy to generalize psychoanalysis as an area that focuses exclusively in and of the mind. Thus, theories that include the body and the physical have been frequently overlooked. This close examination of psychoanalytic literature scrutinizes the texts concerning views of the body in the psychoanalytic community from 1890–1950, based on the material drawn from PEP-Web (Psychoanalytic Electronic Publishing), a comprehensive online database of psychoanalytic writings. The discourse of the body-mind relationship is situated at the center of this dialogue, crossing over philosophical, clinical, and psychological perspectives. Questions regarding the ego, “ego-feeling”, consciousness, instincts, sexuality, and child development all play into the richness of this discussion. With growing interest in connecting the mind and body in the field of somatic psychology as well as mainstream psychotherapy, the close reading of these psychoanalytic texts provides a sound theoretical background for those interested in incorporating the body/soma into psychotherapeutic practice, as well as for any avid thinker who is critically involved in the mind-body debate.

A Tough Pill to Swallow: Margaret Sanger, the Birth Control Movement, and Eugenics

Sydney Lakin, History

Sponsor: Professor Cathy Moran Hajo, History

The relationship between eugenics and the birth control movement has a complicated and controversial history. Eugenic ideals pervaded the thoughts of most progressive thinkers and movements of the first half of the twentieth century, including Margaret Sanger and her crusade for birth control. However, after World War II, eugenics was dropped from American dialogue concerning social reform, viewed as a horrific and embarrassing past. Fortunately, more light has been shed on this dynamic, as recent historians have begun to examine the connection between eugenics and the birth control movement, specifically in context of its pioneer, Sanger. While it is undeniable that there is a link between the two movements, it is disputed as to how deep the connection penetrated, how much it motivated Sanger, and its implications today. This project seeks to answer these questions by dissecting the discourse surrounding Sanger’s attention to working-class women and analyzing Sanger’s own words to determine how she should be defined within four benchmark realms of the eugenics movement: Positive/Eugenic, Defining the ‘Fit’ and ‘Unfit’, Hereditary/Environmental perspectives, and Voluntary/Coercive measures. This research contributes a historical perspective to the modern-day discourse surrounding Sanger’s legacy, women’s rights, and Planned Parenthood.

A Taxonomic Approach to Louise Bourgeois’ Early Paintings: 1937–1949

Andie Levinson, Art History

Sponsor: Professor Kenneth Silver, Art History

Between the years of 1937 and 1949, Louise Bourgeois created over fifty paintings. Although Bourgeois is predominantly known as a sculptor, scholars have repeatedly diminished the value of her early painted oeuvre, while according her drawings and etchings well deserved recognition. Despite the artist’s internationally acclaimed career, no catalogue raisonné or definitive work of literature exists on these paintings. Bourgeois exhibited small groups of her paintings in a handful of mid-twentieth century solo exhibitions, but accompanying catalogues and checklists are minimal if they exist at all. When featured in survey exhibitions, Bourgeois’ paintings are consistently given short shrift, and rarely appear in catalogs as more than supplements to the artist’s early biography. The present study attempts to rectify this neglect by offering an in depth visual and thematic analysis of the works, and by suggesting a taxonomic approach to the painted work. This taxonomy argues that Bourgeois’ paintings fall into six broad categories: Young Women in Profile, Object-Based Paintings, Early Architectural Motifs, Grid Paintings, Femme Maison Imagery, and Later Architectural Motifs and Sculptural Forms. The majority of these groups feature several subcategories as well. By classifying Bourgeois’ paintings into distinct, visually-oriented sets, it is apparent that the artist’s paintings demonstrate a clear motif-based progression that extends into her well-known, early three-dimensional work. This taxonomy of Bourgeois’ paintings is important because the overwhelming majority of these works are privately owned, meaning that scholars may not even be aware of their existence, let alone their significance. Furthermore, in the wake of Louise Bourgeois’ recent death, this study suggests that an understanding and appreciation of the artist’s early paintings is crucial to a discussion of her now completed oeuvre.

Climate Change and Individual Moral Obligations: A Response to Walter Sinnott-Armstrong

Aaron Thomas Lynch, Philosophy

Sponsor: Professor David Frank, Environmental Studies

In his 2005 essay “It’s Not My Fault: Global Warming and Individual Moral Obligations,” Walter Sinnott-Armstrong argues that anthropogenic climate change generates no ethical requirement for any individual to abstain from
wasteful greenhouse gas (GHG) emissions. Because no one individual’s emissions are necessary or sufficient to cause the harms of climate change, no individual is causally responsible—and therefore morally culpable—for those harms. This study argues against this view, drawing on universally acknowledged cases where an individual can be held morally culpable for harms for which they are not causally responsible. From Derek Parfit’s famous “harmless torturers” to cases of causally overdetermined murder, this study considers what generates moral culpability in these cases, then apply the same reasoning to climate change, finding each time that an individual moral obligation to reduce GHG emissions results. Even Sinnott-Armstrong’s own account of what makes causally overdetermined murder morally prohibited—that the murderer intends to cause harm, and that his act is unusual—is shown to apply just as well to the case of wasteful GHG emissions by affluent first-world citizens like ourselves. This research concludes that we are each morally obligated to reduce our GHG emissions, many of us drastically so.

**Savage Passion: The Racial and Ecclesiastical Fantasy of Juan León Mera’s Cumandá**  
**André Marston, Spanish and Portuguese**  
**Sponsor: Professor Sinclair Thomson, History**

Questions of race relations were salient topics in nineteenth-century Latin America, an era of nation-building for recently independent countries. This project investigates how Juan León Mera’s Cumandá (1879) presents his vision of racial and religious redemption in Ecuador. The book follows the indigenous Cumandá and her romance with white poet Carlos Orozco. Through the romantic pairing, Mera advocates a relationship between whites and Indians in which they borrow each other’s supposed “best” cultural values. Nevertheless, his proposal is not meant to eliminate racial difference; it intends to reinforce preexisting hierarchies. The death of both lovers and the revelation that they are long-lost siblings are, in fact, explicit warnings against racial mixture. The lovers’ father, José Domingo, then emerges as the character that encompasses the full scope of Mera’s redemption narrative. Domingo’s spiritual guidance of the natives after repenting his past colonial abuses against them symbolizes the author’s desired religious rehabilitation for Ecuador’s citizens. This research explores the details of Mera’s fantastical vision in this text because it demonstrates the profound impact literary production can have on understandings of nationhood, and vice versa.

**Dominican American Difference: Heterogeneity in Literary Re-creations of Dominicanidad**  
**Manuela Silvestre Martínez, English and American Literature**  
**Sponsor: Professor Tomás Urayoán Noel, English**

This study analyzes the types of Dominican subjectivities being proposed and produced in contemporary literature for U.S. consumption, specifically in the writing of Rhina P. Espaillat, Julia Alvarez, Junot Díaz, and Josefina Báez. The term “diaspora” not only continues to be pertinent for characterizing Dominican subjectivities and literatures, but also that these texts exemplify Stuart Hall’s conception of diaspora in difference. Whereas a multiculturalist approach might group these texts together on the basis of the authors’ Dominican heritage, reading their work together actually suggests the heterogeneity of Dominican American experience through their diverging concerns and aesthetics. These authors’ insistence on revealing difference resists facile conceptions of dominicanidad and pan-Latino ethnicity. In fact, these authors argue for the necessity of emphasizing difference as they constitute complex speakers and characters across normative boundaries of language, gender, race, and class. In doing so, they engage in political work against the homogenizing that has long been a tool of oppression. These texts thematize the role of representation and re-creation in negotiating identity. Moving chronologically, each author adds to the multiplicity of dominicanidad, creating hybrid characters that are not stifled by the supposed conflicting aspects of their subjectivities but instead are empowered by them. Espaillat focuses on language, Alvarez on gender, and Díaz and Báez emphasize race and class. While Espaillat and Alvarez thematize an awareness of difference, Díaz and Báez perform it. Ultimately, the focus on difference in these texts implies that discrepancies between individuals cannot be relegated for the sake of creating a “unified” “ethnic” group. Yet, differences do not have to mean division. Since heterogeneity exists within all groups, acknowledging differences presents us with a way to make alliances beyond ethnic or national loyalties. Similarly, analyzing these texts with criteria other than cultural identity allows us to reconceptualize what can be considered American Literature and could allow us to free texts like these from subaltern positions in the canon. These texts provide a model for cultural identity that is active and a model of diaspora that involves a re-telling instead of a return. Dominicanidad is constantly constituted and redefined through representation and reading.

**PATCO’s Indelible Legacy on the American Worker**  
**Raj Mathur, History and International Relations**  
**Sponsor: Professor Maria Montoya, History**

On August 3, 1981, the Professional Air Traffic Controllers Organization (PATCO) crippled American and global air
Writing Home: Vocational Labor and Literary Production in Contemporary American Homesteading
Amanda McLoughlin, English and American Literature
Sponsor: Professor Una Chaudhuri, English

This study examines literary production in contemporary American homesteading. Homesteaders choose for ideological or ethical reasons to lead lives that are centered around the home, producing for themselves the food, household goods, and other items that most people typically buy. Many are also prolific writers who define the politics, meaning, and community context of their lifestyles through literary production. The bulk of this research focuses on the significance of labor and the construction of selfhood in this body of work. The first section of this study focuses on homesteaders’ innovative perspective on the relationship between people and objects. Homesteaders reject mainstream American cultures of consumerism and materialism, imploring readers to pay closer attention to the things they use rather than buying and disposing of mass-made objects indiscriminately. In section two, an analysis of homesteaders’ work is examined by engaging with the questions of scale and labor raised in environmentalist writer Paul Kingsnorth’s essay “Dark Ecology.” Homesteaders fulfill Kingsnorth’s recommendation to return to an intimate, “human-scale” relationship with nature and objects. They voluntarily produce goods that most people purchase from others, and reap personal and spiritual benefits from this production-oriented lifestyle. Their particular kind of work is called “vocational labor,” a term that indicates the inextricability of work and identity in homesteading. Finally, homesteading literature constructs a collective selfhood for the homesteading community is analyzed. As a group of people linked by ideology rather than physical proximity, the network of American homesteaders as an imagined community is analyzed. In printed literature author-homesteaders establish historicity through references to established traditions and cultural movements, and websites allow homesteaders to socialize, share knowledge, and even conduct commerce regardless of their physical distance from one another. In conclusion, contemporary American homesteaders are described as “The New Pioneers.” They see the home as the final American frontier, a space in which they can reclaim objects, work, and identities from dominant cultural forces like globalization. As in early American frontier writing this genre affords individuals almost limitless opportunity to reinvent themselves, but a twenty-first century frontier is more accessible to historically disempowered groups than its predecessor. This research undertakes the first known literary analysis of contemporary homesteading texts, and asserts that this body of work is an important new addition to the genre of American literature that is worthy of scholarly study.

Ben Miller, History
Sponsor: Professor Linda Gordon, History

This study provides an origin story for Harry Hay’s theoretical developments in the 1960s and 1970s, answers the question of how Hay got from the Mattachine Society to the Radical Faeries, and contributes to a reconsideration of the development of important ideas in the history of LGBTQ theory and the history of LGBTQ politics. It takes the form of an intellectual biography, interrogating a part of Hay’s life that until now has been largely overlooked by scholars—the reconstruction of his emotional, intellectual, and political selves after all three were deeply rocked by his experience testifying in front of HUAC. Hay experienced a political and emotional paralysis caused by trauma from having been pursued by McCarthyism and abandoned by his Old Left colleagues. This trauma and paralysis was unlocked by developments in his research and theory. Reconsidering his unpublished writings from the late 1950s and early 1960s, the research argues that Hay developed an understanding of historical homosexual institutions as historically and culturally specific. Due to his Communism, he viewed only one of those institutions, the Berdache, as providing a valid model for his contemporaries to emulate; I present a reading of Hay’s theory alongside Engels’ Origin of the Family: Private Property and the State that demonstrates Hay’s commitment to the project of reconstituting primitive Communism and his conviction that what he called ‘homophiles’ were uniquely equipped to bring about that change. Additionally, it can be
argued that the key idea behind the Radical Faeries (the concept of subjective relationships), which existing scholarship dates to the early 1970s, was in fact developed as early as 1963. Hay’s affair with Richard Tapia, full of romanticized and orientalized views of Native Americans, allowed him to project his theory about homophile institutions at large onto a specific relationship that could serve as a model for others. The development of political ideas from that relationship and his later relationship with Jim Kepner (absent from his biography and otherwise ignored by scholars) provides an important example of oppressed actors oppressing others. Additionally, the details and eccentricities of his ideas about relationships, including the notion that sexual pleasure was useful only when it promoted political change are analyzed.


*Emily Mass, History*

*Sponsor: Professor Michele Mitchell, History*

The research presented here focuses on the importance of African-American feminists’ contributions to the women’s movement of the mid-to-late twentieth century. It aims to examine African-American feminists’ motivations regarding reproductive rights based on their race, gender, and class interests. In doing so, the project reveals how these motivations separated African-American feminists from the mainstream feminist movement, as well as the civil rights and Black Power movements. The research was conducted using primary sources from a variety of reproductive rights activists and organizations, including the Committee for Abortion Rights and Against Sterilization Abuse (CARASA). By examining these sources, the findings indicate that African-American feminists’ view on reproductive rights are distinguished by their concern with welfare for women who currently had children, their focus on ending forced sterilization, and their willingness to engage with oral contraceptives (“the Pill”) in the face of what had been called genocide by other black activists. This project is especially important in light of the refusal of many states to extend coverage for abortions funded by Medicaid, even in the cases of rape or incest under the Affordable Care Act. Coupled with the pending Supreme Court cases regarding the birth control mandate under the same act, the current political climate continues to show us that marginalized communities are consistently affected in different—and in some instances, harsher—ways.

**Saving Panpsychism’s Project to Account for Our Experiences from the Combination Problem.**

*Seok-Whee Nam, Philosophy*

*Sponsor: Professor Carla Merino-Rajme, Philosophy*

There is a view in philosophy of mind called “panpsychism”. According to this view, all particles have experiences, and their experiences together—not just the brain and its functions—give rise to our experiences such as seeing red or tasting vanilla. This view faces a notorious problem called “the combination problem.” The problem maintains that experiences do not combine with one another, and, so, even if particles have experiences, these experiences do not combine to give rise to our experiences. This, in turn, would mean that panpsychism is false. This study aims at offering a solution to this problem. The research proposes that getting a clear understanding of the similarities between the panpsychist’s proposal and the commitments of our physical inquiry will shed light on why there is no good reason for thinking that experiences cannot combine in the relevant ways. Looking closely to how science takes microphysical properties such as spin or charge to give rise to macrophysical properties such as rigidity or brightness can help us appreciate what is wrong with the thought that experiences do not combine. The upshot is that panpsychism should advance to become a leading account on how we have our experiences.

**The Contemporary Dominican Identity: Race and Gender Representation in Junot Diaz’s The Brief Wondrous Life of Oscar Wao and Rita Indiana Hernandez’s Papi**

*Luz Ozuna, Spanish & Latin American Literatures & Cultures*

*Sponsor: Professor Sibylle Fischer, Spanish & Portuguese*

Junot Diaz’s *The Brief Wondrous Life of Oscar Wao* and Rita Indiana Hernandez’s *Papi* both challenge Dominican stereotypes of race and gender in satirical and hyperbolic manners, respectively. The Dominican Republic has a complex history concerning racial identity. The anti-Haitian sentiments in the country have led to the—in most cases—complete negation of its African roots. In a country where 73% of the population is mulatto, the negation of African roots is ludicrous. The white Spanish ancestry in the country is the biggest influence on Dominican culture today. Women yearn for hair that is long and straight. The culture of “marrying lighter” in order to “whiten” the race is still strong today. In regards to gender, women are overly sexualized and kept in a socially and economically inferior position to men. This research found that in many cases women facilitate this inferiority by willingly depending on men. Men carry many stereotypes—the prominent one being that of a womanizer. Both *The Brief Wondrous Life of Oscar Wao* and *Papi* illuminate the aforementioned statements. Focusing on racial superiority and gender inequality within
the Dominican Republic allows me to shed light onto racial superiority within Latin America as a whole. Within Latin American media, such as telenovelas and films, the cast is predominantly white and the roles they occupy are those of the wealthy, attractive socialites. The Latinos of indigenous and black origin are cast as the blue-collar workers, chauffeurs, and servants. The media marginalizes non-white Latinos because Latinos marginalize non-white Latinos.

**For Rome or For Ruin: A Discourse on the Use of Punic War Similes by British Patriots in the Mid-Eighteenth Century**

*Ravindra Persaud, History & Classics*

*Sponsor: Professor John Shovlin, History*

This project involves a discussion of the ways in which British patriots helped move their country towards an Empire during the mid-eighteenth century. Embroiled in a constant struggle with their rivals, France, these patriots attempted to move Britain towards dominating the entire world. One tactic that they used to convince their peers was relating their current situation to those of the past, namely Ancient Rome. The main simile they used was one concerning the ancient Punic Wars between Rome and Carthage. However, the use of this simile reveals many of the problems that the patriot agenda brought with it. This project fills a gap in the current body of scholarship on the subject of the British patriots by looking at their rhetoric in a way that has not been done before.

**The McCormick Reaper**

*David Popkin, History*

*Sponsor: Professor Maria Montoya, History*

While the story of Cyrus McCormick has traditionally been recognized as that of a successful inventor, this study focuses on the various business, distribution, marketing, and manufacturing techniques that he utilized to transform agricultural production worldwide. McCormick was the first inventor to significantly reduce the amount of labor required during harvesting season with his mechanical reaper, a horse-drawn cutting apparatus, in 1831. Through the examination of various documents from the Wisconsin Historical Society, including publications from McCormick’s company, advertising handbills, and production reports, the research shows that the implementation of the reaper was merely the first step in the foundation of a business with an advanced manufacturing and distribution system capable of sending reliable machinery to farmers throughout the world. The widespread distribution of such a labor-saving device freed much of the population from agricultural pursuits to focus on other cultural, technological, academic and scientific fields. Because modern society as we know it would not exist without him, it is important to gain a better understanding of the man who, in 1851, was elected to the French Academy of Sciences “as having done more for agriculture than any other living man.”

**The Polish Empire: Geopolitical Concerns and Colonial Discourse, 1930–39**

*Piotr Puchalski, European & Mediterranean Studies & French*

*Sponsor: Professor Larry Wolff, European & Mediterranean Studies*

This study scrutinizes the ways in which colonial discourse in the Second Polish Republic (1918–39) reflected the country’s geopolitical concerns. Particular attention is paid to the activities of the Maritime and Colonial League and to the idea of “Maritime Poland” of Gen. Gustaw Orlicz-Dreszer. The Polish expedition to Liberia and the ways in which it was reported in the monthly Morze serve as a case study. In addition, the private correspondence of the contemporary traveler Kazimierz Nowak is juxtaposed with official propaganda. The analysis of many forms of colonial discourse in the newly-independent Poland leads to a more nuanced understanding of its overseas activities, which are conventionally seen as merely “imperialistic” in the English-language literature concerning the period. A new interpretation of primary materials and a dialogue with secondary works elucidate the little-known aspects of Poland’s colonial history: the economic pioneering in Africa and Latin America in the hope of improving the financial situation of Polish citizens and its attempt to reclaim its “rightful” place among European nations, among others. The conclusion argues that Polish interwar colonialism should be considered “legitimate” given the country’s geopolitical situation and its elaborate program of “Maritime Poland” that reached beyond territorial acquisition.

**An Anthropological Analysis of Astrology and the Margins of Scientific Hegemony**

*Artricia Marina Rasyid, Anthropology and Comparative Literature*

*Sponsor: Professor Alison Cool, Anthropology*

This research examines astrology and science as categories of knowledge that are socially constructed in culturally-specific discursive practices. Through interviews with astrologers in Manhattan, this study explores the modes of thought with which astrologers collectively imagine, define, and practice astrology as an amalgamation of an authoritative discipline—which they often assert as scientific—and as a semiotic mechanism. Drawing on an ongoing analysis of ethnographic interviews as well as data collected from astrological websites and discussion forums, this research contributes to scholarship pertaining to the politics and sociology of scientific knowledge. The theoretical framework
builds on Emily Martin’s idea of “scientific citadels” (1998) and the anthropological concept of scientific fraternities in order to argue that the production of astrological knowledge is embedded in linguistic and cultural repertoires shared by scientists and astrologers alike. Astrology, as a marginalized body of knowledge that is often dismissed as “mere superstition,” provides a compelling example for examining how social boundaries between science and non-science are drawn. This research demonstrates that scientific objectivity is an embodied, situated knowledge in which the discourses on power, gender, and class are particularly salient. Finally, the research aims to disrupt the assumptions behind the debate about whether astrology is science or superstition, and instead suggests that such simplistic separations are a barrier to thinking about the commonality of the two disciplines and the historical, cultural, and social milieu that shaped their conditions of productions and their privileging of certain claims of authoritative knowledge.

**Astor Place Riots**  
Dominique Roberts, History  
**Sponsor:** Professor Rebecca Goetz, History

The Astor Place Riots took place from May 8–10, 1849 and resulted in over 20 deaths. On the surface, the riot was the result of a long and public feud between two actors: the British actor William Charles Macready, and the American celebrity actor Edwin Forrest. In May 1849 New York City, both actors played the role of “Macbeth”: Forrest at the Broadway Theatre, and Macready at the “elitist” Astor Place Opera House. Crowds stormed the Astor Place Opera House in an effort to drive Macready off the stage and back to London. The riots are not often analyzed within the context of the larger class struggle and changing culture of mid-nineteenth century New York City. The actors’ feud was an undeniable contributor to the riot, but there is more to the story. There has been very little written in the past thirty years about this topic; a topic that was once considered a topic of history, but is now largely regarded as a topic of theatre studies. I am writing twenty-nine years after the publication of my most contemporary source still in print; and as a student of both History and Theatre, I have a unique perspective to bridge the gap between the two fields.

**To BE or not to HAVE: Application of Perspective Structure to Account for HAVE/BE Alternations**  
Chloe Jaclyn Rothbloom, Language and Mind  
**Sponsor:** Professor Stephanie Harves, Linguistics

This project explores the cross-linguistic variation of the verbs HAVE and BE when used in three syntactic constructions that make up the Locative Paradigm (Freeze 1992): existential (eg. There is a book on the table), locative (eg. A book is on the table), and possessive (eg. John has a book). Freeze (1992) and Kayne (1993) propose that HAVE and BE are derivationally related, in that HAVE is composed of BE plus an abstract preposition. However, the relation of HAVE and BE does not fully account for a puzzling occurrence in languages such as Polish, Bulgarian, and Korean, in which negation creates an alternation of the verbs (Blaszczak 2007; Irwin 2009). This project takes Partee and Borschev (2004)’s Perspective Structure Hypothesis, which is used to explain Genitive of Negation (Kagan 2007) in Russian, and applies it to Polish, Bulgarian, and Korean. Under Perspective Structure, presupposed information is said to determine when Genitive Case is used instead of canonical Case in negated sentences. Successful application would suggest that the presupposed information of a sentence also dictates the unexpected alternations of HAVE and BE. Research and native speaker consultations indicate that Polish and Bulgarian are sensitive to Perspective Structure, while Korean is not.

**Verdades (im)previstas: el Cine Documental de Raymundo Gleyzer**  
Lily Ryan, Spanish and Portuguese  
**Sponsor:** Professor Dylon Robbins, Spanish and Portuguese

Raymundo Gleyzer was an Argentine documentarian whose work during the 1960s and 1970s explores various places, people and problems in Latin America. This study analyzes three of his films: *La tierra quema* (1964), *Nuestras Islas Malvinas* (1966) and *México, la revolución congelada* (1971) and uses them as a springboard to contemplate the boundaries of documentary as a genre. Although these three films are all directed by the same person, each is unique in its subject matter, filming location and intended audience. Because of their diversity, these films contest the common preconception that documentary films use a uniform method to illustrate “the truth.” In analyzing Gleyzer’s work, we can begin to understand the strategies that a documentarian employs in integrating various sources of information to construct a singular document. Ultimately, this document becomes a self-reflexive product of the process of filmmaking that celebrates the achievements and reveals the limitations of the documentary genre.

**Tarsila do Amaral and the Anthropophagic Rejection of European Cultural Authority**  
Alex Santana, Latin American Studies  
**Sponsor:** Professor Eduardo Subirats, Spanish and Portuguese

The Brazilian Antropofagia movement of the early 20th century was a revolutionary one that succeeded in rejecting the rigid cultural imperialism of European avant-garde intelligentsia circles. Beginning with the artwork titled *Abaporu* (1928), Tarsila do Amaral’s works served as a catalyst for
the movement as well as its manifesto, written by Oswald de Andrade in 1928. Through the metaphoric cannibalism of the stylistic and conceptual trends of Western Modernism, the artists of the Antropofagia movement were able to figuratively “eat” the dominant Western influence, while alluding to Brazil’s indigenous groups and cannibalistic practices. This denial of hegemonic artistic restrictions, in turn, prompted the creation of an original aesthetic. This study also considers the importance of alternative national histories, as well as ethnic and racial boundaries—in Tarsila do Amaral’s case, this study argues that her “primitive” subjects are in fact reflections of an embodied national landscape and consciousness. Through a formal analysis of key paintings by Tarsila do Amaral as well as the manifesto itself, this thesis examines how her transgressive use of symbolism through color and figural abstraction helped develop a specific Brazilian artistic autonomy. By exploring how historical notions of race and indigeneity in Brazil are redefined in Tarsila do Amaral’s work, a broader theme emerges: how can artwork serve as a method for post-colonial reconstruction and re-imagining?

**Invisible Wounds and Deafening Silences: Examining War Trauma in Virginia Woolf’s *Mrs. Dalloway***  
*Sabrina Sekaran, English and American Literature*  
*Sponsor: Professor Peter Nicholls, English*

This study closely examines the character of Septimus Warren Smith in Virginia Woolf’s *Mrs. Dalloway*. Septimus, a tormented World War One veteran, serves as the main focus of this analysis, and suggests that he acts as the interpretive crux of the novel, upon which notions of temporality, trauma, recovery and memory are hinged. This analysis destabilizes the common classification of *Mrs. Dalloway* as a post-war novel, questioning the idea that “…the War was over…” (Woolf 5). I observe the various ways in which Woolf’s characters are drawn back into the past and how the memories, losses, and damages of the Great War persist like wounds left unhealed. By way of recognizing numerous cyclical patterns in the text, my reading explores the different narratives of trauma and whether there exists the possibility of recovery. This study consists of four chapters. The first centers on the limits and potential failure of language and communication, between characters in the novel, and also with regards to Woolf as a writer. This research comments on Septimus’s inability to narrate his past experiences to others, as well as the inherent problem of representation that Woolf faces when depicting trauma. In Chapter Two, the research begins a discussion of war trauma in the novel, emphasizing Septimus as an embodiment of individual trauma. In Chapter Three, this study moves outward, from a discussion of private trauma, to public (or collective) trauma. This chapter will expand on the idea of a constructed, national narrative that seeks to normalize and “heal” by way of repression. This study argues that this constructed fallacious narrative is ultimately destructive and in reality, impedes recovery and perpetuates trauma. This research ultimately suggests that in *Mrs. Dalloway*, both of these distinct narratives co-exist, at times thwarting one another, and often fusing together. In the final chapter, as well as in the concluding section, which act as a collective counterpart to the opening chapter, the focus shifts from Septimus to Woolf. This study examines Woolf’s highly stylized prose, the link between beauty and madness, and the ways in which the novel—despite its linguistic and communication barriers—reclaims the potential for recovery. This research is notable because it unravels the intricacies that are bound up in the term “post-war,” specifically with respect to England after the Great War.

**Mary Magdalene: A Multivalent Model of Femininity in Fifteenth-Century French Passion Plays***  
*Grace Shay, History*  
*Sponsor: Professor Karl Appuhn, History*

Each Easter season, towns and villages throughout medieval France came together to perform “passion plays,” lengthy dramatizations of the Christ’s last days. Each town’s unique play weaved together local tradition with Biblical characters that interacted with Jesus in the paschal narrative. In particular, these dramas enhanced the role of the reformed prostitute Mary Magdalene, giving her a literal “voice.” This study examines the construction of the Magdalene by her eleventh and twelfth-century religious cult and its focus upon her legendary status as a sinner-saint. This research argues, however, that the passion plays from Paris, Arras, and Angers, recorded in mid-fifteenth-century manuscripts, look beyond pure reification of the penitent sinner, and instead reflect the increasing influence of early humanism in both secular and religious French society. In scenes that underscore her roles as comforter and caretaker, the Magdalene escapes the confines of Biblical narrative and becomes a practical Ewoman who directs and nurtures a household in the face of uncertainty, and even so conducts herself as a virtuous Christian. In this sense, the Magdalene’s value as a prescriptive model for the plays’ audience aligns with the virtues set out in Christine de Pizan’s *The Treasure of the City of Ladies* (1405), a secular treatise written in the humanist French court of Charles V, which propagates specific visions of worthy feminine life. Indeed, scholarship regarding passion plays has mostly centered upon the intersection of gender, theatre, and religious ritual, while focusing narrowly on the plays’ dramatic rhetoric. Yet this research establishes the passion plays’ Magdalene as a multivalent character: a theatrical product of the intellectual and secular influences that permeated France in the early and mid-fifteenth century.
La lumière venue de la France: French Republicanism and the Making of “Latin” America
William Sherman, Global Liberal Studies
Sponsor: Professor Ijeoma Fulani, Global Liberal Studies

“Latin” America is a geographical concept as deeply engrained in our minds as that of Europe or Asia. It is a given that its inhabitants, their cultures, and their sensibilities be called Latin. But where does this denomination come from? In fact, it was not the Spanish or the Portuguese who determined the Latin-ness of the territories south of the Rio Grande, but the French. In its beginnings, Latinity was not a cultural or a racial pretension, but a moral, civic, and geopolitical one. The Creole elite class rejected Spanish absolutism, and looked to republican France for political inspiration following Independence. The expansionist advance of the “Anglo-Saxons” from Britain and North America provoked France into defensive fervor. It thought itself the protectorate of “Latin” civilization, both in Europe and the Americas. French emphasis on a Latin social and legal history, Franco-Latin republican political influence, and antagonism with “Anglo America” worked together to forge an idea of “Latin” America in the minds of Creole intellectuals. This “Latin” distinction is an essential but often ignored element of civil society and (geo-) political disposition in Spanish- and Portuguese-speaking America.

A Lack of Will to Live, But a Strong Desire to Not Die: Critical Negativity and Queer Longing in the Gary Fisher Archive
Connor Spencer, English
Sponsor: Professor Nicholas Boggs, English

First posed by writers such as Leo Bersani and Lee Edelman, the antisocial thesis in queer theory argues that queers occupy a negated, abject position in society, one that may rupture the social order altogether. Although such writers purport that there is a jouissance to be found in negation, the antisocial thesis too often locates negative effects in a strictly oppositional relationship to hope, futurity, and collectivity. In contrast, Lisa Duggan and José Muñoz propose a critical negativity that forges connections and imagines other worlds through negativity itself. Mobilizing an optic of critical negativity, this project turns to the relatively unexamined archive of Gary Fisher, a queer black writer who was a student of Eve Sedgwick and kept journals throughout his life. This study argues that despite its negative effects, Fisher’s writing is guided by a profound longing for difference, one that centers around the unusual relationships opened up by hopelessness, illness, and death. Accordingly, this research proposes a form of critical negativity called queer longing that opens up queer relationships and imagines different worlds. Moreover, in unearthing a previously buried archive, this project also suggests alternative archival practices that look to the ephemera and scraps that might better describe queer subjectivities.

Can Brain Drain Justify Emigration Restrictions? : An Analysis of the “Right to Leave” a State
Ihab Syed, Philosophy
Sponsor: Professor Ryan Pevnick, Politics

Some of history’s gravest injustices were perpetrated by regimes that did not allow people to leave their borders: the Holocaust, the Berlin Wall, slavery in its many forms… Today, international law enshrines citizens’ “right to leave any country, including their own,” but the limits of this right have rarely been the subject of philosophical scrutiny. This research investigates the normative foundations of citizens’ “right to leave” their state and explores whether developing nations can impose emigration restrictions to combat “brain drain,” the exodus of skilled workers to industrialized countries. This study argues that third-world nations may justly circumscribe the exit of workers trained with public funds when their leaving would further impoverish their compatriots.

Anna Takada, Social and Cultural Analysis
Sponsor: Professor John Kuo Wei Tchen, Social and Cultural Analysis

As a result of the forced diaspora of Japanese Americans to Chicago from the American concentration camps of 1942–1945, an organization known today as the Japanese American Service Committee was established. Originally a social service agency aimed to help “resettlers” find housing and employment, JASC continues to serve the community as a central organization and meeting place. Beginning in the 1970s and increasingly since the 1990s, JASC’s efforts to preserve historical memories of the experience of WWII evacuation and incarceration have reflected a perceived need within the community to record, collect, and share such memories. This study examines the forms that these memory-preservation efforts have taken, through an annual Day of Remembrance commemoration; a community archive and library; and various film screenings, discussion workshops, and reunions. In addition, it views the reasons for their perceived necessity as threefold: 1) responses to national events including the Redress Movement and the September 11th attacks; 2) the passing and coming-of-age of generations; and 3) Japanese cultural traits. A thorough investigation of this particular “culture of memory” may provide insights into how collective memory of trauma within minority communities can work to prevent future mass civil rights violations based on ethnicity or race.
Marta Chilindrón: South American Conversations in Geometry and Participatory Art
Robert Wilson Tarbox IV, Art History
Sponsor: Professor Edward Sullivan, Art History

Marta Chilindrón is an Argentine-Uruguayan-New York artist who works with transparent acrylics to make manipulatable sculptures in the visual language of geometric abstraction. Born in Buenos Aires in 1951, raised in Montevideo from the time she was two until the time she was seventeen, Marta Chilindrón moved to New York in 1969 and has remained there ever since. It cannot be a coincidence that the geographies of Chilindrón’s life parallel the sites so vital to the history of abstract art in the Americas. Seen through the prism of the history, Chilindrón’s work can be understood as the continuation of the traditions of not only geometric abstraction, but also of kinetic, tactile and participatory art in South America. From the inauguration of constructivism in South America by the Uruguayan Joaquín Torres-García in the 1930s, to the first tactile, participatory sculptures of Argentine Gyula Kosice in the 1940s, to the chromatic-kinetic discoveries of Venezuelan Carlos Cruz-Diez in the 1950s, and finally to the abandonment of geometry by the Brazilian Lygia Clark in the 1960s; the examination of the non-parallel trajectories of Marta Chilindrón’s career and the development of geometric abstraction in South America reveals not only how a visual language geometry has come to mean different things in different times and places, but also why geometric abstraction continues to remain a viable form of aesthetic and intellectual expression in art historical discourse today: Marta Chilindrón’s works are presented as evidence that a visual language of geometry has not in fact been exhausted, but that, through the synthesis of aforementioned traditions, continues to surprise, to delight and to enlighten.

Managing Migrant Workers in Abu Dhabi City through Urban Planning
Eunice Teo, Middle Eastern and Islamic Studies
Sponsor: Professor Arang Keshavarzian, Middle Eastern and Islamic Studies

Global cities today have to cope with the challenges of accommodating an increasingly mobile workforce. This is especially so in Abu Dhabi, where the migrant workforce comprises an overwhelming majority of the resident population and is viewed as both a cornerstone of its oil-fuelled development and a potential threat to national stability. Consequently, the Abu Dhabi state has put in place various institutional structures to eliminate the perceived social and political threat that migrant workers pose. This research focuses on how urban planning principles and policies are one such means of control. Based on analysis of general planning principles outlined in Plan Abu Dhabi 2030 and the effects of the Urban Planning Council’s initiatives on Abu Dhabi City since its formation in 2007, this study argues that this is accomplished by various forms of urban separation and exclusion along class and ethnic lines. At the same time, this research shows that migrant workers also influence urban space in unexpected ways, appropriating informal spaces within the city that both reinforce and contradict the state’s goals. The state’s control over migrant workers, while extensive, is a constantly evolving set of relations.

Representing Nature: Aesthetics, Art and Action
Alexandra Tsubota, Environmental Studies and Dance
Sponsor: Professor Peder Anker, Gallatin School of Individualized Study

In an age where reconsideration of human-nature relationships is much needed, environmental art provides a valuable tool for engaging the public. Without sufficient principles to guide it, however, it runs the risk of falling flat or upholding faulty environmental values. Environmental aesthetics, in providing guidelines for proper appreciation and moral engagement with nature, may possess these principles. By aligning artistic practices with concepts and theories within contemporary aesthetics—including cognitive, non-cognitive, and mixed-view approaches to nature—this research examines how environmental art can effectively 1) uphold an appropriate environmental ethic (defined as a value system that includes—to some extent—nature); and 2) motivate positive environmental behavior. These findings are paired with strategies employed in mass climate change communications—namely appeals to fear and sense of place—and are identified in select visual artworks produced between the years 2003–2013. By critically evaluating representations of nature, this research provides insight into how environmental art can better motivate changes in personal values and behavior, and presents practical tools for artists and environmentalists alike.

Philosophical Contradictions in the Revolutionary Calendar of 1793
Sophie Tunney, History
Sponsor: Professor Stefanos Geroulanos, History

On the 24th of October, 1793, Fabre D’Églantine and Gilbert Romme, implored the National Convention to terminate the old Gregorian calendar and create a new Revolutionary calendar based on the principles of reason and nature. With the goal of dispersing revolutionary ideas of the importance of nature through a more logical ten day week and ten month year, the calendar quickly became depicted as anti-clerical. However, when taking a deeper look at the logic behind this calendar, this study concluded that both Le Baron D’Holbach’s materialist position on nature and the inexistence of God in his book, System of Nature, as well
as Jean-Jacques Rousseau’s opposite religious perspective on nature in *Emile* were used in this calendar. The calendar in effect pushed towards changing clerical institutions and doctrines without denouncing the existence of God. This research demonstrated that the Revolutionary Calendar was not an anti-clerical push on the part of the National Convention, but rather the melding together of two contradictory philosophical doctrines for the purpose of spreading the ideals of the revolution.

**Transformative Architecture in Post-Apartheid South Africa: The Constitutional Court and the Walter Sisulu Square of Dedication**

*Anna van Niekerk, Art History*

*Sponsor: Professor Carol Krinsky, Art History*

Post-apartheid architectural rhetoric highlights the need to formulate a new South African architecture distinct from the imported modernist forms that continue to characterize its cities. This study examines two attempts to integrate the built environment and resolve the spatial entrenchment of the apartheid regime: the Walter Sisulu Square of Dedication and the Constitutional Court. To investigate the extent to which these buildings have contributed to Johannesburg’s urban transformation, each site was visited and interviews were conducted with the architects, professionals involved in construction and upkeep, prominent artists and critics, and community members. The Constitutional Court, an internationally lauded, award-winning structure in center city, employs an ambitious “Africanizing” design scheme to convey the ideals of the “Rainbow Nation,” but this study found it limited in terms of practical accessibility. The Walter Sisulu Square, overlooked due to its location in the peripheral township of Kliptown, exemplifies the problems resulting from governmental prioritizing of economic stimulation over crucial development processes, particularly community involvement. The persistence of de facto segregation and the continuing lack of consensus on how to transform the built environment establish the need for further research into the appropriate expression of South Africa’s unique post-colonial character.

**There Are No Moon-worshippers Among the Negros in America: Alternative Healers and African-American Doctors in 1920’s New York**

*Kim VanderVoort, History*

*Sponsor: Professor Andrew Needham, History*

During the 1920s, African American physicians and the greater medical community launched an informal campaign to criminalize and ultimately eradicate the practices of alternative healers. Using New York City as a focal point for the campaign, this study first explores the social world of magico-religious workers in Harlem—how they operated, and the space they occupied in the community. This study also highlights African American physicians during the same period, separating the two identifiers as separate yet equally influential to the experience of the black doctor; not only did black healthcare professionals want to bring modern medicine to their community, but they also understood proper healthcare as a necessary prerequisite to economic and social advancement, and therefore understood their roles as crucial to the elevation of blacks in American society. Thus alternative healers and African American doctors experienced significant tension in the 1920s as healthcare professionals campaigned to criminalize the alternative medical practices, the implications of which this research seeks to clarify. Utilizing collections of African American doctors at the Schomberg Center for Research in Black Culture, as well as advertisements and articles from publications such as the *New York Times*, the *New York Amsterdam News*, *New York Medical Week*, and the *Journal of the American Medical Association*, this research deepens contemporary understanding of the doctor’s place in the community, the racial divide that persists within our healthcare system, why science and culture at times collide, and what happens when they do.

**Not Just Franco’s Spain: The Spanish Political Landscape during Re-emergence Through the Pact of Madrid**

*Jacob Watkins, History*

*Sponsor: Dr. Andrew Lee, Associate Curator, NYU Division of Libraries*

In 1953, Franco’s dictatorial regime signed a series of three executive agreements, collectively known as the Pact of Madrid, with the United States. The Pact traded military and economic aid for leave for the US to station military bases in Spanish territory. The newfound relationship with the US brought European and global recognition, ending Spain’s decade long political quarantine, and marked Spain’s re-emergence onto the international stage. Scholarship has neglected the motivations for these agreements by the various factions within the governing political right, instead portraying the Franco dictatorship as simply “Franco’s Spain.” In this way, scholarship to-date mistakenly homogenizes the distinct conservative groups instrumental in the Franco regime’s persistence. Newspapers were the public face of many of the ideologically distinct groups during this period. Therefore, this study examines how three prominent groups (Alfonsoist monarchist, businessmen, and Franco’s own party) framed this critical moment in their press. By examining these groups’ respective newspapers, this project presents the dissimilar framings of the Pact of Madrid to reveal the differing ideologies of various factions in Spanish society and combats the image of Franco’s Spain as homogenous and monolithically fascist.
Culture, Politics, and Ideology: Reinterpreting the Opening Scene of China’s Cultural Revolution
Mengran Xu, History
Sponsor: Professor Rebecca Karl, East Asian Studies

On November 10th, 1965, a major Shanghai newspaper published an article by an obscure critic, Yao Wenyuan. Today, this article, “On the New Historical Drama Hai Rui Dismissed from Office,” and the subsequent six-month-long national polemic against the drama, written by a major historian who was also the deputy mayor of Beijing, is considered by most commentators as the opening scene of China’s Great Proletarian Cultural Revolution (1966–1976). Yet, most scholars fail to address the broad cultural environment of the polemic and reduce it to a political conspiracy designed by Mao, or his wife, to destroy the Beijing municipal government. This study argues that the Cultural Revolution should be interpreted as a “cultural” event and I therefore examine the cultural criteria Yao used in his four major accusations. This thesis analyzes how the cultural, political and ideological conditions of the early 1960s affected the way people evaluated literary and art works and how the Hai Rui polemic reflected and gave shape to this mutation. While the Cultural Revolution has become a sensitive political matter, its complex history needs a systematic reinterpretation. By focusing on its cultural aspect, and on the Hai Rui polemic as the key to Mao’s vision of constructing a Socialist new culture, this research begins that project.

Georges Bataille and Beyond the Measure
Lindsay Zackeroff, Comparative Literature
Sponsor: Professor Stefanos Geroulanos, History

“The only way to define the world was to first bring it down to our measure and then, with a laugh, to discover it in this: that in fact it is beyond our measure.” Bataille’s work describes unique moments in experience often through terms that are measurable and immeasurable. What does measure mean for Bataille? This question will be crucially examined in this study. By comparing him with his contemporaries and historical milieu, this study explores the possibility of what lies beyond measure for Bataille. This research starts with Bataille’s magazine DOCUMENTS (conceived as “a war machine against received ideas”) and the tenuous question of subjectivity and representation locked in art history, anthropology, and sociology. Furthermore, inflected with Hegelian tradition from Alexandre Koyré, Émile Meyer- son, and Alexandre Kojève, Bataille seeks to go “beyond” Hegel’s dialectic. His text on the birth of humanity in Lascaux expresses deep overcoming of the measure in artistic, anthropological, and scientific frameworks. This project contributes to a reading of Bataille that exceeds the literary and Hegelian dimensions—putting at stake the violence of Kojève’s anthropogenetic myth, the place of Bataille as an art historian and thinker of forms, and Bataille’s responses toward science.
The central concern of the social sciences is people. Social scientists try to understand what motivates people’s behavior, how people interact and communicate in society, how they produce and distribute goods and services, how they govern themselves, how they create norms, institutions, cultures, and languages, and, in turn, how these institutions and cultures shape their thoughts and their actions. The vast scope of this inquiry, aimed at understanding human behavior and the functioning of our societies, requires a variety of diverse perspectives and approaches. The methodologies of the social sciences range widely from ethnographic studies to historical investigation, formal and mathematical modeling, survey techniques, and statistical analyses of data.

—Jess Benhabib, Paulette Goddard Professor of Political Economy

Drugs in America: How the War on Drugs Fuels the Prison-Industrial Complex
Priscila Abraham, Latin American Studies
Sponsor: Professor María Josefina Saldaña-Portillo, Social and Cultural Analysis

The purpose of this research is to investigate the effects of the war on drugs on the prison-industrial complex. The evolutionary arc of drug policy started with the criminalization of opium in the 19th century and has continued into 20th and 21st centuries with U.S. drug policy oscillating between the criminalization or treatment for marijuana, heroin, and cocaine addiction and sales. The racialization of drugs has occurred throughout American history, but when President Nixon declared the war on drugs in 1971, drugs became implicitly racialized this research argues, as a response to the success of the civil rights movements in the 1960s. Explicitly discriminatory public policies that controlled people of color in the United States were deemed illegal. Hence the need for a punitive drug policy that associated drug use with criminality, and criminality with incarceration, leading to a seemingly “color-blind” approach to drug use that was in fact highly discriminatory. The shift in forms of racial control began with the political rhetoric of ‘law and order’ that preceded the “war on drugs.” Civil rights activists became the antithesis of order because of their civil disobedience in protesting for racial equality. Framing racial equality in opposition to law and order allowed for the logical leap to the racialized war on drugs a few years later. This study focuses on how the war on drugs was a backlash to civil rights, and how the criminalization of race through draconian drug policies has led to their mass-incarceration that ignited the prison-industrial complex.

Let’s Put the Baby to Sleep!: Aspects of Children’s Play with Their Mothers
Stephanie Aguirre, Biochemistry
Angelica Alonso, Psychology
Sponsor: Professor Catherine Tamis-LeMonda, Applied Psychology, Steinhardt School of Culture, Education, and Human Development

Prior research has found abundant evidence to support the benefits of play for children’s development. In particular, children’s play with their caretakers has been predictive of their cognitive, social, emotional, and language development. However, more research needs to be done to understand the different types of play that mothers engage in with their children, and whether types of play have specific associations to children’s outcomes. Thus, this study will examine play patterns between mothers and children surrounding toys. In particular, this study looked...
at two types of play: 1) symbolic play (e.g., engaging in pretense), and 2) functional play (e.g., building a tower with blocks). These two types of play are further broken down into different modalities a) verbal, b) physical and c) verbal and physical simultaneously. The findings of this descriptive study will advance research by providing an understanding of how mothers and children engage in play. Future analyses will look at symbolic and functional play as predictors of children’s skills.

**Pay Back: The Effect of Political Instability on Sovereign Default**

*Mary Jane Ajodah, International Relations*

*Sponsor: Professor Alastair Smith, Politics*

Governments have encountered difficulties paying off their external debts for centuries, sometimes repaying less than full value or defaulting outright on their obligations. Creditor have few viable enforcement mechanisms for collecting outstanding payments. When making lending decisions, creditors consider a host of political, economic, and social factors that may lead to a higher likelihood of debtor non-compliance or default. This study examined the impact of democratization and leader turnover as sources of political risk leading to sovereign default from the 19th century to the present day, looking at seventy countries. Twenty-four logistic regression models were used to test regime type, leader turnover, and democratization as predictors of default. The results of this study suggest that less democratic countries are more likely to enter default, and recent leader change in autocracies (but not democracies) significantly increases the likelihood of default. The strength of these political indicators is dampened when conducting more extensive analyses with a broader range of economic indicators. Recent democratization is shown to be a significant predictor of default, even when controlling for sophisticated economic indicators. This study helps to fill in empirical gaps in the sovereign debt literature, particularly regarding the link between democratization and default, and can be a useful analytical tool in predicting and mitigating debt crises in the future.

**The Validity of the Big Mac Index as a PPP Proxy**

*Simona Aksman, Economics*

*Sponsor: Professor Andrew Paizis, Economics*

This research tests whether *The Economist*'s Big Mac Index (BMI) can serve as a proxy for purchasing power parity (PPP). To accomplish this, an econometric model of panel data based on that of previous researchers was conducted. This model compared both true PPP and the Big Mac Index against the theoretical criteria of PPP which involved two independent variables: the nominal exchange rate of a country and the real GDP per capita ratio in terms of US GDP per capita. This study rejected the joint null hypothesis of PPP theory for both true PPP and the Big Mac Index, showing that neither holds using the theoretical model. Still, the measures can be compared empirically. A regression of Big Mac PPP on true PPP reveals that the Big Mac Index can serve as a proxy for true PPP.

**Clone—A Portrait of Seri Orfali**

*Angela Almeida, Journalism*

*Sponsor: Professor Jason Samuels, Journalism*

Put simply, what does it take to become a pop icon today? *Clone*, a film, explores such a question from the perspective of fame, music and cultural misconceptions of the modern age. This linear documentary follows NYU Stern senior Seri Orfali along his quest to become a pop performer. *Clone* also takes a profound look at the Western perception of Islam and the Arab world, given that Seri is a devout Muslim who lived in the United Arab Emirates until he moved to New York. Shot over the course of eight months, *Clone* portrays the compelling story of a boy who sees no alternative to fame. On an existential level, this documentary challenges a number of societal norms. Seri is a successful Stern student who wishes to be a pop performer—a devout Muslim who fondly dreams of music video plots. By chronicling what it means for Seri to become famous, *Clone* refutes a number of stereotypes surrounding the Middle East. Even more, *Clone* explores the Western-Arab overlap that reveres a culture of music and status. *Clone* is an intimate portrait of one boy reeling to “make it”—one that transcends cultural boundaries to reveal our universal regard for fame.

**256 Shades of Gray: How Skin Tone Colors Perceptions of Politicians in the Media**

*Amy Alpert, Psychology*

*Aneline Amalathas, Psychology*

*Surya Menon, Psychology*

*Sponsor: Professor Emily Balcetis, Psychology*

Whether intentional or not, news sources and individuals frequently demonstrate implicit racial biases. This study examined the relationship between news sources’ political leanings, the content of the articles in the news sources, and the depiction of skin tone of U.S. politicians. The researchers conducted an archival study of 3000 recent articles. This study measured the political bias of the source. Photoshop was used to analyze the brightness of Black and White politicians’ faces. Coders assessed the content of each article, evaluating the overall positivity or negativity. The researchers anticipate news sources will depict politicians’ skin tone differently as a function of the ideology of the politician, the political bias
of the source, and the valence of the article. Specifically, we predict news sources select lighter images of Black politicians with whom they have consistent political biases particularly when reporting positive stories, than of Black politicians with whom they have inconsistent biases and when reporting negative stories. The media’s depiction of politicians’ skin tone may influence voters’ perceptions and subsequent decisions during elections. Biased visual representations can also have serious implications in the American criminal justice system, where Black defendants perceived as having darker skin tone are more likely to receive the death sentence.

**Painting Votes: Athenian Street Art and the Greek Sovereign Debt Crisis**

Eleni Arvanitis, Economics and Hellenic Studies  
Sponsor: Professor Liana Theodoratou, Hellenic Studies

Some of the most politically rampant street art has come from the walls of Athens, Greece. Despite their lack of major funding, Athenian street artists whose work is noted for its visual appeal and grandeur, have displayed their personal and political opinions for the entire world to see since the break of the Greek Sovereign Debt Crisis. At the same time, the political efficacy of the Greek citizenry is less prevalent despite pivotal political and economic decisions being made. It is crucial, then, to understand this phenomenon, given that there is no sufficient research on this topic. I sought to fill this gap by interviewing street artists and analyzing their work on the walls of Athens. What my research revealed is that this upsurge in street art is the result of a new cultural framework: one that focuses on public opinions being painted on walls as free art rather than opinions being expressed through democratic ballots. This research concentrates on the Greek context, but its results apply globally, and contribute to society as a whole in understanding how street art can provide an outlet outside of the traditional political participatory process.

**Going the Distance: The Role of Active Goals, Energization, and Physical Fitness in Distance Perception**  
Shanice Beaumont, Psychology  
Sponsor: Professor Emily Balcetis, Psychology

To stay healthy, a person must exercise. However, people’s perceptions of the physical environment, including the distance to walk, height of the stairs to climb, and slope of the hill to traverse, may lead people to choose not to exercise enough. This research asked whether people’s exercise goals, in addition to their physical fitness, affect how they perceive their physical environment. Moreover, this research asked what goals do to improve the quality
of exercise. Specifically, do increases in physical energy lead people to perceive distances as shorter, and is this the reason they exercise better? This study measured fitness and manipulated whether exercise goals were active for participants, prior to measuring changes in blood pressure, perceptions of distance, and the quality of exercise. Among people with low fitness, the finish line appeared closer when a goal was active than when it was not. People who felt more energized also viewed the finish line as closer, and subsequently walked faster when exercising. This has implications for weight loss interventions, and designing strategies for people to have more active exercise goals in order to feel more energized. This study expands current knowledge in psychology related to how goals affect a person’s perception of the environment.

The Impact of Post Soviet Collapse Russian Emigration on the Economies and Education of Post-Soviet Independent States

Vadim Belinskiy, Political Science
Sponsor: Professor Rachel Brulé, Political Science

In recent years, states in transition have been heavily researched in order to determine what effects a sudden and drastic change can have on the various internal aspects of these states. However, this scholarship significantly dwindles when this sudden change is not solely a regime-change or newly adopted policies, but also the loss of a significant portion of a country’s population. Therefore, this study aims to answer the following question: What effect does a mass out-migration of a specific group of people, especially one that held a substantial amount of power in the nation’s inner-workings and policy making for decades, have on the remaining individuals and state as a whole? This study will examine one specific case that exemplifies this: The mass out-migration of individuals of Russian nationality from the 14 now-independent states that formerly comprised the Soviet Union in the context of the Soviet Union’s collapse. Ultimately, this study concludes that immediately following the collapse of the USSR, a greater out-migration of Russians led to a decrease in the overall economy and education, while an increase in educational spending is visible. This can be explained by a “brain drain” resulting from the emigration of more educated individuals who held the majority of key political roles in these countries pre-collapse and an increase in spending to make up for this rising difference. Following this initial period, around the year 1994 and beyond, the economies and educational levels of most of these nations increased due to foreign aid, the influx of educational spending, and necessary adjustments that were made over time with trial and error.

Generic Language Facilitates the Construction of Social Categories in Toddlers

Lydia Bianchi, Psychology
Sponsor: Professor Marjorie Rhodes, Psychology

Category labels highlight meaningful connections among group members. Providing toddlers with labels helps them recognize natural and artifact categories before they would ordinarily recognize them. Social categories though, seem to require a stronger form of linguistic input, as younger toddlers are not able to recognize subgroups of people even when they are labeled. This study hypothesized that using generics—language referring to a group as a whole—in addition to labels would help toddlers recognize a distinction between social categories. Using either generic or specific language, this study introduced toddlers to a novel group of people, “Zarpies” marked by shirt color, and asked them to categorize subsequent people. Generic language helped younger toddlers learn the category where specific language did not, demonstrating the power of generic language in facilitating categorization before it emerges naturally. Young children can thus make generalizations about social categories if they hear generic statements about groups of people. This study shows generic language (language that talks about a group as a whole—“boys like trucks”) facilitates very young children’s categorization of people into social groups. This is important because it shows the type of language we use to talk about people, influences a toddler’s ability to recognize and classify people into social categories.

After the Bell Rings

Mohamed Najid Bin Mohamed Sultan, Journalism
Sponsor: Professor Jason Samuels, Journalism

After the Bell Rings is an online multimedia project that examines after-school programs in New York City and evaluates how important these programs are to children and their families. Surveys have shown that New Yorkers take after-school programs seriously and are supportive of their benefits, yet 25% of New York’s K–12 children are responsible for taking care of themselves and are unsupervised after school. Should more be done to ensure that youths here are not left unsupervised after school? How can after-school programs help address this issue, and what benefits do they provide to students? The main approach of this project is to detail the lives of some of the youths in these programs, as it is important to hear the voices of the participants themselves in order to assess potential benefits of these programs. Parents, teachers, after-school providers, community leaders, and education experts will also weigh in, providing a holistic view on the issue. The project will culminate in a multimedia website that will include short videos, pictures, written articles and infographics,
and can be used as an online resource for New Yorkers to learn more about after-school programs and assess their relevance in the lives of youths.

Get Moving: Perceived Proximity Leads to Increased Action through Efficacy and Challenge Construal

Abigail Bisi, Psychology

Sponsor: Professor Emily Balcetis, Psychology

America’s waistlines are on the rise, but why? One main contribution to this obesity epidemic is that people eat too much and fail to offset the calories with sufficient exercise. This research tests whether the quality of exercise is affected by the visual experiences and psychological processes that underlie exercise. Participants learned they would complete a challenging exercise task requiring them to wear ankle weights and march to a cone 15 feet away. Prior to walking, they estimated how far away the cone felt, and completed measures assessing their sense of efficacy and challenge mindset. Finally, participants performed the weighted walking task and this study measured how quickly they did so. Results suggested the closer participants felt the cone was, the faster they walked to it. In addition, participants’ sense of personal efficacy and stronger challenge mindsets mediated this relationship, suggesting personal beliefs in ability and resources served as the reason by which felt proximity leads to better exercise. This research suggests people’s perceptual experiences of the world affect their actions within it. Feeling able to traverse a distance improves action. These results can have implications for interventions to reduce the national trend of insufficient exercise.

A Metric Analysis of Zapotec-Attributed Domestic Dog Remains

Madeline Breda, Anthropology

Sponsor: Professor Pam Crabtree, Anthropology

Excavations of sites attributed to the Zapotec civilization of southern Mexico (thriving from 500 BCE to the arrival of Spanish colonials in the 16th Century CE) have yielded a wealth of domestic dog fossil remains as well as art depicting cultural practices involving dogs. Historic, artistic, and archaeological records all indicate that domestic dogs were of great importance to the Zapotec civilization, and were sometimes eaten. However, it has not been confirmed whether specific breeds of dog were reserved for different ceremonial or culinary practices, and the conditions under which dogs were routinely consumed remain unclear. This paper details a metric analysis of Zapotec-attributed dog remains in comparison to body mass/withers height data gleaned from modern Mexican dog specimens. Similarities between ancient Zapotec dogs and modern Chihuahuas in terms of size and head shape suggest that Zapotec dogs were most likely ancestral precursors of the modern Chihuahua. Examination of Zapotec dog remains for evidence of butchery or post-mortem ornamentation also offers clues about the animals’ cultural uses. The results of this small-scale analysis will have useful applications for future excavations of Zapotec sites: to help explain the unique recovery locations of dog specimens in Zapotec sites, and to offer a predictive correlation between ancient breeds of dogs and their cultural significance.

Looking for Love: Motivated Perception of Attractiveness in Dating

Chase Brennick, Psychology

Sponsor: Professor Emily Balcetis, Psychology

Physical attractiveness plays an important role in the decision about whether to date someone (e.g., Li et al., 2002). What factors determine how physically attractive a potential dating partner appears? This research tested whether the feasibility of dating a person and the desirability of the person’s personality influence how physically attractive he or she appears. Single college students came to the lab for a study about forming impressions. They were ostensibly partnered with another student next door, who was really a confederate assistant. Participants exchanged personal information with the confederate, including a photograph. Participants received information describing the confederate as interested or not in dating (manipulating feasibility) and describing the confederate as having a pleasant or unpleasant personality (manipulating desirability). Participants rated physical attractiveness at three different time points. Ratings of physical attractiveness changed as participants learned new information. Attractiveness ratings decreased when feasibility was low; attractiveness ratings decreased when desirability was low. Results suggest that evaluations of physical attractiveness are dynamic and can change over time as people learn new information about a potential mate. Additionally, changing ratings of physical attractiveness can influence the probability of future interactions in a dating context.

A Nation Enraged: Negotiations of Race and Guilt in Responses to the Shooting of Trayvon Martin

Rebecca Brown, Social and Cultural Analysis

Sponsor: Professor Michael Ralph, Social and Cultural Analysis

This study explores how the shooting of Trayvon Martin was portrayed as a critical moment in U.S. race relations. The shooting of the 17 year old black teenager by George Zimmerman in February of 2012 fostered a national dialogue about racial profiling and contemporary race relations as it quickly garnered extensive media
coverage and inspired activism across the country. This research specifically examines how the concepts of guilt and race intersect in interpretations of and reactions to the shooting and subsequent trial of George Zimmerman through analysis of New York Times articles, conservative blog posts, and the Million Hoodies March held in New York City in March of 2012. As a result, this study argues that the emphasis placed on Trayvon Martin’s moral guilt, as an indicator of criminal guilt, in the responses to the shooting not only reflects the widely held assumption of guilt based on race, but also hinders a truly widespread and comprehensive challenge to racial profiling by maintaining the notion of an impermeable racialized ideological divide.

**Assessing the Conservation Status and Taxonomic Assignment of the Indochinese Silvered Langur (Trachypithecus germaini) in Two Protected Forest Sites in Cambodia**

Aparna Chandrashekar, Anthropology  
Naciely Cabral, Anthropology  
Sponsor: Professor Todd Disotell, Anthropology  

The Indochinese Silvered Langur (Trachypithecus germaini) is found throughout parts of Thailand, southern Lao PDR, southern Vietnam, and Cambodia, the latter of which holds the largest remaining population of this endangered species. Due to extensive human-induced destruction of its habitat, the future viability of T. germaini is severely threatened. Thus, there is an urgent need to assess the conservation status of this species. Recent studies have suggested a species split between populations on either side of the Mekong River, which is a known biogeographic barrier for several primate species (Nadler et al. 2005, Roos et al. 2008, Duc et al. 2013). These studies have proposed that populations west of the Mekong retain the name T. germaini, while populations found east of the river be assigned the species name, T. margarita. There is a lack of long-term field studies providing ecological information about this species, and the existing molecular research is based on mitochondrial DNA, which can be problematic for male dispersing species, that is characteristic of most langur species. Thus, this study will utilize nuclear DNA to assess whether or not T. germaini diverged into distinct species as a consequence of being geographically separated by the Mekong River. Cambodia is the ideal location for this study, not only because it contains the largest population of T. germaini, but also because the Mekong River bisects the country. This study will use noninvasive samples collected from two populations located on either side of the Mekong River in Cambodia. These samples were genotyped at up to eight polymorphic microsatellite loci to measure genetic differentiation between these populations, and evaluate the relationship of these populations with respect to the Mekong River.

**The Effect of Socioeconomic Status on Food Choice: A Comparison of Food Environment Factors That Influence Diet in Harlem and the Upper East Side**

Shakara Carter, Sociology  
Sponsor: Professor Ruth Horowitz, Sociology

This study aims to provide an answer to the following question: “How do the factors that influence food choice vary with socioeconomic position?” The methodology that was chosen for this project fills what appears to be a gap in the literature on food environment and other factors that influence diet. Quantitative data such as neighborhood demographics were gathered to provide context about the sample and their food environments, but the primary data set was derived from 18 in-depth, semi-structured interviews with heads of households representing 6 zip codes in Harlem and the Upper East Side. Previous research strongly indicates that resources and health disparities are complexly intertwined, but what appeared to be missing among the survey and statistical data were the accounts of actual people regarding how they choose the food they ate. This type of qualitative examination took into account the factors that influence food choice, including an examination of socioeconomic status which is essential in developing effective food and public health policy interventions.

**The Role of Visual Attention in Intergroup Bias in Mind Perception**

Bosi Chen, Psychology  
Sponsor: Professor Jay Van Bavel, Psychology

In social interactions, people must infer that other agents have thoughts and feelings—termed mind perception—and naturally do so upon merely seeing others’ faces. However, recent research found that social group membership can influence the readiness with which people engage in mind perception. Other research suggests that attending to the eyes of others is important for mind perception. This study examined whether group membership shapes visual attention to the eyes of others, and whether this explains the intergroup difference in mind perception. Participants rated face morphs between human and inanimate faces described as in-group or out-group members. They were either instructed to attend to the eyes of the faces, or no such instruction was given. Each participant’s ratings were used to calculate each individual’s threshold of mind perception for in-group and out-group faces across conditions. This study hypothesized that attention to the eyes of target faces would mediate intergroup bias in mind perception, such that when people were told to attend to the
The chronic lung inflammation characteristic of asthma can be controlled with daily use of inhaled corticosteroid (ICS) medication. Regular ICS use decreases the frequency and severity of asthma attacks. ICS adherence is especially important among elderly asthmatics, who are most likely to be hospitalized or die from asthma. However, adherence rates are very low, around 40–50%, among this population. To identify medication use strategies associated with ICS adherence in older adults, this study uses data from a cohort of English- and Spanish-speaking asthmatics from New York and Illinois. Medication adherence was assessed with the Medication Adherence Rating Scale. Medication use strategies were assessed via open-ended question. This study identified six medication use strategies employed by patients. However, only two significantly improved odds of adherence: keeping ICS medication in the bathroom (AOR: 3.05, 95% CI: 1.03–9.02, p<.05) and integrating its use into a daily routine (AOR: 3.77, 95% CI: 1.62–8.77, p<.01). Prior research has focused on demographic predictors of adherence (e.g., income), which are difficult for clinicians to address on a patient-by-patient basis. Teaching effective medication use strategies may be a quicker and easier way for clinicians to improve adherence and, subsequently, health outcomes.

**International Aid Relief Following Natural Disasters: Given Based on Humanitarian Concern or Policy Concern?**

*Jane Chen, International Relations*
*Sponsor: Professor Alastair Smith, Politics*

Following natural disasters, many countries show outpourings of support and assistance in the form of monetary aid, supplies, and emergency response teams. However, little has been written about what drives post-disaster aid donations, as this aid is often perceived to be given as an act of empathy. This study uses statistical analysis to explore which countries are more likely to receive post-disaster aid, how much is given, and whether donor states consider political relationships when determining disaster relief allocations. With a focus on the United States as the donor nation, the results suggest that the number of deaths and people affected actually has a negative impact on how much post-disaster aid is received and that enemies in the United Nations General Assembly (countries that do not share similar voting patterns) receive more post-disaster aid. The implications of these findings point towards a disaster relief response that is influenced by political concerns and buying policy favors. These findings can also play an important role in how we interpret the intentions behind international aid and development programs.

**Strategies for Adherence to Inhaled Corticosteroids among Elderly Asthmatics**

*Taylor Chen, Psychology*
*Sponsor: Dr. Howard Leventhal, Institute of Health, Health Care Policy and Aging Research, Rutgers University*

The hard and fast fact is dying away. Reports reveal the inaccuracies behind many nonfiction works despite their compelling stories. In such situations, translation theories such as refraction can help analyze the presentation. In March, Touchstone publishing rejected a book proposal by the Goldman Sachs Elevator Twitter account holder. Although the tweets claimed to state overheard conversations in the firm’s building, the author had never worked for the company. Regardless of this deception, the
tweets captured common attitudes towards financial firms. Similarly, translation as refraction holds that every work is the product of its environment. If the truth is seen as the original source and the reporter taken as the translator, the result is the translated fact. This concept plays out in the case of Mike Daisey’s monologue on poor conditions at Apple’s factories in China. The performances generated enough attention for protests at Apple stores, but NPR found many flaws in Daisey’s story, including a fabricated chronology. Bound by traditional laws, the radio station even retracted a related radio episode. But refraction shows that, with the model of translation, facts are not so rigid and by using these theories, journalists can present a more accurate story.

The Difficulties of Learning English as a Second Language—In and Outside the Classroom
Susan Cheng, Journalism
Sponsor: Professor Brooke Kroeger, Journalism

New York is a city of thousands of English language learners—16.4% of whom are from China. Since immigration to the United States is on the rise, English as a Second Language (ESL) education is more crucial to this city than ever. While schools like the lauded Lower East Side Preparatory have sent 80% of its ESL students to college, there are problems in and outside the classroom for these newcomers, too. This study aims to humanize these students from China and to shed light on some of the struggles they face. Throughout this study extensive research was done on ESL education/language acquisition, as well as meeting conducted with educators and experts. Full access was given at Lower East Side Prep where classroom observations, along with interviews with students and faculty members helped with first hand research. This study was published in May 2014, in Shoe Leather magazine and will be pitched to other publications. Though there’s no doubt a necessity for quality ESL programs in the United States, native speakers tend to marginalize and box ESL learners into a category. With this piece, however, I will give voice to these students and present a more true to life portrayal of an immigrant student.

Chloe Coffman, Social and Cultural Analysis and Metropolitan and Africana Studies
Sponsor: Professor Maria Josefina Saldaña-Portillo, Social and Cultural Analysis

The word terrorist has developed into a broad, under-specified and toxic label that is used to both disregard problems and squash dissent. The case study of “eco-terrorism” illuminates this trend. This project examines the United States government’s repression of environmental and animal rights activists under the guise of protection against “eco-terrorism” since September 11, 2001. “Eco-terrorists,” referred to as ecotage in this study, are those who partake in non-violent illegal tactics like sabotage or property destruction as a means of advocating for the environment and animals. Through archival research, this project examines the word “terrorism” and reveals that the true reason these activists are labeled as such is due to their extremely successful strategies. They have caused major monetary damage to corporations, which are ingrained in and thus protected by the US government. Ethnographic research concentrating on mainstream ecological activists will support this archival research and demonstrate how the “eco-terrorism” rhetoric negatively affects the entire ecological movement. This research is therefore of major import to any person who is interested in ecological protections and protest. This case study of “eco-terrorism” exemplifies the US government’s forceful repression of effective dissent, and its resulting restrictions on constitutionally protected civil liberties.

Emergency Response Data Management Systems
Jorge Cortes, Geographic Information Science, Borough of Manhattan Community College, CUNY
Sponsor: Professor Anthony Creaco, Science Department, Borough of Manhattan Community College, CUNY

In an emergency event one of the most precious resources is time. The difference between positive and negative outcomes can occur in the span of seconds. To reduce the impact of an event, processes are currently being developed to manage human and technological resources in near-real time. It’s also advantageous to utilize these processes to interface private and government organizations involved in emergency response and recovery. The Employee Registry Maintenance Program, written in the C++ programming language, manages registration information by creating an entity from the employee’s unique identifiers. It served in developing an algorithm for organizing and managing data sets as entities. This program was created as a proof of concept for the further development of a tool to manage the vast amounts of primary data generated during a natural disaster or in an emergency environment. The tool will manage information through the use of complex data structures and create an archival record of all managed primary data as well as manipulating the output of these entities. By making this output compatible with Geographic Information Systems, these unified data sets can be shared with emergency services at near-real time, in a map format designed to integrate with heterogeneous communication conventions.
Altruism in Group Relations
Melanie Corwin, East Asian Studies
Sponsor: Professor Jay Van Bavel, Psychology
Sponsor: Professor Leor Hackel, Psychology

Past models of economic decision-making assumed that altruistic behavior was purely selfish (Rangel & Montague, 2008). In this model, altruistic behavior was understood to be the result of calculations for future benefits from reciprocity and reputation. In other words, it was assumed that a person participating in prosocial behavior was only doing so in hopes of favors and behaviors being returned, as well as an overall positive reputation, which is seen as a long-term advantage. However, recent research on the neural bases of social decision-making and valuation, known as neuroeconomics, suggests that humans often place intrinsic value on social goods such as cooperation, sharing and various other forms of altruistic behavior, without personal gain (Fehr & Tics, 2007). Specifically, the orbitofrontal cortex (OFC), a region of the brain associated with reward and valuation located just above the eyes, has been shown to be active during tasks that involve equitable sharing of money with others (Zaki & Mitchell, 2011). Meanwhile, from a behavioral point of view, group membership is known to play a role in altruism, as people show biases favoring members of their own groups, even in arbitrary groups (Tajfel, 1971). Some theories posited that in-group biases are strategic choices arising from expectations of future reciprocity within the in-group (Yamagishi, 2009), in which case in-group bias may be associated with brain regions related to cognitive control, such as the dorsolateral prefrontal cortex, located directly above the OFC. Building on Fehr & Tics’ work (2007, cited above), an alternative perspective would be that people place greater intrinsic value on altruism with in-group members because they see their group as an extension of themselves (Brewer, 1996). In this case, in-group bias would be associated with greater activity in brain regions involved in intrinsic value, such as the OFC. Therefore, this study builds off of Zaki & Mitchell (2011), which showed that subjects participating in prosocial behavior had significant activity in the OFC, by examining whether group membership influences activity in the region during altruistic decisions.

Correlation of Molar Cusp-spacing and the Expression of the Middle Trigonid Crest in Hominidae
Emma Curtis, Anthropology
Sponsor: Professor Shara Bailey, Anthropology

When describing taxonomic distinctions of extinct hominins, dental anthropologists acknowledge a “Neandertal complex” of dental characters, which distinguish H. neanderthalensis from other hominids. These characters are treated as taxonomically significant based on an assumption of developmental independence. However, recent studies of postcanine trait interdependence call this assumption into question. This study examines the relationship between intercusp spacing and expression of the middle trigonid crest (MTC), a lower-molar feature found in high frequencies among Neandertals, but also present, to varying degrees, in other hominids. Scores of MTC expression are tested for bivariate correlation with two separate measures of relative intercusp spacing in H. neanderthalensis, H. sapiens, A. africanus, and genus Pan, individually. While results show non-significant correlations between cusp spacing and MTC expression both intra- and interspecifically, a significant positive correlation is found across H. sapiens, A. africanus and Pan, when Neandertals are removed. H. neanderthalensis are unique in exhibiting the opposite trend of high MTC scores and closely spaced cusps. These results do not exhibit a clear relationship between cusp-spacing and MTC expression, but rather suggest that the nature of the relationship is entirely dependent on taxon. Additionally, the evidence that Neandertals exhibit a highly derived pattern may have implications on our understanding of the evolutionary relationship between H. neanderthalensis other hominin taxa.

Documenting the Lives of Three Dancers Trying to Break into the Commercial Dance Industry
Dan Dao, Broadcast Journalism
Sponsor: Professor Jason Samuels, Journalism

The aim of this film is simply to tell the stories of three young New Yorkers who are struggling to survive in the city while training to become professional dancers. Each has a unique, powerful backstory of hardship prior to the start of the filming period that is explored in the film. All three—Kaily Buemi, a media planning assistant from Cleveland, Ohio; Chris Carbonell, a former professional dancer from Queens, New York; and Charnele Crick, an aspiring actress from Taos, New Mexico—were followed from October until April to get an in depth look into their lives. The thread that links them together is that their involvement in three different urban dance teams, which compete for money and recognition in various competitions in the New York and New Jersey circuit. While they work tirelessly to create innovative competition sets, train other dancers and perform at shows, they each also pursue professional dance endeavors—including auditioning for talent companies, opening dance instruction businesses and shooting dance videos for Youtube. The competition scene forms the primary space for the film’s action. This highlights the competitiveness between the different teams while showing the overall camaraderie that exists within a community of dancers. At the beginning of the film, each of
the three characters had taken on leadership roles in three different dance teams, although circumstances change completely within the 5 month period. The film became a more reflective piece about chasing your dreams, and understanding the sacrifice that anyone makes when they pursue a passion like dance. The film indirectly addressed the following questions: (1) why do people choose to devote so much to such a time-consuming and physically demanding "hobby" that has little pay-off and (2) how do people reconcile financial obligations with their passions. Ultimately, this is a piece of work meant to entertain while at the same time tell the very real stories of 3 young people trying to find their way as dancers in NYC.

Understanding the French Front National: Immigration, Unemployment, and Priming
Cody Delistraty, Politics
Sponsor: Professor Anna Harvey, Politics

In determining what causes support for far-right European political parties, previous studies have used observational data to show that as immigration rises during times of high unemployment so too votes rise for these far-right parties that emphasize immigration policy reforms. The causal mechanism underlying this association is, however, unclear. The author thus conducted a survey experiment to collect original data in order to distinguish between the primary causal mechanisms put forth by previous literature. The survey, which was electronically disseminated to eligible voters in France, focused on France’s anti-immigrant Front National (FN) party whose support has risen dramatically in the past few years. The hypotheses tested are that FN voters may simply be xenophobic, FN voters may be economically self-interested (i.e. if there are more immigrants in France then there are more people in France and thus there are fewer available jobs), or that FN voters are responding to priming in the media (i.e. the use of rhetoric to direct voters’ attention to certain facts). There are two overarching conclusions from the results. First, respondents tend not to budge their initial preferences even after undergoing treatments appealing to economic self-interest or priming. The fact that France’s economic outlook does not have a significant effect on votes for the FN means that far-right parties have a better stronghold on the political sphere than many have thought, and it means that claims linking economic outlook to the success of far-right European parties may need to be reassessed. It also means that measures to ameliorate the economy and measures to reduce media time for far-right politicians may not have a significant effect on voting outcomes. Second, a voter’s education level and political knowledge have generally insignificant effects on whether he/she responds to economic self-interest or priming treatments. In fact, voters with low education and low political knowledge showed very little response to the treatments, which contradicts the common hypothesis that less educated and less politically knowledgeable voters are more easily swayed in their political preferences. These overall findings are particularly significant because they propose an alternative to the observational literature that has so far been unable to entirely explain the causal mechanism behind FN vote shares and support for political extremism at large—an issue that is wide spread across Europe, notably in England, France, Spain, and Greece. Understanding that voters are not significantly responding to economic and priming appeals shows that people who vote for far-right parties are voting for more complex reasons than once thought.

The Red-Blue Divide in Choosing Green Energy
Monica Dietrich, Environmental Studies
Sponsor: Professor Harvey Molotch, Social and Cultural Analysis

This research investigated the relationship between political ideology and purchasing decisions around energy efficient products and renewable energy in the United States. A review of the psychological, economic, and environmental studies literature suggested that political ideology predicts green behaviors (i.e., liberals are more likely to purchase energy efficient products than moderates and conservatives), but only when the cost of green behaviors is significantly larger than non-green conventional behaviors, and environmental benefits are salient. Peer effects on green behaviors were also examined. Based on the findings in this review, marketers and environmentalists might reconsider promoting the environmental benefits of new technologies when their audience is politically heterogeneous. Government policy should be put in place to equalize the costs between green and non-green behaviors (e.g., by subsidizing the cost of green energy or taxing conventional energy). There are implications that point to the limitations of the research and directions of future research.

The Effects of Trauma on Parasympathetic Response to Threatening Stimuli in Women
Nicole Dodich, Psychology
Sponsor: Professor Wendy D’Andrea, Clinical Psychology, The New School

A growing body of literature highlights the role of parasympathetic nervous system (PNS) activity, responsible for slowing cardiovascular processes, in emotional and attention self-regulation. The purpose of this study was to investigate the effects of trauma on parasympathetic responses during a cognitive task with emotional stimuli. A high trauma exposure group and low trauma
exposure group completed the emotional go-no go task, which involved a set of trials featuring a threatening target and a set of trials featuring a neutral target, while their physiological activity was monitored. Changes in parasympathetic response, measured in terms of respiratory sinus arrhythmia (RSA), from baseline to mid-task for both the threatening and neutral target conditions were compared between the groups. The results indicated overall differences in parasympathetic response between the two groups, with participants in the low trauma exposure group showing decreased RSA response to both neutral and threatening target stimuli and participants in the high trauma exposure group showing increased RSA response to both types of target stimuli. These findings suggest that when exposed to the same situations, traumatized individuals, in comparison to non-traumatized individuals, perceive stimuli as more threatening and are less able to mount adaptive response to stressors.

Network Organizations and Economic Innovations at Farmer’s Markets

Asia Dorsey, Sociology
Sponsor: Deirdre Royster, Sociology
Sponsor: Professor Ruth Horowitz, Sociology

Obesity and diabetes in America are largely socio-economic issues (Drewnowski & Specter 2004). Based on aggregate census tract data, the proportion of families living in poverty was strongly associated with higher neighborhood rates of obesity and type 2 diabetes. Refined grains, added sugars, and added fats have all been linked to the rise in non-communicable diseases (Drewnowski 2007). They are among the lowest-cost sources of dietary energy especially compared to the cost of the recommended “healthful” diets based on lean meats, whole grains, and fresh vegetables and fruit. Food Justice advocates have worked to address the inequality in fresh food access, spatially, culturally and economically through the creation and placement of farmer’s markets which utilize economic innovations (such as EBT/SNAP, Health Bucks, WIC etc.) within the communities which have the most need. This research employs Weberian notions of Ideal Type and organizational theory to understand how farmer’s market networks impact the adoption and flow of economic resources into these high need communities. The method employed included semi-structured interviews with key decision makers in farmer’s market organizations, individual farmer’s market managers, as well as an analysis of a wealth of public and privately available data. This study discovered that varying forms of interfirm and intrafirm capital, organizational structure as well as ideology and values are all elements contributing to the ideal community impact as well as speedy adoption and deployment of economic innovations at farmer’s markets. This research could help to pinpoint the organizational structures, policies and individual contributions that have the greatest influence and chance of impacting key disadvantaged populations. This work could also help to more efficiently target and distribute the finite resources that enable low-income people to access healthful foods.

Establishing Sexual Dimorphism in Oreopithecus bambolii

Alyssa Downs, Anthropology
Sponsor: Professor Terry Harrison, Anthropology

Oreopithecus bambolii is one of the best-preserved fossil primates. Previous dental studies indicate that Oreopithecus exhibits sexual dimorphism (males > females), which allows us to make inferences regarding social structures. The degree of postcranial body size dimorphism remains unknown. This study addressed sexual dimorphism in Oreopithecus given the length of bone markers from the preserved postcranial skeleton. We proposed the postcranial data would indicate that Oreopithecus would have slight levels of sexual dimorphism. To test the relationship between sexual dimorphism and size range, the linear distance (total length) of ten postcranial markers associated with body size dimorphism across non-human taxa were measured (3085 measurements). We found a positive correlation for each marker. A positive correlation between size range and sexual dimorphism was then observed (R2=0.89). Based on this relationship, Oreopithecus exhibits slight body size dimorphism (Males 39% > females). In extant primates, sexual dimorphism informs aspects of social organization that help make conclusions regarding social organization in extinct primate species. This study compared Oreopithecus to other non-human primates with varying degrees of sexual dimorphism and found it to be closest to chimpanzees. Applying this method after obtaining more measurements enables researchers to relate fossil apes to extant primate social organizations.

Effects of Group Membership on Early Attentional Shifts in Moral Judgments

Jessica Dubin, Psychology
Sponsor: Professor Jay Van Bavel, Psychology

Research has shown that moral judgments are made rapidly and intuitively, with little conscious reasoning factoring into final discussions. Current models of attitude formation propose that attitudinal evaluations shift to accommodate contextual information as it becomes available. In the case of moral judgments, the severity or leniency of an individual’s evaluation of a moral transgression is significantly impacted by group membership of the transgressor. Prior research has suggested that implicit early shifts in attention impact later explicit moral judgments. The current research examines the role of attention in differential moral judgments by racial
groups. This study predicts that when assessing the severity of a crime and the guilt of a criminal, individuals will preferentially attend to mitigating evidence for Black criminals and incriminating evidence for White criminals. This study further predicts that preferential attention to either mitigating or incriminating evidence will lead to more polarized explicit judgments of guilt. This research provides novel insight into the cognitive and attentional mechanisms that underlie the formation of morally salient judgments. Identifying these mechanisms is key to minimizing racial and group bias in morally charged situations.

**The Unstoppable Commuter School**

*Connor Durkin, Journalism*

*Sponsor: Professor Jason Samuels, Journalism*

Nearing its bicentennial, New York University has grown from a regional commuter school to a celebrated academic institution, yielding a global presence and influence. Physical expansion and real estate deals cultivated the university’s reputation and thus enriched the worth of an NYU education. With John Sexton at the helm, the NYU 2031 plan and the Global Network University present aggressive developments, both locally and abroad. Now, controversy regarding these plans and Sexton’s leadership cripple the country’s largest, private university from within. Many members of NYU and the New York community question the academic, social and financial merits of such development. Opinion within the university remains sharply divided, and both sides struggle to communicate. “The Unstoppable Commuter School,” a multimedia, online-based journalism project, places the current state of the university and its expansion within a historical context. The mixing of videos, photography, graphics and text creates an engaging platform, allowing the viewer to experience a rounded understanding of both sides of the argument. As the university’s influence continues to grow, more academic institutions frame possible growth after the NYU model. Therefore, presenting the current state of NYU illuminates the blessings and drawbacks of an academic institution using physical expansion to garner prestige.

**Incumbent Goals: World Cup Qualifications and Electoral Success**

*Justin Epstein, Politics*

*Sponsor: Professor Anna Harvey, Politics*

*Sponsor: Professor Emily West, Politics*

How do voters evaluate incumbents? Could voters be making decisions at the ballot box based on information completely irrelevant to candidates? The literature suggests that voters have no incentive to become informed on candidates and thus may be using exogenous shocks to the political system to evaluate incumbents. This research tests the theory by using qualification to the FIFA World Cup as an exogenous shock to the political system. Establishing a model of regression discontinuity to reduce endogeneity, the models suggest that qualification has a strong and highly significant effect on incumbent success, when the election is held less than two years after qualification. Incumbents in countries that qualified see significantly larger increases in the percent change in vote share, seat share, and reelection probability from before and after qualification, compared to countries that failed to qualify. These results imply that voters are using irrelevant, exogenous shocks to reward and punish incumbents, which presents a significant challenge to viewing elections as methods of selecting “good types”. This undermines elections as accountability mechanisms and opens the door to “bad types” of politicians winning office based not on their performance but on a random event.

**Gamers: A Role to Play?**

*Eryn Fox, Psychology*

*Sponsor: Professor Victoria Olsen, English*

The vast majority of psychological research conducted on the effects of video games points to its association with aggression, addiction, and depression—risks especially heightened in children and adolescents. This focus is due in part to the tremendous media attention garnered from mass killings associated with youth playing video games (e.g. the 1999 Columbine shooting). However, according to many researchers in the field of psychology, in order to truly assess the effects of video games on child and adolescent mental development, a far more balanced perspective is needed, one that considers both the risks and benefits associated with gaming. This need has become extremely pressing in part because the nature of the video game has changed dramatically within the past decade. In the last 5 years, a small body of research has been conducted that documents the cognitive, emotional, and motivational benefits of gaming. This paper aims to provide a comprehensive summary of that research and to critically analyze it in the context of research that argues just the opposite. As the mental development and security of today’s children is in question, reaching a conclusion to this debate should be considered to be of invaluable importance to society at large.

**Interpersonal Consequences of Goal Projection in Dyadic Negotiations**

*Kelly Gallagher, Psychology*

*Sponsor: Professor Gabriele Oettingen, Psychology*

Goal projection is the assumption that other people share the same goal that one is currently pursuing. The present research examined the consequences of goal projection in dyadic interactions. Specifically, this study analyzed the consequences from the point of view of the target partner...
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Towards an Understanding of Production Sites in the Archaeological Record: Waste in Bead Manufacture
Giulia Gallo, Anthropology
Sponsor: Professor Randall White, Anthropology

Production sites make especially valuable contributions to the archaeological record. Indeed, the physical traces of the technologies and social relations at play can be literally grounded in time within the site itself. To identify a production site within the archaeological record, however, one must be able to identify the waste created by the manufacture of items that might subsequently have been used, traded, or discarded elsewhere. This study tests two methods currently used in archaeology for their usefulness in identifying the production waste (déchet) associated with amber, talc, and lignite beads produced within the Aurignacian culture (Upper Paleolithic). Using actual beads found at three different Aurignacian excavations as models, I experimentally produced beads with these materials. The researcher then subjected the resultant déchet to both mass analysis and to microscopic examination. While the mass analysis method was able to produce many statistically significant numbers, it proved unreliable as a way to specifically identify the production waste of beads. Analysis at the microscopic level, on the other hand, can discriminate the morphologies of déchet, and therefore is a more effective way to identify this material in the archeological record. This suggests the future positive implications of applying micromorphology to research questions involving production.

China’s Quest for Oil: Opportunity or Obstacle? Reevaluating the Role of Chinese FDI in African Development
Karin Gegenheimer, International Relations
Sponsor: Professor Rachel Brulé, Politics

In recent years, China has earned a reputation as a major global investor. This status, however, has not come without controversy. Claims that China’s outward Foreign Direct Investment (FDI) is appropriated with the intent of natural resource extraction plagues its legitimacy as an instrument for host country economic development. This study aims to isolate the effects of oil production on growth spurred from Chinese FDI. Does Chinese investment in oil accelerate or inhibit a state’s economic development, and how does this relationship change across the time horizon? Using a cross-country analysis of 47 Sub-Saharan African states, it was discovered that oil production has a significant negative impact on FDI growth in the short and medium term. In these time specifications, oil-dependent states observe lower levels of economic growth relative to states with minimal oil production. This result substantiates concerns about China’s self-interest, and helps identify the mechanisms through which foreign direct investment affects economic growth.

Christian Missions and Gender Inequality: An African Perspective on Politics, Education, and Health
Chelsea Getz, Politics
Sponsor: Professor Anna Harvey, Politics

This research project examines how the historical presence of Protestant and Catholic mission stations has impacted modern levels of gender equality in 43 African countries. It seeks to test whether historical Protestant and Catholic missionary activities transmitted norms and values that may have had a long-run impact on women’s access to educational and political institutions and the quality of health care provided to women. It is hypothesized that a greater historical Protestant missionary presence will have had a positive impact on indicators of modern gender equality, and that a greater historical presence of Catholic missions will have had no or a negative effect on indicators of modern gender equality. To target issues of endogeneity, an instrumental variable design, using historical and geographical variables to predict the location of Protestant and Catholic missions in 1924 is implemented. This project contributes to the growing politics literature analyzing the impact of religion on gender norms, targeting the historical differences between Protestant and Catholic denominations and their approaches to gender equality.

Predicting M1 Size from dm2 in Fossil and Modern Hominins
Evelyn Glaze, Anthropology
Sponsor: Professor Shara Bailey, Anthropology

The goal for this research project is to build a regression algorithm that will allow dental anthropologists to estimate the size of an adult molar in a later hominin based only on the size of a deciduous (baby) molar. More directly, this model will be used to estimate the size of a deciduous second molar recently found in Longtanshan, China.
Homoplasy in Ateline and Hominoid Lumbar Vertebrae
Deanna Goldstein, Anthropology
Sponsor: Professor Scott Williams, Anthropology

Homoplasy is the independent evolution of similar features in species that do not share a recent lineage. Homoplasy can be mistaken for homology (evolution due to shared ancestry), which is particularly problematic for interpreting and inferring the phylogenetic position of fossils. Atelines (spider monkeys and relatives) and hominoids (humans and other apes) have, for example, convergently evolved a shortened lower back, or lumbar spine, from the primitive anthropoid condition of a long, flexible lower back. Within the family Atelidae, this parallel evolution has been mistakenly interpreted as an indication for shared ancestry (homology) between the atelines Ateles and Brachyteles, to the exclusion of Lagothrix. This feature, however, has been revealed to be a product of homoplasy, not homologous evolution, by recent genetic studies of the families Atelidae. Lumbar vertebral measurements, considered within the postural and locomotor behaviors of each species, allows for a comparative study within the family Atelidae (Alouatta, Ateles, Lagothrix) and within the superfamly Hominioidea (Hylobates, Pongo, Gorilla, Pan), and between the two groups. By examining parallel evolution within each clade and convergence between them, this study allows for a better understanding of the conditions that lead to homoplasy, or parallel and convergent evolution, with implications for interpreting the fossil record.

Removing Self-Presentation from Competitive Tasks Eliminates the Performance Difference between High versus Low Trait Competitive Individuals
Anton Gollwitzer, Psychology
Sponsor: Professor Tessa West, Psychology

Why do non-competitive people perform worse than competitive people on competitive tasks? What role does presenting one’s abilities before competing play in this gap in performance? To answer these questions we examined how engaging in self-presentation before competing differently impacts the task performance of non-competitive versus competitive individuals. Participants were either assigned to compete or not compete with another person on a verbal ability task, and were either told that a self-report of their verbal abilities would be shared or would not be shared with that person. Competitiveness differently predicted verbal task performance dependent on whether or not participants were competing, and whether or not participants engaged in self-presentation. When participants engaged in self-presentation before competing on the verbal ability task, non-competitive participants performed worse than competitive participants. However, when participants did not engage in self-presentation before competing on the verbal ability task, non-competitive participants performed as well as competitive participants. These results posit that non-competitive individuals can perform as well as competitive individuals on competitive tasks if they avoid or learn to cope with presenting their abilities before competing.

Self-Control and Dietary Choices
Tara Gore, Psychology
Sponsor: Professor Yaacov Trope, Psychology

When faced with temptations, people are often unable to resist them and end up forfeiting their long-term goals. This study examines how such self-control failures can be reduced, especially for those individuals who struggle with self-control conflicts. This study suggests that by having individuals think about a goal that requires one to exert self-control in one domain, they will be able to successfully promote self-control in subsequent choices even if the self-control experiences are in varying domains. This research aimed to explore whether self-control activated in one domain (academic achievement) can later influence dietary choices. In this study, participants were either primed with self-control or not. Self-control was primed by having participants list activities they were trying to avoid this month in order to focus on their studies. First, in the neutral condition participants listed music they were trying to avoid listening to. Second, participants were then given the opportunity to take as many M&M candies as they wished. The researchers intend to determine whether an initial self-control prime influenced how many M&M candies participants chose to take. This research has the potential to significantly contribute to the understanding of how self-control can be facilitated in the health domain. As obesity rates in America are continually on the rise, this research has important applied implications as well.

Hope For the Future? A Genetic Population Viability Analysis of 3 Fragments of L. catta
Olivia Gray, Anthropology
Sponsor: Professor Todd Disotell, Anthropology

Anthropogenic interference and related climate change has led to the fragmentation of the natural habitat of Lemur catta in Madagascar. Despite their seemingly wide range and high numbers, the ring-tailed lemurs are now more at risk for extinction than ever because the increasing fragmentation of their groups jeopardizes their proper dispersal and resultant genetic variability across populations. The researcher conducted genetic analysis on three fragment populations of L. catta and have found evidence of significant inbreeding among two of the groups and of recent bottlenecks in the third. This data, as well as a composite selection of life history data taken from extant long-term behavioral studies using a population viability modeling program, was
analyzed in order to determine the future viability of these fragments. The results help to identify measures likely to be most effective in ameliorating the predicament of population fragments.

**Beyond The Scope: Barriers to Colonoscopy**  
*Elizabeth Green, Anthropology*  
*Sponsor: Professor Rayna Rapp, Anthropology*

Colorectal cancer is the second leading cause of cancer-related death in the United States. Colonoscopies have proven to decrease colorectal cancer mortality if baseline imaging begins at least 50 years with subsequent tests every ten years, barring abnormalities. Yet adherence rates are less than 30% among eligible adults. This study examines biocultural barriers to colonoscopy as they relate to views of divination: do subjects sent for colonoscopy want to know/not know about their possible medical futures? If pre cognition of the medical future is determined to be a primary barrier to colonoscopies, interventions may be developed that might prove effective in increasing screening rates. Research is being conducted at the Jill Roberts IBD Center of Weill Cornell Medical Center, with up to 100 patients at high risk for Colorectal cancer. Primary interviews and secondary surveys assess reasons for non-adherence and compliance, addressing biocultural issues specific to colonoscopy screenings. Initial data suggests that the primary barrier to adherence of colonoscopy screening is fear of a psychosocial nature with regard to taboos of the body and future implications. Other barriers include: scheduling, preparation, insurance and lack of referral. Interventions tailored to biocultural barriers of colonoscopies are necessary.

**Facial Recognition Technology and Privacy Law**  
*Susannah Griffie, Journalism*  
*Sponsor: Professor Brooke Kroeger, Journalism*

In small pockets across the United States, from Silicon Valley to Las Vegas, primarily male tech developers in hoodies and sneakers are coding for 18 hours a day and sleeping in startup homes that double as offices. They are figuring out ways to turn your shopping habits, personal conversations, favorite restaurants, daily commutes, fingerprints, retina scans, healthcare data, and even your face into computerized data that can be read, analyzed, and categorized almost instantaneously. In other words, they want to merge the physical and online worlds. The developers at NameTag exemplify this trend; they are currently developing a facial recognition app for Google Glass that can scan people’s faces in real time and link them to all of the information they have ever published (knowingly or unknowingly) on the Internet. A revolutionary change in handling of personal data should result in a similarly revolutionary change in laws protecting personal data. The American legal system simply does not operate quickly enough to legislate, or even propose legislation, regulating these new technologies before they are released to the public. If new laws or privacy policies are proposed, it is a number of months or even a number of years after the technologies they are meant to regulate have been released. Developers have called the gap between when technology is available to the public and when laws governing technology emerge the “innovation” period. This period allows developers to release new programs free of legal restrictions on data collection other than long consumer agreements specifying how much personal data the technology will collect (contracts the consumer often doesn’t read).

By the time the privacy issues surrounding the technology come up for legal consideration, the public is already comfortable with and even reliant on the new programs. This phenomenon has resulted in the swift spread of the tech community’s niche conception of privacy to the rest of the population. When digital and physical lives are merged, everything takes place in the same mostly public online arena. Distinctions between work life and social life, public persona and private persona, become much more difficult, and the traditional legal idea of “expectation of privacy” disappears because there are no more private places. The quiet spread of this technology without the national debate usually generated by proposed changes in governmental policy has resulted in a mostly uncontested cultural as well as legal shift from an expectation of privacy to an expectation that most information will be public. Within the tech world, this paradigm is widely accepted and generally taken for granted. However, in the general public, the slow death of privacy law is going unnoticed. This long form article explores the changing dynamics of privacy law in a world in which technology threatens to make the legislative system itself obsolete.

**Perceptions of Racial Minority Adolescents with Mental Illness**  
*Charlotte Henriksen, Teaching and Learning*  
*Sponsor: Professor Tessa West, Psychology*

There are a large number of adolescents in the United States who are currently suffering from depression and ADHD. Many of these adolescents have not been properly diagnosed and are not receiving adequate treatment. Researchers speculate that this under-diagnosis and lack of treatment are due in part to the stigma that is attached to being labeled with a mental illness. There is considerable variability in people’s beliefs about adolescents with mental illness. Using the 2002 wave of the General Social Survey, this current analysis compared whether Black and White adults differ in how they perceive Black and White children who are diagnosed with depression, ADHD, or no illness. Results revealed that Whites were more likely to think...
that children had a chemical imbalance and bad character than Blacks, and Black adolescents were marginally more likely to be perceived as having bad character than White adolescents. Additionally, adolescents who had a mental illness were evaluated more negatively than those without a mental illness. Implications are discussed for reducing stigma against mental illness.

A Critical Examination of the Restoration and Future Use of Castle Clinton

Bryn Hendrich, Urban Design and Architecture Studies
Sponsor: Professor Mosette Broderick, Urban Design and Architecture Studies

This study examines how best to reintegrate Castle Clinton, an architecturally rich but poorly utilized National Landmark, into the social and cultural life of lower Manhattan. It examines the Fort’s history of adaptive reuse through analysis of past archaeological reports, plans of the site, and contemporary correspondence to better understand past instances of successful and unsuccessful renovations of the site. This study then uses this historic structural analysis to evaluate both the 1950s restoration of the site and current proposals for the fort’s renovation. This research challenges both the historical rigidity of the site’s current form as well as the dramatic structural alterations proposed by the Battery Park Conservancy’s current renovation proposal, advocating instead for a historically aware renovation that acknowledges the site’s historic elements while allowing for contemporary architectural interventions where the building’s historic elements have been lost. Because of Castle Clinton’s historic significance and status as a National Landmark, there are significant implications for the conclusions drawn using this research. Whatever form Castle Clinton’s future restoration takes will set a precedent for future attempts at renovation of historic buildings in New York City.

Friedman-Savage Utility Functions in the Lab: Revisiting the Assumption of Strictly Concave Utility Functions in Models of Decision-Making Under Risk

Lindsay Hunter, Economics, Psychology
Sponsor: Professor Andrew Caplin, Economics

From understanding leisurely behavior that takes place in Las Vegas Casinos to outlining policy reform and health care procedures, the numerous applications of decision-making under risk have fueled demand for further research on the topic. Models of decision-making under risk traditionally assume strictly concave consumption utility in order to study subjective choice variables that influence monetary preferences. Without abandoning the Expected Utility Theory (EUT) framework this study considered the notion that the shape of the consumption utility function can actually be considered a subjective variable itself. While Friedman-Savage (1948) proposed a large convexity in the utility of wealth function to explain the coexistence of insurance and gambling, this study argued that local convexities in an individual’s utility function can produce abnormal risk behavior in economic games studied in the lab. This point was demonstrated with a case in which the decision maker (DM) has a set of preferences over a finite set of indivisible goods because consumption utility is not strictly concave in wealth in this case. Such deviation revealed that, at least in this case, the standard revealed preference models that assume strict concavity are too structured to capture nuances of consumption preferences and therefore the individual utility function is miss-specified. Such misspecifications can lead to false conclusions about risk attitudes. As such, this project ultimately sought to demonstrate that reconsidering the appropriateness of this assumption in the laboratory and other empirical environments can shed light on the inexplicable prevalence of abnormal risk behavior such as “narrow bracketing” which is commonly reported by researchers using under revealed preference methods such as the famous Holt-Laury (2002) measure of risk aversion.

In Dispute: The Role of Executive Elections on Official Development Assistance

Philip Hwang, Politics
Sponsor: Professor Alastair Smith, Politics

Authors Michael Faye and Paul Niehaus in their paper Political Aid Cycles present significant results which support their claim that donor countries give more to allied executive leaders facing competitive elections. When their research is replicated and expanded however, the significance of their results disappears. Undertaking their research model with several adjustments, this paper seeks to answer the question “What are the effects of executive elections on official development assistance?” once more. The results support that donors give more aid during executive elections, give more aid to politically aligned countries, and give more aid to countries which have competitive elections. However, each of these factors is isolated from each other. Furthermore, the increases in aid for politically aligned countries and countries with competitive elections are confined to specific donor-recipient country pairs. This study adds research to the relatively scarce literature on the relationship between foreign aid and executive elections.

The Role of Imagery and Indeterminacy in Aesthetic Experiences of Literature

Alison Isaacs, Psychology
Sponsor: Professor Gabrielle Starr; English, Seryl Kushner
Dean of the College of Arts and Science
Sponsor: Dr. Edward Vessel, NYU Center for Brain Imaging

Aesthetic appreciation is a uniquely human phenomenon
that involves experiences including beauty, disgust, and even the sublime. Both mental imagery and the level of detail of literary object have been hypothesized to play a role in people’s aesthetic experiences; however, it is unclear how these two concepts relate to each other. Rich detail prescribes a specific way in which a stimulus can be imagined while lack of detail, or indeterminacy, allows a participant to fill in missing information with more self-generated detail. Literature is a unique way to study aesthetics because the imagery it evokes is of a different form than the stimulus itself (text). Unlike, for example, visual imagery evoked while looking at visual images such as artwork. This dissociation allows the role of imagery in aesthetic experience to be studied independently of confounding sensory input. To study the relationship between imagery, indeterminacy, and aesthetic response, this study asked participants to read literary passages and rate each of these measures. This study hypothesized that the level of indeterminacy would affect the degree of mental imagery evoked by a passage such that both ends of the spectrum (too little or too much detail) will hinder vividness while passages that lie in-between will evoke more vivid imagery. It was also hypothesized that more vivid mental imagery will predict a stronger aesthetic response. This study explored a new modality through which to study neuroaesthetics that relies on internally driven stimuli.

Food for Thought: The Allocation and Distribution of U.S. Food Aid
Rebecca Israelson-Kurland, Politics and French
Sponsor: Professor Alastair Smith, Politics

Since the inception of U.S. food aid in 1954 with the passage of PL 480, the United States government and journalists have viewed it as a humanitarian program designed to alleviate global hunger. Particularly in more recent years, the rhetoric of the American government has evolved from describing the program as a method of domestic surplus disposal toward a program designed exclusively for international assistance. This study asks what determinants affect U.S. food aid allocation. How does food aid distribution affect the quality of life, nutritionally and economically, in recipient nations? This research demonstrates that American allocation of food aid remains an exclusively donor-oriented program whose purpose is to dispose of surplus product. Furthermore, this study shows that food aid has no significant impact on the quality of health or agricultural economies of recipient nations.

Social Identity and Economic Preferences
Poorvi Iyer, Psychology
Sponsor: Professor Jay Van Bavel, Psychology

This study seeks to measure and examine how identity influences economic preferences. Past research in social psychology suggests that people are motivated to maintain social identities (i.e., identification with social groups) that reconcile opposing needs for assimilation with and distinctiveness from others (Brewer 1991). Recent economic models have proposed that people place intrinsic value on social goods (Fehr & Fischbacher, 2002); this research seeks to test whether this is true of identity related motives. This study hypothesizes that identity distinctiveness motives—i.e., motivation to differentiate oneself from others—would influence economic preferences, such that people with high distinctiveness needs will pay a financial cost to keep their group small and distinct. To test this hypothesis, a study was done in a lab setting that pit monetary incentives against distinctive needs involving choices with real monetary outcomes. Thus, this work tested whether a previously untested form of social concern—social identity—could influence economic preferences, offering new insights to psychology and economics.

Sun Culture: Measuring the Impact of Solar Irrigation Technology in Kenya
Sameer Jaywant, International Relations
Sponsor: Professor Jonathan Mordoch, Public Policy & Economics, Robert F. Wagner School of Public Service

One of the more promising elements of development in Africa is the synthesis of renewable technology and conventional agricultural practices; this trend is illustrated well by SunCulture, a startup social enterprise founded at NYU that designs and sells solar-powered drip irrigation systems to Kenyan farmers using a microfinancing partnership with Equity Bank, the largest bank in Kenya. During the summer of 2013, two months were spent in Nairobi conducting research for SunCulture—specifically, a project to construct an Impact Assessment System (IAS), which would allow the company to accurately measure important impact benchmarks as they scaled their operation. First, an “impact map” was organized into 3 subsidiary categories of impacts: social, financial and environmental. Secondly, the researcher selected 3–4 desired outcomes per category, including: access to finance, increased profit, food security, agricultural productivity, sustainable land use, and renewable energy generation. Finally, I consulted the reputable Impact Reporting and Investment Standards (IRIS) initiative of the Global Impact Investing Network (GIIN), which provided standardized metrics that served as indicators of the desired outcomes mentioned above. Examples include: microloan usage/value, input & energy costs, change in post-harvest revenue, the percent of harvest consumed vs. sold, crop yield, hectares cultivated, and energy cost savings. A questionnaire was developed that elicited information regarding SunCulture clients’ lives before and after their utilization of the solar irrigation system—the answers to the
questions directly linked to specific metrics on my impact map. Although the final version of my IAS was approved by the management of SunCulture, the business was not set to expand rapidly enough to warrant implementation of the full IAS until mid-2014. Nonetheless, the following large-scale impact indicators have been measured: $558,960 total annual economic benefit to SunCulture farmers, 292,000,000 liters of annual water savings, 36,500 kWh annual renewable energy generation, and 12,329 individuals that can be fed by food generated by SunCulture farmers. In addition, the researcher will be joining the executive management team of SunCulture beginning in June 2014, to personally oversee the full implementation of the IAS in order to quantify the impact of microfinance and solar irrigation technology on the lives of Kenyan farmers.

**Un-dumbfounded: How Reasoning Shapes Moral Reactions**  
_Eugene Jaw, Biology and Psychology_  
_Sponsor: Professor Jay Van Bavel, Psychology_  
_Sponsor: Professor Jennifer Lauren Ray, Psychology_

Moral dumbfounding is a phenomenon in which people judge actions with no explicit harmful outcomes as wrong on the basis of their gut reaction and despite their inability to justify their judgments (Haidt, Bjorklund, & Murphy, 2000). While moral dumbfounding is frequently cited as evidence for intuitionist models of moral judgment, we believe that prior states of the evaluative system can tune intuitions and thereby change individuals’ judgments—a process we term “moral tuning.” This study hypothesized that simply varying the order in which moral stimuli are presented can alter peoples’ subsequent moral judgments. In a first study and a replication, participants were presented with two moral dilemmas: a dumbfounding scenario (e.g. incest or cannibalism, Haidt et al., 2000) and a classical moral reasoning dilemma (e.g. the Heinz or Euthanasia dilemmas, Kohlberg, 1969), in counter-balanced order. In both studies, when the moral dumbfounding scenario was presented first, the results replicated Haidt’s dumbfounding effect such that participants reported more confusion. However, when the reasoning dilemma was presented first, levels of confusion on the dumbfounding scenario were attenuated. These results suggest that priming a reasoning mindset can tune the evaluative system, thereby altering subsequent responses to moral scenarios.

**View of Intelligence Affects Sense of Belonging in Math Environments**  
_Andrew Johns, Psychology_  
_Sponsor: Professor Catherine Good, Psychology, Baruch College, CUNY_

Most people believe that intelligence is either a fixed quantity or that it can be molded and improved through work and effort. In this study, belief in these two views of intelligence were manipulated to study the impact they might have on an individual’s sense of belonging in a math community (e.g., a math class). To achieve this, undergraduate students were asked to read and summarize short, _Newsweek_ -style articles, which were modified to emphasize one or the other view of intelligence. These students then filled out detailed surveys about whether they felt they belonged to a math community. While this study is still ongoing, researchers predict that the students who read the articles depicting intelligence as malleable will have a higher sense of belonging than those who read the other article. The study will provide insight as to what constitutes a sense of belonging and how to encourage students to continue to pursue math.

**Congressional Tweets: Analyzing the Relationship between Political Ideology and Reliance on Specific Human Values**  
_Kevin Jones, Psychology_  
_Sponsor: Professor John Jost, Psychology_

Little research in the realm of political psychology has focused on the actual differences in communication between liberals and conservatives. The limited research conducted has not focused on political elites: those most engaged and knowledgeable in the realm of American Politics, specifically federal legislators. In this study, the researchers specifically analyzed public twitter accounts from members of the 113th United States Congress. For the purposes of the study, researchers analyzed conservatism and liberalism as both a binary variable and a continuous variable based on a principal component analysis of roll call votes. The researchers developed custom Linguistic Inquiry Word Count (LIWC) Dictionaries (Pennebaker, 2002) for each of the ten universal values encompassed in Schwartz’s Circumplex of Human Values (2004). LIWC software was used to calculate the rates in which each federal legislator utilized words included in each of ten value dictionaries. The statistical analysis concluded that Conservatives use words associated with achievement and hedonism at a statistically significantly higher frequency than Liberals. Results suggest that Conservative members of Congress more often talk about ideas related to success and pleasure than Liberals.

**Citizenship Rights, Race, and Collateral Consequences: How the Percent of Racial Minorities in the State Influences the Pattern of State-Level Collateral Consequences**  
_Zoe Kahn, Sociology_  
_Sponsor: Professor Deirdre Royster, Sociology_

Although no longer at the surface of US laws, racial discrimination continues to permeate social, political and legal systems. One important and often overlooked facet...
of the criminal justice system is a set of laws enacted at the federal and state level—referred to as collateral consequences—that limit the activities and opportunities of convicts after the completion of court-mandated sentences. Given the racial demographic of the convict population, it is evident that collateral consequences affect racial minorities more than their white counterparts. This study looks beyond this known fact to investigate if the observed variation of state-level collateral consequences further demonstrates racial discrimination. Data on collateral consequences limiting two specific citizenship rights (access to education grants and voting rights) and those limiting citizenship rights as a result of misdemeanor offenses were obtained from the National Inventory of the Collateral Consequence of Conviction. Data analyses related collateral consequence severity to states’ racial, political, and economic demographics. An analysis of collateral consequences at the state-level suggests that while racial discrimination exists in certain contexts, substantial presence of racial minorities in state populations can influence state politics in ways that limit pervasive racial discrimination.

The Cohesion of Voting Blocs at the UN General Assembly: An Adaptation of WNominate to Policymaking

George Mark Kailas, International Relations Honors Program
Sponsor: Professor Michael Gilligan, Politics

This research looks to bridge the gap between academia and policymaking by employing the latest methods in political science, namely the statistical algorithm WNominate, to develop two quantitative measures relating to the voting behavior of states in the United Nations General Assembly. The first estimates the cohesion of voting blocs by calculating the distance between a state’s ideal point and that of an average state belonging to the same bloc. By identifying those states whose policy preferences are farthest away from those of the average state, this measure also determines which states belonging to that bloc are most likely to defect on any given vote. The second quantifies the distance between a state’s ideal point and that of the United States, thereby serving as an indicator of voting coincidence. The resulting figures for all 193 members of the UNGA have been incorporated into an interactive dashboard, which is intended to serve as an intuitive tool for active policymakers. These figures indicate that voting blocs on average have strengthened following the Cold War, although levels of cohesion vary greatly across issue-area. Notably, the findings also suggest that the cohesion of the Group of 77 (G-77) has decreased over time, for which this paper finds factionalism to be the most likely cause. The ability of these two measures to better inform policymaking exemplifies the potential that quantitative analysis has to change the conduct of multilateral diplomacy.

Pandora’s Box: The Development of Opening Containers
Danielle Kellier, Biology
Sponsor: Professor Karen Adolph, Psychology

Containers are a common and pervasive artifact in every culture, yet little is known about how children learn to open and close containers. Opening a container to gain access to its contents requires several critical perceptual-motor skills: Children must recognize important features of the container such as the type of closure; they must orient their hands correctly and assign appropriate roles to each hand; and they must perform the necessary actions in the right sequence. How and when do children learn to open containers? As a first step, we asked children aged 12–54 months to open containers with twist-off lids that varied in diameter. Twelve-month-olds displayed a variety of futile actions that failed to open the containers. Eighteen-month-olds performed twisting actions but still failed to open the containers. By 24 months of age, infants showed a M = 71% success rate at opening containers. Between 30–54 months, speed of opening continued to increase. Between 18–36 months, very large and very small containers proved most difficult to open; children knew the required actions but could not implement them effectively. These findings will increase understanding of how children learn to use the artifacts of their culture.

Ex-Combatant Reintegration and Post-Conflict Violence Against Women in Colombia
Jessica Kim, Politics and Spanish
Sponsor: Professor Anna Harvey, Politics

Does ex-combatant demobilization increase post-conflict violence against women? Research on contemporary reconstruction strategies suggests the plausibility of this relationship, but with varying explanations and using only qualitative evidence. In 2003, the Colombian government implemented a Disarmament, Demobilization, and Reintegration (DDR) program through the Santa Fé de Ralito peace agreement with members of the paramilitary group, United Self-Defense Forces of Colombia (AUC). This study implemented a 5-year lagged first-difference regression on values from nationally-representative health surveys of women in 2005 and 2010 to test the effect of AUC ex-combatant presence in a given municipality on changes in municipality-level measures of violence against women. The regression results indicated some significant increases in measures of psychological violence between 2005 and 2010 associated with greater AUC ex-combatant presence, but little to no effect on changes in physical violence. While the effects were relatively small, these findings suggest that the reintegration program appears to have had an adverse affect on non-physical forms of violence against women. Because violence against women has become a principal
characteristic of modern-day civil wars, it is necessary to more specifically rehabilitate demobilized rebels to prevent harmful behaviors towards women.

**Language and the Judicial System**
*William Koessler, Anthropology*
*Sponsor: Professor Bambi Schieffelin, Anthropology*

The American legal system is a highly regulated and systemized institutional body that strives to be objective while adjudicating disputes between conflicting parties based on particular types of evidence. Despite the systematic nature of the law, American courts do not afford spoken language/speech the same uniform procedural protection it extends to the written word and other forms of human evidence such as DNA, fingerprint analysis, and eyewitness identification. This project explores the unpredictable and variable nature in which spoken language is treated as an object and as evidence within the formalized, rule-governed American legal system. It applies concepts from linguistic and legal anthropology to a selection of case law concerning workplace disputes, aiming to understand how accent and speech figure in claims made within the American court system. Whether the way language is treated within the workplace fosters discrimination or not, it is important to analyze the underlying cultural and linguistic ideologies to see various ways participants in the legal system may be excluded or limited due to the way they speak.

**Choose Your Memory: The Effects of Choice on Long-Term Memory and Preference**
*Donna Koo, Psychology*
*Sponsor: Professor Lila Davachi, Psychology*

Choice has recently been shown to improve long-term memory. However, the mechanism by which choice improves memory is unknown. This research demonstrated that choice is associated with reward networks, suggesting that this system drives choice-memory enhancements. This current study investigated the effects of choice on memory features associated with rewards: consolidation, preference changes, and state-level activation. Specifically, this study tested whether choice memory benefits are seen only after a delay (consolidation), predicted by changes in preference, and maintained over an extended block of time. In two experiments, participants learned objects initially hidden behind occluder screens. On choice trials, they chose which screen to reveal; on fixed trials, they were told which screen to reveal. Preference ratings for selected screens were collected before and after learning, and object memory was tested both at immediate and 24 hour delays. Results revealed better memory for objects in choice trials and that memory enhancements were predicted by changes in preference ratings. These effects, however, were seen at both testing sessions, and do not support consolidation mechanisms. Thus, this data partially support the involvement of reward systems in choice memory enhancements. Results from our experiments can be used for improving studying and education models in schools.

**The Scaling Relationship Between the Hypoconulid and Facial Length in Papionini**
*Jessica Korsgaard, Anthropology*
*Sponsor: Professor Shara Bailey, Anthropology*

Research has shown significant correlation between postcanine tooth area and facial size in primates; however, no study has examined the relationship between facial size and specific components of tooth morphology. Since studies of evolution and development have suggested that later forming cusps are highly evolvable, there is reason to believe these cusps may also vary with facial size. The hypoconulid is the last forming cusp of the lower molars and is highly variable among species of the Old World monkey tribe Papionini. This study examined whether or not hypoconulid size has a predictable relationship with facial length and, if so, what that relationship is. It also examined whether that relationship is constrained by phylogeny. Measurements were taken on the third mandibular molar (M3) and include hypoconulid length, tooth row length, and hypoconulid area. Both static (within taxa) and evolutionary (between taxa) allometry were analyzed in five genera of Papionini (*Cercopithecus, Lophocebus, Macaca, Mandrillus, and Papio*). Results indicated a significant positive allometric relationship between hypoconulid size and tooth row length within and between certain taxa. Further examination of these differences in allometry will help to better understand evolvability of both components and their utility in phylogenetic comparisons.

**Fostering Chinese-American Identity Through Multilingual Teaching at a Preschool in Chinatown**
*Corrina Kroeker, Anthropology*
*Sponsor: Professor Sonia Das, Anthropology*

This research examines the relationship between language acquisition and cultural identity formation through analysis of conversational practices at a multilingual preschool in Chinatown, New York City. It draws on observations and audio recordings in the classroom, parent surveys, and teacher interviews to explore the impact of multilingual teaching in Cantonese and English (and to a lesser extent Mandarin and Taishanese) on notions of Chinese-American identity among 3-year-olds of Chinese descent growing up in New York. Although Mandarin has become more popular among heritage and foreign language programs in the United States, the use of Cantonese as one of the languages of instruction in this preschool highlights its continued importance for some members of New York’s Chinese-American
community. Through language socialization practices, such as storytelling, verbal instructions, and wordplay, children at the preschool learn that code-switching between Chinese languages and English is a natural and integral part of a coherent Chinese-American identity within this community. While most research on Chinese as a heritage language in the U.S. focuses on Mandarin, this research suggests that Cantonese and other dialects should be studied as heritage languages in their own right because of their importance in the formation of diverse Chinese-American identities and communities.

Message Paid for by Citizens United: Campaign Finance Policy, Independent Spending, and Incumbent Vote Share in State Legislative Elections
Anna Le, Politics
Sponsor: Professor Anna Harvey, Politics

In Citizens United vs. Federal Elections Commission (2010), the Supreme Court of the United States ruled that government restrictions on independent campaign expenditures made by corporations and labor unions were unconstitutional. This study analyzed the forced repeal of these restrictions to determine the effect state statutes limiting independent expenditures had on incumbent margins of victory in state legislative elections. The Citizens United ruling created a “natural experiment” of a federal ruling being imposed on the states. States had no choice but to adjust their laws to conform to the ruling. A control group was created consisting of states that did not have laws restricting corporate and labor union independent expenditures prior to the Court’s ruling. The treatment group consisted of states that did have these laws. A difference in differences method of analysis was utilized to determine how incumbent margins of victory changed after restrictions on independent expenditures were lifted. This study found a statistically significant increase in Republican incumbent margins of victory after Citizens United. These results matter because Citizens United did not harm or benefit political actors equally. The repeal of independent expenditure restrictions altered election probabilities and changed the dynamics of electoral politics.

Not for Sale: Assessing the Socio-Political Implications of Water Privatization in Developing Nations
Myung Eun (Marianne) Lee, International Relations Honors
Sponsor: Professor Alastair Smith, Politics

Given the increase in concerns over global water scarcity phenomenon and the possible conflict between states, the topic of water resource management has become highly contentious, particularly the debate surrounding the role of the private sector as a viable solution. The global trend for water privatization began in the late 1980s as the Western economies and international financial institutions aggressively promoted neoliberalism in developing nations. This study provides a quantitative analysis of the socio-political conditions that are conducive to a successful implementation of the neoliberal water and sanitation policies and the implications associated with them. The study uses data ranging from 1980 to 2010 to properly assess the impact of water privatization on social instability, particularly using varied regime types, water scarcity, and the level of inequality. Utilizing fixed effects Poisson and OLS regression models, this research found that regardless of the political system, the private sector participation in the water sector increases the likelihood of anti-government protest and conflict in the short-run. However, the long-term consequence vary drastically over regime types; in democracies, water privatization in the current and recent years can drastically lower the number of expected anti-government protests, while it has the opposite effect in autocracies. Water privatization in areas of drought lowers the chance of social instability in the long run, while inequality does not impact the possibility of protest.
Defining the Success of China’s National Oil Companies
Christine Liu, Economics
Sponsor: Professor Victoria Olsen, Expository Writing

State Owned Enterprises (SOEs) are companies where a voting majority of the stock is owned directly or indirectly by the government. National oil companies (NOCs) are a type of state owned enterprises that have grown in popularity and power in the past half-century. This study focuses specifically on China, recently the largest importer of oil in the world, and the three NOCs that aggressively monopolize the country’s oil industry. The major Chinese NOCs are currently Chinese Petroleum Corporation (CNPC), Sinopec, and Chinese National Offshore Oil Corporation (CNOOC). This research identifies the three main goals of China’s NOCs from the state’s perspective. The success of China’s NOCs is determined by the number of goals met. Defining the success of a SOE is based upon a mix of both economic and political objectives. By using a definition of success and identified state goals, the results of my research predict the short and long term success of Chinese national oil companies.

Health and the Transition to Agriculture: Overcoming the Osteological Paradox
Aaron Thomas Lynch, Anthropology and Philosophy
Sponsor: Professor Rita Wright, Anthropology

The transition from foraging to farming in the ancient Near East is associated with a marked increase in skeletal and dental pathologies, from decreasing stature and longevity to increasing dental caries, enamel hypoplasia, and signs of infection. But the “naïve” interpretation of this data—that early agriculturalists were less healthy than their hunter-gatherer forebears and contemporaries—has come under scrutiny. For example, because visible bone pathologies take considerable time to form, increases in pathology may reflect a healthier population, with hardier individuals who could survive longer even while suffering from disease. This project defends the straightforward interpretation of the osteological data using multiple interdisciplinary lines of evidence. Ethnohistory, along with ethnography of extant hunter-gatherer groups, support the claim that disease is relatively uncommon within these societies. Modern epidemiological theory provides models that predict and explain increased disease among early farmers. And historical archaeology shows strong correlations between recorded good health and low rates of skeletal pathology in documented subpopulations. This research reinforces the growing consensus that agriculture had negative impacts on human health, a result which can lead us to question our own culture’s relation to food and the narrative of progress surrounding the distinction drawn between ourselves and hunter-gatherers.

Walking (and Crawling) Infants Avoid Prone Posture When Possible
Omran Majumder, Middle Eastern and Islamic Studies
Sponsor: Professor Karen Adolph, Psychology and Neuroscience

Crawling and walking infants can use a variety of postures. Crawling infants can sit or stand upright supported by furniture. Walking infants can sit, crawl, or walk. However, researchers don’t know what postures infants use spontaneously and whether their status as crawlers or walkers affects their choice in posture. To answer this question, 12-month-old crawling and walking infants and their parents were observed freely playing in a laboratory playroom. We scored videos to determine whether infants were prone (hands and knees, hands and feet, or on belly), sitting, or upright (standing, walking, or cruising). As expected, walking infants spent most of their time upright and were rarely prone. A striking finding, however, was that even crawling infants spent very little time prone; instead they spent 74% of their time sitting or upright. Parents also behaved differently based on whether their baby was a crawler or a walker. Although parents of both crawling and walking infants spent the majority of their time crouching or sitting, parents of walking infants spent more time upright than parents of crawling infants, and parents were more likely to be upright when their babies were upright. This study helps us better understand the developmental progression of infants’ motor skills.

Conflict over “Conflict”: American Student Activism and the Situation in Israel-Palestine
Alexandra Maresca, Sociology
Sponsor: Professor Ruth Horowitz, Sociology

While it is often assumed that the controversy surrounding Israel-Palestine is restricted to the Middle East, advocacy on behalf of both Israel and Palestine has proliferated on Western college campuses. American attitudes about the conflict, both parties contend, will have a profound impact on its resolution due to the close relationship between Israel and the United States and the role of the U.S. in the peace process. Recognizing that students represent the next generation of American voters and policymakers, student activists on both sides strive to influence their classmates’ perceptions of the region. Using observations of two groups of student activists—one pro-Israel, the other pro-Palestine—this study analyzed the way each relates to the larger, transnational movement with which it is affiliated. Despite considerable differences in how each group interacts with its larger movement, this study argued that the manner in which both groups frame and interpret events strongly corresponds to the framing advanced by these larger movements. Irreconcilable differences between these frames obstruct meaningful dialogue between the two sides; even the term “conflict”
has been contested. Because these frames are advanced in lieu of developing new approaches, familiar obstacles to peace are reproduced in the context of an American campus.

**Height of Change**
*Victoria Markus, Journalism*
*Sponsor: Professor Jason Samuels, Journalism*

After already experiencing a momentous amount of change over the past decade, the Brooklyn neighborhood of Crown Heights continues to endure the gentrification process as new residents and businesses move in, resulting in issues of increases in rent and property values, changes in the neighborhood’s culture, and the displacement of people and establishments by “gentrifiers.” *Height of Change* is a multimedia project utilizing video, text, photos, and other visual graphics to document the gentrification process taking place in Crown Heights. The project will reveal how a variety of different residents feel about the changes. New establishments, such as coffee-shop Little Zelda and bookstore Hullabaloo Books, will be studied to examine what kind of contribution or impact they have on the community. Older establishments will also offer insight as to how the neighborhood has changed over the years, what kind of customers they are seeing today, and whether they feel the changes are positive or negative. Residents facing housing issues will also be studied, sharing their side of the gentrification story. The collection of stories paired with facts about the changing neighborhood will illustrate how Crown Heights is at the precipice of change. The project in its entirety will be an investigative journalistic piece that focuses on a small part of Brooklyn as more of it endures gentrification.

**Celebrity Race and Skin Tone**
*Michellee Mayers, Psychology*
*Priscilla Chin, Psychology*
*Sponsor: Professor Emily Balcetis, Psychology*

Society’s love of celebrities has resulted in entire industries dedicated to commenting on their lives. This study is interested in whether media outlets use skin tone differences to perpetuate their claims about celebrities. Does the positive or negative tone of celebrity gossip articles predict the brightness of the target celebrity’s skin color in photographs? Researchers conducted an archival study of 1550 online news articles covering Caucasian and African American celebrities. The brightness of the skin tone of celebrities depicted in the photographs was measured using Photoshop. Coders rated the valence of the content of each article. Supporting the hypothesis, results revealed that skin tone luminance depended on celebrity race and gender and the valence of the article. Skin tone of both Caucasian and African American celebrities was significantly brighter in articles of positive valence than in articles of negative valence. Skin tone was lighter among women than men. Together, these findings indicate that cognitive associations between lightness and good in addition to darkness and bad are present in and perpetuated by the media. Future studies may investigate whether this relationship serves as a basis for discrimination against African Americans who naturally have darker skin tones than Caucasian Americans.

**Art as Active Citizenship in Urban Senegal**
*Natalie McCauley, International Relations and Environmental Studies*
*Sponsor: Professor Rosalind Fredericks, Gallatin School of Individualized Study*

The view of the ocean from the bustling beachfront boulevard in Senegal’s capital city of Dakar is enhanced by the poignant art that lines the low walls separating the sand from the street. Artistic expressions, including scrawls urging citizens to vote for the incumbent in the 2012 presidential elections, a mural of Martin Luther King, Jr. and other leaders in human rights, and a Senegalese flag depicted behind a reminder to respect the environment, tell the story of urban Senegal’s political and social dynamism. Public displays of progressive ideas can be seen throughout this quickly growing city and in the northern city of Saint-Louis. Senegal’s unique history as an uninterrupted democracy since independence from France in 1960 provides support for these demonstrations of active citizenship. In Senegal, art is both an indicator of a strong democratic tradition and a glimpse into the future progress that Senegalese people can make in their nation. Creativity is an important aspect of society that is often overlooked in studies of citizen participation. This project highlights urban Senegal’s ingenuity in encouraging change in Senegalese society and provides proof that art should be considered a hallmark of Senegal’s democracy.

**Arts at Risk**
*Emily McDermott, Journalism and Self-Designed Honors Major*
*Sponsor: Professor Jason Samuels, Journalism*

In many New York City public schools, arts education merely means a subject that allows classroom teachers to take their required planning period. But what does arts education mean to students, especially those from socioeconomically diverse neighborhoods? For many students, art is a way through which they can build confidence, learn skill sets, express themselves, and reengage with a positive community. However, in the past four decades, budgetary cuts across the United States and in New York City have led to a significant decrease of arts education in public schools. Arts at Risk is a multimedia website that humanizes the statistics surrounding arts education with a specific focus on at-risk,
or low-income, youth in New York City. Through the incorporation of text, video, photography and interactive maps, Arts at Risk elucidates the current state of arts education and tells the individual stories of New York City teachers and students from various backgrounds. Furthermore, it profiles the arts program at Lower Manhattan Community Middle School—a public school that exemplifies what arts education can be—and highlights two organizations that attempt to fill the gap for students who receive little or no arts education in school. Arts at Risk provides a unique perspective on arts education as it focuses on at-risk youth, shedding light on a population of students whose stories often remain untold.

The Ups and Downs of Infant Locomotion over Slopes
Dejana Mladenovic, Psychology
Sponsor: Professor Karen Adolph, Psychology

Motor skill improves with experience. Previous work on the development of locomotion adopted one of two approaches: describing infants’ gait as they crawled/walked over flat ground or describing infants’ ability to navigate obstacles. The current study integrated both approaches to examine how improvements in locomotor skill affect obstacle navigation. This study conducted frame-by-frame video analyses of gait in 5 infants (2 boys, 3 girls) as they navigated uphill and downhill slopes (0°–36°). Infants were tested longitudinally (first and tenth weeks of crawling and walking). Infants showed improvements in locomotor skill after ten weeks of experience: In both postures, infants were able to navigate steeper slopes. Experience crawling allowed them to maintain their typical trot-like gait on steeper slopes and to adapt their posture to crawling on hands and feet to navigate uphill slopes, but experience walking did not affect infants’ typical alternating gait. With experience, infants adapted gait to degree of slant by reducing crawling and walking speed on steeper downhill slopes. These findings indicate that improvements in locomotor skill are geared toward function (navigating varied environments) rather than form (maintaining particular gait patterns).

Cherry-Picking the Material Record of Border Crossings: Examining Artifact Selection and Narrative Construction Among Non-Migrants
Leah Mlyn, Social and Cultural Analysis
Sponsor: Professor Luisa Heredia, Social and Cultural Analysis

Since 2000, over 4 million people have been apprehended trying to cross without authorization into the U.S. from Mexico via the Arizona desert. During this process millions of pounds of artifacts associated with migration have been left behind. Subsequently, humanitarian groups, artists, local U.S. citizens, and anthropologists have collected and used these artifacts in a multitude of ways. In this study we draw on interviews and participant observation data collected with the aforementioned groups to explore how value judgments, emotion, class, ethnicity, gender, and political ideology impact what is collected and how artifacts are interpreted and deployed in various contexts.

Surface Color Perception in Black Space: The Influence of Target Orientation
Kelly Ng, Psychology
Sponsor: Professor Laurence Maloney, Psychology

Color constancy is the natural ability to perceive object surface colors the same way despite changes in illumination (Wandell, 1995). It has been proposed that color constancy is achieved by accounting for the light field in the scene (Brainard & Maloney, 2011). In our study, we explore whether color constancy is preserved when viewing a target test patch in black space, which provides minimal cues about the light field. The target orientation from light field cues varied across trials and the task was to identify whether the test patch was bluish or yellowish. Each participant’s color constancy was calculated as a function, such that a color constancy of $a = 0$ indicates complete failure of constancy and a color constancy of $a = 1$ indicates perfect color constancy, or perfect ability to interpolate and account for the light field across black space when identifying the color of the target diamond. Although light field cues are minimal in black space, we expect that some color constancy will be preserved for this task. This research hopes to discover how the visual system uses lighting information to accomplish color constancy and whether it interpolates the lighting information across spaces in scenes with minimal cues. Investigating these questions can help us better appreciate how phenomenal the visual system is and also how to recreate the visual system with artificial intelligence.

Impact of Regional Economic Integration on Developing Countries: Projecting the Trajectory of Indonesia’s Labor Market in ASEAN
Yeow Choon Ng, Economics
Sponsor: Professor Unurjargal Nyambuu, Economics

The Association of Southeast Asian Nations (ASEAN) consists of 10 member states situated in Southeast Asia, including Indonesia. It aims to establish the ASEAN Economic Community (AEC), a regional economic integrated zone, by 2015. Given that Indonesia’s population size is the largest in ASEAN, the free flow of high-skilled labor resulting from the AEC will impact its labor market and cause significant changes to its low-skilled industries. Immigration of high-skilled labor either causes a decrease in low-skilled labor if it is substitutable or an increase in low-skilled labor if it is complementary. This study describes the ramifications of a free flow of high-skilled labor on Indonesia’s labor market.
and hypothesizes that an increased influx of high-skilled labor will bring about an increased number of low-skilled labor due to the complementary effect. By analyzing past data and current trends in Indonesia’s labor market, this research predicts that Indonesia’s labor-intensive industries will undergo restructuring with improved productivity and upgrading of skills among low-skilled workers.

**What is Race’s Role? : The Effects of School Racial Composition on Standardized Test Scores**
*Jennifer Oliver, Politics*
*Sponsor: Professor Anna Harvey, Politics*

For decades educators and researchers alike have battled with the question, does diversity in schools matter for academic outcomes? This research study explores the question further by taking advantage of the natural experiment created by the 2007 Supreme Court case, *Parents Involved in Community Schools vs. Seattle*. The case found race-based school assignment, or programs that explicitly use an individual student’s race in determining which school they will attend, unconstitutional, forcing many schools to change their policies. This study uses a differences in differences design to look at schools that used race-based school assignment before 2007 and those that did not, and investigates whether the changes in racial composition brought on by this policy change had any effects on standardized test scores. Utilizing data from yearly school report cards mandated by No Child Left Behind, analysis was run on test and control districts in Illinois, Kentucky and Washington. This project aims to add to this highly studied area by accounting for the endogeneity of a school’s choice to be more or less diverse, a confounding aspect that has not been accounted for in the previous literature.

**Public Perception of Threats in Cyberspace: A Survey Experiment on the Evolving Internet Security Landscape**
*Harry Oppenheimer, International Relations*
*Sponsor: Professor Michael Gilligan, Politics*

Cyber-security threats to public and private data play out frequently in the public sphere but are distinct from traditional conflict models due to the unique combination of state and non-state actors. Despite the widespread public knowledge of cyber-security threats there is a void of research on how these threats are perceived by citizens and translated into policy demands. This survey experiment presented respondents with hypothetical cyber-theft scenarios that varied the origin and target of threat and utilized metrics typically associated with terrorism research in order to test the variability of public attitudes about cyber-security. While the findings are multifaceted, in general, theft of private data increased respondents’ perception of future threat, demands for transparency, and priority for national security over privacy while decreasing personal concern over the presented cyber-threats themselves. Varying the origin of threat between the United Kingdom, China, or Unknown had a significant impact on perceived threat, personal concern, acceptance of surveillance, and militarism. Background factors, especially age that heightened every metric in the experiment, had profound effects on these results. Overall, the experiment demonstrated that circumstances of cyber-attacks have a significant impact on citizens’ views towards privacy and security, and their opinions about the role of government in the cyber-security domain.

**Making Old Memories Less Distracting: Potential Benefits of Integrating the Old with the New**
*Ashima Oza, Psychology*
*Sponsor: Professor Brice Kuhl, Psychology*

When recalling a recent experience, older memories may come to mind and create distractions. The present research attempts to identify contexts in which distraction from older memories can be reduced. In Experiment 1, subjects first learned a set of word-picture pairs (A-B pairs). This was followed by a second learning phase in which all of the same words were paired with new pictures (A-C pairs). During a memory test for the A-C pairs, words were presented one at a time and subjects attempted to recall the corresponding picture. However, before each test trial, a distractor image was briefly presented. The distractor was either visual noise, a new image, or the B image previously associated with the word. This study found that A-C recall was worst when B images were presented as distractors. In Experiment 2, the procedure was identical except that A-C pairs were encoded in a way that encouraged integration of A-B and A-C pairs. This manipulation fully eliminated—and, in fact reversed—the distraction effect observed in Experiment 1. These findings can be extended to how students learn and retain new information: namely, that there are benefits to reinforcing old concepts while learning new ones.

**Aid Allocation: A Study of Political and Economic Incentives**
*Avin Patel, Politics*
*Sponsor: Professor Rachel Brulé, Politics*

Past studies suggest that disaster aid is not justly distributed and that other factors may be incentivizing aid allocation. This study examines the existence of distributive injustice and political and natural resource factors as predictors of FEMA aid in the context of the 2004 Florida Hurricane Season at the county-level. This research considers distributive justice as aid allocation based on damage incurred by proximity to hurricane path. Political factors are defined as historical party affiliation, party alignment to the current national party in power, and electoral
competitiveness. Natural resource factors are defined as the existence, number, and prominence of natural land features. Ordinary Least Squares regressions find that distance is a highly significant, yet imperfect, determinant of aid distribution. For counties in the eye of a storm, being historically red significantly predicts an increase in aid. Additionally, for a given level of damage, current party alignment significantly predicts a decrease in aid. Natural resources are not a significant predictor of aid. Overall, this study finds that political incentives do predict aid and that distributive justice is a driving factor in aid allocation to some extent.

**Mental Health and Human Rights**

*Komal Patel, Anthropology and Journalism*

*Sponsor: Professor Margaret Satterthwaite, NYU School of Law*

While the mental health of human rights advocates is still a highly understudied field, this research project undertook a literature review of the psychological effects of firsthand and secondhand trauma for human rights workers and related professions. Three negative psychological effects generally attributed to these professions in the mental health studies my research looked at are: post-traumatic stress disorder (PTSD), secondary trauma stress (STS), and burnout. PTSD is a disorder results from firsthand exposure to a traumatic experience. STS is a type of stress that occurs from hearing about a traumatic experience from another person; it is secondhand exposure rather than firsthand exposure. Burnout is exhaustion from working in distressing conditions. This review also encompassed two positive effects of working with trauma: resilience and compassion satisfaction. Resilience, adaptation to traumatic situations, is a much more common effect of trauma-related work than previously thought. Compassion satisfaction, the derivation of pleasure from one's work, has been found to be a protective factor in this field. This research project is meant to show where the field is in terms of research on the psychological effects of trauma, both negative and positive. Identifying the gaps in the research will help advance the research of others.

**Do Voters Make Judges More Punitive? Understanding Public Responses to Judicial Mistakes**

*Vishan Patel, Politics and History*

*Sponsor: Professor Anna Harvey, Politics*

Extensive political science research suggests that elected trial court judges become more punitive in their rulings as elections approach. However, the causal mechanism underlying this relationship is unclear. One hypothesis is that voters inherently prefer punitive judges because they dislike crime, and therefore judges become more punitive near reelection to win votes. Another hypothesis is that voters do not like judicial mistakes like “overpunishment” or “underpunishment,” but they are more likely to learn about cases of “underpunishment” through the media; thus judges increase sentences near reelection to prevent negative media attention to cases of “underpunishment.” Observational data cannot identify which of these hypotheses explain why judges become more punitive as reelection approaches. This study was conducted as a survey experiment through Amazon’s Mechanical Turk, an online crowdsourcing marketplace. The data supported the first hypothesis as it showed that respondents on average reacted more negatively to “underpunishment” than to “overpunishment.” This suggests that voters may be inherently punitive when it comes to their opinions on crime. Overall, this means the causal mechanism driving judges to become more punitive in their rulings as elections approach is public opinion on crime.

**Historical Revisionism and Japanese American Relocation and Internment**

*Vishan Patel, Politics and History*

*Sponsor: Professor John Kuo Wei Tchen, Social and Cultural Analysis*

Executive Order 9066 signed by President Franklin D. Roosevelt in early 1942 paved the way for the relocation and detention of Japanese Americans living on the west coast. The general consensus among the historical community is that the WWII mass incarceration of Japanese Americans represents a major stain on American history by condemning an entire ethnic group as potential enemies and violating their basic civil liberties. There has been the persistence of a small revisionist movement that argues that the forced concentration of west coast Japanese Americans during WWII was an absolute necessity for national security. This paper traces the history of this revisionist movement, analyzes the validity of the arguments of the revisionists, and evaluates the larger implications of their perspectives. An analysis of these revisionist works reveals that their arguments are not historically valid. It is still important to understand this small movement because it reveals tremendous information about the underlying philosophies and thought processes embedded within American conservatism. The revisionists stem from ideologies that hold that America is an innately good country, a rigid definition of “Americanness,” and a justification of discrimination and profiling practices for purposes of national security.

**Across the Border: International Spatial Diffusion of Euro Attitudes Throughout the Czech Republic**

*Sponsor: Professor Anna Harvey, Politics*

The Czech Republic has long been a member of the EU, but it has traditionally been an anomaly in the region, given
that the Euro-skeptic country refuses to convert to the Euro or adopt outside monetary authority. However, the introduction of the Euro in the Czech Republic’s neighboring countries has led, naturally, to more egocentric, or personal-level, exposure to the Euro currency. If Czech citizens gain more exposure to the Euro, does the adoption of the currency by the Czech Republic’s neighbors affect those regions of the country that border these Euro-using states, and if so, how? This study examines the impact of the Czech Republic’s neighboring countries’ conversion to the Euro upon political party preferences within the Czech Republic. Conversions to the Euro took place in 2002 in Germany and Austria, as well as in Slovakia in 2009, and this paper examines whether the regions that border these countries within the Czech Republic displayed a larger shift in local elections toward more Euro-favoring political parties, in particular toward the Czech Social Democratic Party (ČSSD), and away from Anti-Euro political parties, than do regions that do not border Euro-adopting countries. The results of this study pave the way for political scientists to gain more insight into how support for the Euro, or any monetary union, can evolve when personal interaction is involved, and contributes to academic research on spatial diffusion of economic ideas.

**Baby Bundling: Description of a Traditional Infant Cradling Practice in Tajikistan**

Dhandevi Persand, Psychology  
*Sponsor: Professor Karen Adolph, Psychology*

Childrearing practices shape infants’ experiences, which in turn affect infant development. For example, childrearing practices that restrict infants’ movements are associated with motor delays. This study capitalizes on a rare chance to describe a unique childrearing practice that may elucidate effects of context on early development. It aims to quantify and describe the process of placing infants from 0–24 months of age in the “gahvora” cradle in Tajikistan. The practice was video-recorded for 50 mother-infant pairs. Preliminary analyses show that cradling is a multi-step process involving 3 to 7 (M=5) restrictive components, which take M=1.8 min to complete in total. While laying supine, infants are catheterized, swaddled and bound to the cradle at the arms and again at the legs, covered with a blanket, and then draped with a curtain. Cradling is highly ritualized: The number and duration of components stay the same across age and geographic location. These data highlight the dramatic differences in childrearing practices across cultures.

**Learning is a Snap: How Mothers Scaffold Children to Open Containers**

Sneha Radhakrishnan, Psychology  
*Sponsor: Professor Karen Adolph, Psychology*

In everyday activity, mothers often “scaffold” or teach their children by providing physical and verbal assistance. Prior research focused on scaffolding during play and academic activities. This study examined how mothers spontaneously scaffold their children to open containers. Thirty-six mothers were asked to teach their children (aged 12–54 months) to open overcap containers—Tupperware that require a pulling action to open. Mothers displayed both physical (pointing to container contents, stabilizing container, modeling the opening action, etc.) and verbal (encouragement, describing features of the lid or the opening action, etc.) scaffolding strategies. Overall maternal scaffolding—both physical and verbal—decreased with children’s age. Across age and for both types of scaffolding strategies, mothers of younger children focused more on directing children’s attention to the task (pointing to or describing treats inside the containers, shaking the containers, and encouraging children) than on providing information on how to actually open the containers. These findings suggest that mothers recognize their children’s skill level and vary the amount and type of scaffolding based on children’s age. Understanding maternal teaching strategies for the daily activity of opening containers provides insight into how children learn other routine tasks of their culture.

‘We are Citizens of Heaven’: Language, Performance, and the Production of Heavenly Citizenship among Pentecostal Nigerians in the Bronx

Samuel James Rolfe, Anthropology and Religious Studies  
*Sponsor: Professor Noelle Stout, Anthropology*

This study explores ideas of citizenship and belonging among congregants at the Chapel of Restoration, a Nigerian Pentecostal church in the South Bronx, New York City. Based on data drawn from six months of field research, including extensive participant observation and several in depth ethnographic interviews, how congregants envision themselves as citizens of heaven is investigated. This research shows how citizenship for the congregants at this Chapel is understood first and foremost as belonging within heavenly spaces, and suggests that congregants draw upon personal histories of migration and diaspora to comprehend heavenly citizenship. Further, congregants craft themselves as citizens of heaven through diverse linguistic performances of three types of Pentecostal speech: prayer, speaking in tongues, and testimony. This study focuses on religious language, as it illuminates the performative and embodied nature of heavenly citizenship. Performances of religious speech articulate religious and heavenly spaces, which, through their invocation, work to position congregants as agents within their own kingdom of God, or, heaven. This research engages with contemporary scholarship on citizenship, performance, and language to suggest that anthropologists of religion should take seriously ideas
The Sinosphere acts as a sphere of influence that creates an identity, the political environment and a perspective from the call of over urbanization and development of a cultural forces, the government of Kenya will be forced to answer the Kenyan market while challenging the history and direction changes the cultural identity of Kenya through the shifting urban landscape but also the intellectual landscape as there is now a need for Kenyans to acquire the skills necessary to influence how classrooms are run and what is taught to students. The Chinese mass influence on education and infrastructure exists at the University of Nairobi. There, the first Confucius Institute was established providing Chinese language lessons to students. The Chinese mass influence on education and the built environment comes together in the creation of the University of Nairobi Towers. The goal of this project is to address how the construction of these towers will literally and figuratively change the built environment of Nairobi and at the University of Nairobi. Another goal of the project is to expose how this investment and influence will start to affect the operations of higher education in Kenya, and more importantly how these initiatives of globalization affect the Kenyan market while challenging the history and direction of Kenyan independence. Despite the influx of outside forces, the government of Kenya will be forced to answer the call of over urbanization and development of a cultural identity, the political environment and a perspective from the people on how the Chinese influence created a Sinosphere. The Sinosphere acts as a sphere of influence that creates an idea of modern economic imperialism as a lens for globalization. Ultimately, the actions of the Chinese collide with the established systems and mindsets at play disregarding questions of collaboration to answer the issues of over urbanization. The research project tackles a microcosm within the issue of rapid globalization of infrastructure and education that challenge the projection of ethnic solidarity of economies to ensure their own independence. The significance of the project presents a new methodology and mindset to think about globalization of infrastructure and education that tries to promote an initiative of collaboration rather than collision with the culture, economy and society already established in Kenya, the rest of Africa or even the world.

How Expectations Shape Learning: The Role of Cognition in Fear Conditioning

Christina Sandman, Individualized Major
Sponsor: Professor Elizabeth Phelps, Psychology

Expectations shape our experience by influencing cognition, attention, and emotion. A powerful example is the placebo effect, which depends upon two mechanisms: conscious expectations and classical conditioning. The present study investigated whether expectations shape classical conditioning. Participants performed a Pavlovian aversive learning paradigm in which one image was paired with shock on 50% of trials, while a second image was never paired with shock. Halfway through the task, contingencies reversed. Participants were assigned to two groups: one group generated expectancy ratings of the probability of upcoming shock on each trial, while the other group made no ratings. Skin conductance responses (SCR) to the images were measured as the dependent variable of conditioning. This study found that expectations increased SCRs to both images but did not cause greater differential conditioning. In fact, expectancy ratings caused slower learning and impaired the strength of reversal. Expectancy ratings and SCR were highly correlated from trial to trial, revealing a correspondence between cognition and bodily arousal. Future research might extend these results to increase clinical relevance by manipulating long-term expectations. Elucidating these mechanisms could help to harness the healing potential of the placebo effect.

The Birth of a 21st Century Capital City: Astana, Kazakhstan

Aigerim Saparova, Journalism
Sponsor: Professor Brooke Kroeger, Journalism

Under the direction of President Nursultan Nazarbayev, the only leader that Kazakhstan has known since declaring independence from the Soviet Union in 1991, this petrodollar-fueled country is in the midst of an effort to transform its national identity in the global arena. The streets of the capital city of Astana are being lined with high-rise apartment
complexes, futuristic office buildings, and innovative malls. Yet this energetic burst of rapid development stops at the city limits. A short drive outside of Astana recalls a journey through time, to villages filled with homes of peeling paint, bumpy dirt roads, and herds of stray dogs reminiscent of Soviet times. This research explores the current state of Kazakhstan, its political, economic, social structures, and its plans for the future. The move from socialism to capitalism presents the country with the difficulties of a transformation drenched in decades of prior Soviet control. A successful transformation requires a multi-dimensional approach; political will-power, natural resources, human potential and other factors are of the essence. With the world as its witness, the nation’s success will illustrate the ability of a post-Soviet territory to move forward and to compete among the world’s more powerful players.

The Effects of Social Group Membership on Emotion Detection Sensitivity
Julia Schaus, Psychology
Sponsor: Professor Jay Van Bavel, Psychology

Emotion detection sensitivity refers to the minimum amount of emotion expression necessary for detection. Past research has shown that emotion detection sensitivity can be affected by contextual factors such as race of the target. In the current research, we examined whether mere social group membership affects emotion detection sensitivity. Participants learned faces of randomly assigned in-group and out-group members and completed an emotion change-detection task in which they detected the emergence of four emotions (happiness, sadness, anger, and fear). The results indicated that target emotion affects emotion detection sensitivity such that happiness is detected quickest, followed by fear, anger, and finally sadness. Yet, there was no shown effect of group membership on emotion detection sensitivity. The methodological limitations of the current research are discussed and suggestions for future research are made.

Double Standards in Leadership Evaluations: Incumbent Female Leaders’ Performance Effects on Future Female Leaders
Morgan Schusterman, Psychology
Sponsor: Professor Madeline Heilman, Psychology

This study explored how current females’ performance in leadership roles affects the chances of selection among women seeking these roles in the future. Because gender is salient for women but not for men in male-typed roles, the researchers expected that the evaluation of female candidates would be more affected by the good or poor performance of a female incumbent than by the good or poor performance of a male incumbent. In a 2 X 2 between subjects design, participants reviewed male and female incumbent leaders, with good or poor performance, and were asked to evaluate and make screening decisions of a female candidate. As predicted, a female candidates’ likelihood to be selected was found to be lowest when there was an incumbent female leader in power who had performed poorly, confirming the primary hypothesis. A female candidates’ likelihood to be selected was also found to be highest when there was an incumbent female leader in power who had performed well, confirming the secondary hypothesis. These results will lend to a more comprehensive understanding of contextual features, other than mere exposure to high-ranking women, affecting the advancement of women in male-typed fields, which will hopefully lead to social and conscious belief change. Implications of the effects of poor performance by other under-represented leaders on evaluations of future minority candidates are discussed.

How We Really See Our Partners: Emotion Perception Bias Predicts Negative Emotions During Conflict
Alison Schwartz, Psychology
Sponsor: Professor Emily Balcetis, Psychology

People in satisfying romantic relationships experience fewer psychological illnesses and better physical health. While conflict predicts relationship dissatisfaction, conflict itself does not explain dissatisfaction. Only when conflict is experienced negatively does relationship dissatisfaction occur. This research tested whether emotion perception helps explain when conflict feels bad. This study predicted that partners who perceive or interpret emotions as more intensely negative (thereby exhibiting a perceptual negativity bias) may be more likely to experience conflict negatively and as bad. In the lab, couples were randomly assigned to discuss a high conflict issue or a low conflict issue. Participants completed a rapid categorization task, identifying positive and negative emotional expressions. Participants reported how bad they felt before and after conflict. This study found a main effect of perceptual negativity bias. Across conflict conditions people with a perceptual negativity bias felt worse during conflict than people with a perceptual positivity bias. This study also found an interaction effect, such that the effect of negativity bias on self-reported bad feelings was greater in the low conflict condition than the high conflict condition. By determining if people experience conflict with a negative perception bias, we can intervene at the perceptual level for people dissatisfied in relationships.

Stereotypes Influence How People Visually Experience Black and White Expressionless Faces
Jaclyn Schwartz, Psychology
Sponsor: Professor Tessa West, Psychology

Research shows that stereotypes can influence how people interpret a target’s behaviors. For example,
identifying both Black and White faces with neutral expressions, Black faces are more likely to be identified as angry rather than friendly. The current research investigates whether the race of a face also influences how people visually experience a target’s neutral expression. Participants were shown a Black or White target face with a neutral expression for 5 seconds (Study 1) and asked them to find it in an array of seven extremely similar and difficult to distinguish emotional distortions of that face. Participants were then presented the faces for both a short and long period of time intermixed for each participant (Study 2). In both studies, participants’ motivation to avoid prejudice in order to see how this controlled process affects how stereotypes bias the visual experience was measured. Researchers expected participants to select a more distorted angry face when presented with a Black target face, and a more distorted friendly face when presented with a White target face (Studies 1 and 2). Researchers also expected that when given more time to look at faces, those with high external motivation to avoid prejudice will correct their choices away from angrier distortions of Black faces and instead choose friendlier distortions of a Black face (Study 2). Researchers found that people saw target White faces overall as angrier than target Black faces and there was a significant difference of visual bias based on the perceiver’s race (Study 1), as well as a significant interaction between the perceiver’s race, the target’s race, and external motivation to appear unprejudiced (Study 2). This research shows that by measuring the discrepancy between the actual face and the chosen matched emotional expression, we are able to understand if stereotypes affect the visual experience of emotionally ambiguous Black faces.

Empathic Accuracy During Interracial Interactions
Jaclyn Schwartz, Psychology
Sponsor: Professor Tessa West, Psychology

Research shows that people are more sensitive to potential signs of anxiety in an interaction partner during cross-race relative to same-race interactions. Pearson et al. (2008), for example, found that slight temporal disruptions in conversation increase perceptions of an interaction partner’s anxiety only in cross-race interactions. Further, recent research suggests that it is one’s partner’s anxiety and the perceptions of one’s partner’s anxiety that best predict liking for a cross-race interaction partner and desire for future contact with a cross-race interaction partner. This study investigates how the increased sensitivity to anxious behaviors that occurs during interracial interactions affects people’s ability to accurately identify an interaction partner’s level of anxiety. By using longitudinal methods, researchers can investigate whether the racial composition affects: (a) people’s accuracy at judging overall levels of a partner’s anxiety; and (b) people’s accuracy at judging changes in a partner’s anxiety. Participants first interact and are told to talk about three controversial topics for 90 seconds each, for a total of a 3 minute interaction. After the interaction, the participants are to watch each 90 second segment of the interaction in which they indicate at the 3 different time points what they were thinking and feeling during the conversations in the video. Participants then watch the same interaction at the same 3 time points, but now indicate what they think their partner was thinking and feeling during the conversations shown in the video. Researchers expect that people will be more accurate in tracking their partner’s anxiety (i.e. notice fluctuations in their partner’s anxiety), but will systematically overestimate their partner’s anxiety when in cross-race rather than same-race interactions. In order to improve interracial interactions, this research will help gauge when in an interaction with a new cross-race acquaintance people misinterpret their partner’s anxiety.

A Double Standard? The Recruitment Practices of Non-Profits vs. For-Profits
Pria Shah, Sociology
Sponsor: Professor Ruth Horowitz, Sociology

The present study asks the question: How do staff recruitment practices differ between non-profit and for-profit organizations? This paper aims to flesh out the way non-profits and for-profits are viewed, view themselves and how they convey this image through the recruitment process. The primary data for this research resulted from interviews conducted with HR professionals directly involved with recruiting for multiple positions from both non-profit and for-profit organizations. Recruiter’s must assess the organization’s values and culture in order to represent it to the workforce as well as hire individuals who would be the right fit. The research did reveal differences in the way recruiters described what they were looking for and provided interesting insight into how they justified the same. Dan Pallotta’s book Uncharitable explains that there are two separate rule books for non-profits and for-profits. Applying this framework onto recruitment practices and ideologies, the data shows how organizations interact with these different rules.

Democracy’s Innovation Advantage: How Political System Matters for Technological Change
Sondre Ulvund Solstad, International Relations Honors Program
Sponsor: Professor Alastair Smith, Politics

Political analysts and democratic leaders often refer to a causal relationship between political regime and innovation, but this has not previously been demonstrated by researchers. This study leveraged patent data from the United States Patent and Trademark Office from 1965 to 1995 to show that
democratic countries innovate more and that democratization leads to increased levels of innovation at the technological frontier. This study shows that this relationship is robust when controlling for per capita incomes, size of population, levels of foreign direct investment, and exports to the United States, and holds among countries which started out the sample period as autocracies. Exploring mechanisms underlying this relationship, this study found that expansion of public control of executive power leads to large increases in innovation, and that political competitiveness and better public goods provision in democracies also are underlying links by which the democratization-innovation relationship is manifested over time. This investigation, through a novel interdisciplinary approach to an important question, finds that democratic countries have a decisive advantage in innovation-led growth, and ceteris paribus, will continue to dominate exploration of the technological frontier.

How Children Learn to Stereotype: The Role of the Parent-Child Dyad in Children’s Formation of Essentialist Trait Beliefs
Max Stivers, Psychology
Sponsor: Professor Marjorie Rhodes, Psychology

As human beings, we understand other people as a composition of their observable traits and behaviors. This natural system of evaluating others becomes dangerous, though, when essentialist generalizations about individuals within a social category manifest as prejudice and stereotypes. To learn how such prejudice can be stifled, we must examine how these generalizations develop. Using a partnered storybook task, the present study investigated how parents may influence their children’s understanding of social groups. Parents received essentialist or non-essentialist information about a novel group before reading a story about that group with their children. This story featured scenes depicting individual group members behaving in different ways, followed by questions asking the parents and their children to explain the observed behaviors. Results will be analyzed in terms of whether the participants believe the behavior is motivated by a temporary mood or a stable trait—then, if they attribute the behavior to a motivating trait, whether or not they will generalize that trait to the rest of the group. Our findings should tell us if parents with essentialist beliefs are capable of teaching their children to form similar beliefs of their own.

Wesley Stubenbord, Sociology and Economics
Sponsor: Professor Ruth Horowitz, Sociology

Although mass transit systems in the United States play an important role in the development of urban economies and communities, they require significant amounts of government funding in order to remain solvent and keep fare prices low. On average, fare revenue pays for less than forty percent of the total cost of operating a mass transit system in the U.S. This research attempts to find the determinants of government subsidy allocations through an analysis of the current literature and laws and through a multivariable regression analysis. Focusing on the effects of poverty, traffic congestion, pollution, population size, and transit ridership on subsidies at the federal, state, and local levels of government between 1991 and 2011, this study found no clear evidence of statistical determinants besides population size. The results of this study challenge the common political claims that these subsidies were designed to reduce traffic congestion, decrease pollution, and help the poor. It also opens the door into future sociological analysis of transportation policy on the grounds of public welfare.

Baby in a Bind: Traditional Cradling Practice and Infant Motor Development
Anna Tavdy, Psychology
Sponsor: Professor Karen Adolph, Psychology

Cross-cultural and experimental research show facilitative effects of exercise and training on infant motor skill. Research also reveals inhibiting effects of restricted movement on infant motor skill, but the most extreme effects are seen in infants reared in orphanages, which also involve social deprivation. This study examined a traditional child-rearing practice in Tajikistan, which restricts movement using a “gahvora” cradle, and its effects on motor development. Using a time-diary method, 76 mothers of infants (0 to 24 months) reported the frequency and duration of cradle use during a 24-hour day. Cradle use decreased with age—older infants spent fewer hours per day in the cradle than younger infants. Based on video recordings, the researcher also observed the most advanced motor skills these infants could perform. Infant sitting, crawling, and walking were delayed relative to Western norms; by 16 months, when most Western infants are walking, only a small subset of Tajik infants are walking. This research confirms that restricted movement, even without the confounds of social or cognitive deprivation, delays motor development.

Financial Incentives in the Minimum Effort Game
Sarina Tsukerman, Economics and Mathematics
Sponsor: Professor Guillaume Frechette, Economics

The minimum effort game is an experiment developed by economists to test coordination in settings where group efficiency is determined by the “weakest-link” of the group. Individuals working together in a corporation, for example, contribute some amount of effort to a collective project. The overall success of the project is not only a function of how
much effort each individual contributes, but also depends on the slowest worker, or more generally the individual who contributes the least amount of effort. In particular, each individual’s payoff increases as the group’s minimum effort increases, but is reduced by any deviation above the group’s minimum effort. This experiment proposes a treatment that incentivizes players to select higher effort levels by introducing a random variable bonus that applies uniformly to all players selecting effort levels above the group minimum. Unlike previous experiments, this bonus is designed in such a way that the firm does not pay any bonuses when all players coordinate on any one of the equilibria. Notably, this results in a “win-win” situation for both the firm and all players when everyone coordinates on the most efficient equilibrium. This incentive is aimed at shifting the focus of players toward selecting higher levels of effort, and thereby increasing the group minimum above the inefficient equilibrium.

**Automaticity in the Modern Workplace**  
*Julia Turret, Psychology*  
*Sponsor: Professor Dolly Chugh, Management & Organizations, Leonard N. Stern School of Business*

Our occupation occupies us—and with increasing reliance on efficient, timesaving technology, the modern work environment—where members of society inevitably define themselves—is itself being redefined. This study will investigate with a two-cell design the effects of performing routine work activity on an individual’s perceived productivity. Participants will be randomly assigned to complete a manual data entry task using Excel under high or low time pressure. After the task, participants will complete the Endicott Worker Productivity Scale to provide a score reflecting their perceived level of productivity. This study proposed that in the high time pressure condition, automaticity, or cognitive processing without intentional control, occurs and elicits lower perceived productivity relative to the low time pressure condition. This builds upon research identifying automaticity as a descriptor of fast-paced conditions inherent to the modern work environment, which ultimately limits professional activities like decision-making behaviors. Extending this understanding of automaticity and its relationship to increasing time pressure may ultimately shape understanding of how productivity in the workplace relates to individual self-perception.

**Race to the Top? The Effects of Charter School Support on Per-Pupil Funding**  
*Stephanie Ullman, Politics*  
*Sponsor: Professor Anna Harvey, Politics*

Does increased support for charter schools lead to a decrease in funding for public schools? This project tests whether President Obama’s 2009 Race to the Top initiative, which has awarded school funding grants to states that submit concrete plans for specific educational reforms, including the expansion of charter schools, has led to an increase in the number of charter schools that has caused a corresponding decrease in per-pupil funding for public education at the district level. In order to control for the effects of existing charter support, a distinction is made between friendly and unfriendly states categories by two separate measures: 1) the annual rankings of the Center for Education Reform and 2) the existing number of charters per district prior to Race to the Top. The results indicate that Race to the Top did not substantially influence growth in charters or per-pupil funding at the district level. This finding has significant implications for future federal grant programs in the area of education.

**PeekABoo: When Infants Look at Parents During Natural Exploration**  
*Ravi Vaidya, Economics*  
*Sponsor: Professor Karen Adolph, Psychology*

A long-held assumption in developmental psychology is that infants’ cognitive development is highly related to looking at their parents’ faces. But how often do infants actually look at parents’ faces in naturalistic contexts? Twelve-month-old crawling and walking infants played with their parents while wearing head-mounted eye trackers. This study scored when infants looked at parents’ bodies and faces, infants’ posture (prone, sitting, upright), and parents’ posture (sitting/crouching and upright). Surprisingly, infants spent very little time looking at parents’ faces (5%), and looks to parents’ faces were brief (M= 1.07 s). Crawlers and walkers were equally likely to look at their parents, but across groups, infants looked at parents more from an upright or sitting posture compared to a prone posture. These results indicate that infants’ real-time posture is the primary factor affecting looking at parents. Parents’ posture also played a role: Infants were more likely to look at parents’ faces when parents were sitting or crouching to when they were standing. This data indicates that in real-world situations, infants’ looking at parents’ faces is limited by physical constraints of both infants and parents.

**James Felt, Politician, Planner and Urban Liberal: A Master Builder of Progress**  
*Christian Vastola, Urban Design and Architecture Studies*  
*Sponsor: Professor Jonathan Ritter, Urban Design and Architecture Studies*

Scholarship on urban renewal projects in New York City has focused on its first administrator, Robert Moses. However, James Felt, who took up the mantle of urban renewal after Moses, has been left out of the scholarly dialogue. Under Title I of the National Housing Act of 1949, Moses devised ambitious projects and razed communities...
to create cultural institutions and housing, at the expense of the original inhabitants. Public backlash and scandal dismantled Moses’ urban renewal program, but urban renewal continued to play an important role in New York City. In 1958, an election year, Mayor Wagner appointed James Felt to chair the City Planning Commission. Moses had taken power from the Commission and reduced it to a state of lassitude. Despite opposition from both Moses and Jane Jacobs, Felt restored power and prestige to the City Planning Commission with innovative urban renewal plans that combined slum clearance, historic preservation and community involvement. Extensive archival research reveals a substantial gap in scholarship on James Felt and his pivotal role in shaping urban planning in New York City. This study explores Felt’s political and planning policies to illuminate how he fundamentally changed urban renewal and the profession of urban planning.

Racial and Class Disparities in the Health Outcomes of Young Teenage Women
Alyssa Vigliotti, Sociology
Sponsor: Professor Jennifer Jennings, Sociology

Multiple studies have demonstrated that patients’ race and socioeconomic status (SES) influence physicians’ diagnoses and treatment of clinically similar adult patients. Fewer studies have examined the role of race and SES in pediatric clinical decision-making. This study uses an experimental design to determine how patients’ race/ethnicity and SES influence physicians’ clinical decisions within the pediatric population. Pediatricians in a northeastern state were randomly assigned to receive a clinical vignette that varied the patients’ race/ethnicity and socioeconomic status. They were then asked to provide their initial diagnostic impressions and to identify the tests that they would order after seeing this patient. Pediatricians reported different diagnostic impressions and ordered different tests for black patients, but SES did not seem to influence pediatricians’ clinical decisions. However, race influenced pediatricians’ decision-making only when diagnoses and treatments involved the patients’ sexual health. This study makes three major contributions by: 1) establishing the impact of race and SES in pediatric practice, 2) disentangling the role of race and SES in clinical decision-making, and 3) clarifying the clinical contexts in which race plays a role in influencing pediatricians’ decision-making.

An Ethnography of Exercise Culture and the Formation of Identity
William Vintzileos, Anthropology
Sponsor: Professor Helena Hansen, Anthropology

In this project, the culture of elite exercise groups and fitness communities in Manhattan was examined. This work takes the form of an ethnography, in which I observed and took part in various group exercise classes and sessions. Throughout ten months of fieldwork, I met several people and developed five critical relationships that informed ethnographic queries. The research questions focused on the intrinsic and extrinsic motivations to exercise, as well as how motivation is related to establishing self-identity within a collective group. This research also explored how identity and agency are re-defined in the context of elite fitness groups, often conveying notions of social status, physique, and a sense of belonging reinforced by brand identity. Data from the ethnographic subjects revealed a distinct acculturation process that takes place in becoming an acknowledged, trusted member of an elite fitness group. This transition is strongly reinforced by the aesthetics and design of fitness spaces, the interpersonal relationships established within them, and the social symbols of specific exercise brands. In some cases, the distinction between healthy, normal exercise and unhealthy, obsessive exercise becomes less clear. This research has important implications for how identity is informed by the social groups we are members of, as well as for how identity may be informed by the marketing strategies employed by fitness companies.

The Effects of Social Mindsets on Cognitive Control
Sol Wahba, Psychology
Sponsor: Professor Yaacov Trope, Psychology

The control adjustment effect states that if the previous trial of a cognitive control task was incongruent and the current trial is incongruent, then response times will be lower on the current trial than on the previous trial. Previous research has observed the control adjustment effect within the same task, but not between two different cognitive control tasks. In the present research it is proposed that control adjustments across tasks may be possible when the participants are on a High construal level or an abstract mindset, as opposed to being a Low construal level or a concrete mindset. Participants were induced in either a High or Low construal level, and then performed alternating trials of different cognitive control tasks. The results indicated that construal level did not have a significant impact on control adjustments across tasks. This finding suggests that the mindset does not have an effect on control adjustment, and affirms that control adjustment is not observed between two cognitive control tasks.

Maternal Verbal Responses to the Affective Signals of Infants with Craniofacial Anomalies
Zixuan Wang, Psychology
Sponsor: Professor Harriet Oster, Paul McGhee Division, School of Continuing and Professional Studies

The aim of the current study is to examine whether mothers of infants with craniofacial anomalies (CFA) and
mothers of unaffected infants pay attention to their affective signals differently during a dyadic interaction. Archival videotapes of mother-infant interactions (Oster & Korman, 1997) were transcribed verbatim for verbal content analysis. Mothers’ verbal responses were blind coded on a sentence-base, and both maternal interpretation of infant’s affective state and its valence were scored. This study found that although mothers of affected and unaffected infants did not differ in the amount of interpretation of infants’ affective state, mothers of mildly affected infants paid more attention to infants’ negative emotions than mothers of severely affected and unaffected infants. By analyzing the verbal content of maternal responses, we proposed a new construct for studying maternal responsiveness and maternal sensitivity.

**The Resor House: Perspective Representation and Mies van der Rohe’s “Inner Structure”**

Veronica Watson, Urban Design and Architecture Studies  
Sponsor: Professor Jon Ritter, Urban Design and Architecture Studies

Architectural representation is the conceptualization and translation of designed space onto a two-dimensional picture plane. Linear perspective, invented in the early Renaissance by Filippo Brunelleschi and described by Leon Batista Alberti in his book *On Painting* as a tool for painters, has become an integral tool for architectural representation. These representations deserve deeper consideration as direct artifacts of the architect’s design conceptualization, freed from physical construction and its practical constraints. Furthermore, it is important to consider the way in which the two-dimensional perspective form may be reflected in the built three-dimensional space it was used to represent. These concerns will be turned toward a close examination of German modernist architect Ludwig Mies van der Rohe, specifically by considering a number of sketches and, more comprehensively, by a study of three-dimensional architectural collages.

The Resor House is an early American commission by Mies van der Rohe. It was built in 1937 for the Chicago architect Batista Alberti in his book *On Painting* as a tool for painters, has become an integral tool for architectural representation. These representations deserve deeper consideration as direct artifacts of the architect’s design conceptualization, freed from physical construction and its practical constraints. Furthermore, it is important to consider the way in which the two-dimensional perspective form may be reflected in the built three-dimensional space it was used to represent.

These concerns will be turned toward a close examination of German modernist architect Ludwig Mies van der Rohe, specifically by considering a number of sketches and, more particularly, three perspective collages he produced for his first American commission, the Resor House, in 1937. The collages combine photographic images of the landscape with drawn perspective of the living space looking out into it. Using as a basis some of the ideas of art historian Erwin Panofsky, in *Perspective as Symbolic Form*, Mies employs the perspective form to a manipulative stylistic effect. While much has been written about Mies van der Rohe’s architecture, especially in regard to his interest in the structure of buildings, this research suggests that we may interpret the “inner structure”, that Mies proclaims to expose in his buildings, as more than a skeletal structure highlighting what holds the building up. Instead we might point to an underlying visual structure that reflects the form of the two-dimensional perspective in which it was conceived.

**Talent Development and Labor Mobility in International Football and Their Effects on Domestic and International Competition**

Daniel Weisbaum, Economics  
Sponsor: Professor Christopher Lucas, NYU School of Medicine

The same forces that dictate labor negotiations in commercial industries command the labor markets in professional football. Firms (teams) and workers (athletes) negotiate contracts based on the relationship between productivity, ability and paid wages. Professionalism, defined as the exchange of financial compensation for labor performance, was introduced to football in the late 1800s after being previously banned. A century later, thanks to the 1995 Bosman Ruling in the European Court of Justice, the nature of football’s transfer market was changed. The ruling deemed it unlawful to restrict employment based on nationality within the European Union. This has propelled football into one of the most globalized professions and international labor markets. Nowadays, the only barriers to trade in the professional football labor market are athletic ability and financial power, allowing teams to purchase player’s rights and players to change locations internationally with relative ease. This freedom has led to a clear isolation of top-tier talent in central football markets, which can afford to pay high wages, and a weakened domestic crop of talent in fringe markets who cannot compete economically. Player talent (human capital) sales have become an essential driver of club revenue so talent development has risen higher on club agendas than ever before. In this comprehensive study we treat investments in talent development through a case study of Argentina’s CA Boca Juniors youth academy; analyze how institutional changes over the past two decades have affected off-field agendas and on-field results and review labor movement trends on a country-by-country basis in relation to international competition results. Much has been written on the unique nature of labor markets in professional football and the development of central and periphery football hubs around the world. As the sport continues to globalize, it is essential to expand on these concepts and better understand how the labor system in place has affected on-field competition.

**Venue Choice in Charitable Giving**

Stephen White, Mathematics  
Sponsor: Professor Catherine Hafer, Politics

This study analyzes the decision process of an individual donor choosing to make a charitable contribution to one of several charities. In this research, an individual’s utility depends only on two factors: post-donation wealth, and status earned by donating. Status is evaluated relative to an expected donation at each charity. Each charity has a
different audience, which confers different amounts of status to donors depending on the donation amount. Results show that if the value of a donation is evaluated relative to some expected donation amount, sufficiently wealthy individuals prefer to donate to high-status charities, while lower-wealth individuals prefer donating to low-status charities where status is “cheaper.” This wealth cutoff increases as the expected donation increases at the high-status charity, and decreases as expected donation increases at the low-status charity, reflecting common-sense expectations. The model thus offers a theoretical explanation of how financial and status concerns might result in status groups stratified by income.

The Role of Gender in the Relationship Between PTSD Symptoms and Overt Attitudes Towards Alcohol in a Clinical Adolescent Sample

Emma Whitmyre, Psychology
Sponsor: Professor Christianne Esposito-Smythers, George Mason University

Approximately 5% of adolescents meet criteria for PTSD during their lifetime (National Comorbidity Survey Replication- Adolescent Supplement; NCSR-AS, 2012). Prior research has shown that Post-Traumatic Stress Disorder (PTSD) is often comorbid with Substance Abuse Disorder (SAD) in adolescents. A study conducted with adolescents ages 12–17 showed that 13.5% of males and 24.6% of females had co-occurring diagnoses of PTSD and SAD (Kilpatrick et al., 2003). Prior research has also demonstrated that positive attitudes towards substances predict substance abuse (Walsh et al., 2011). The purpose of this study is to examine the relationship between PTSD symptom count and positive attitudes towards alcohol use in an adolescent inpatient sample, and to examine potential sex differences. There is a significant relationship between PTSD and alcohol use. Higher PTSD symptom count is associated with alcohol abuse in young adults. Consistent with the stress and coping formulation of substance use (Thomas et al., 2001), individuals may use alcohol to cope with PTSD related symptoms (Edwards et al., 2006). This may be most likely to occur among individual who hold more positive views of alcohol. There is some evidence that PTSD symptom severity and alcohol use may vary by sex. Indeed, previous research suggests that females report higher rates of PTSD symptoms following violence exposure (Foster et al., 2004) as well as PTSD diagnoses in general (8.0% vs. 2.3%, respectively; NCSR-AS, 2012) relative to males. Gender differences are also evident in rates of alcohol use. Adolescent males report higher rates of binge drinking and more alcohol related problems than females (Geisner et al, 2004). To date, research has not yet examined the interrelationships among PTSD symptom severity, alcohol attitudes, and sex. We hypothesize that adolescents with greater PTSD symptoms will have more positive attitudes towards alcohol use. We also hypothesized that sex would moderate this relationship, such that among individuals with higher PTSD symptoms, (males vs. females) would report more positive alcohol attitudes. Participants included 182 adolescents who completed an assessment battery while hospitalized on an inpatient psychiatric unit. PTSD symptoms were measured using the Kiddie-Schedule for Affective Disorders and Schizophrenia (Kaufman et al, 1997), and alcohol attitudes were measured using the Substance Abuse Subtle Screening Inventory (Miller, 1997). Results from a hierarchical linear regression showed a main effect for PTSD symptom count on overt attitudes towards alcohol ($\beta=.25, p < .05$). Specifically, individuals with higher PTSD symptoms reported more positive attitudes towards alcohol. There was no main effect for sex, and sex did not moderate the association between PTSD symptoms and alcohol attitudes. Results suggest individuals with PTSD should be assessed for pro-alcohol attitudes as this may represent a potential area for clinical intervention.

Multifamily REITs: Expanding the Scope of Corporatized Gentrification?

Nicholas Williams, Social and Cultural Analysis
Sponsor: Professor Dalton Conway, Sociology

Real Estate Investment Trusts (REITs) are properties bundled and sold as securities on stock exchanges and they offer less expert and less wealthy investors the access to an otherwise more elusive asset class. Congress authored legislation creating REITs in 1960 and today there are roughly 200 REITs bought and sold on stock exchanges in the United States. This project examines REIT history over the past twenty five years and its role in the gentrification process. This research begins with a review of the gentrification literature and lessons on the nature of gentrification from its onset in the mid twentieth century. This project is primarily interested in the development of ‘corporatized gentrification’, or the influx of capital from global financial markets to inner city. Simultaneously, it reviews happenings in the REIT industry, including consolidation and expansion. The project culminates with a more specific analysis of REITs in New York City that own, develop and operate multifamily communities. As the new mayor attempts to create more units of affordable housing and bridge the gap between rich and poor in New York City, it is helpful to understand the effects of multifamily REITs on corporatized gentrification.

Autocratic Depositions and Human Rights

A. Dylan Yalbir, International Relations
Sponsor: Professor Rachel Brulé, Politics

The “Arab Spring” and the ongoing civil war in Syria have sparked debate in Western nations over what role
they should play in the violent depositions of autocrats. In general, the West seems to be unsure of what autocratic depositions to involve itself in. This paper seeks to identify the effect of violence during an autocratic deposition on post-deposition levels of respect for human rights and terrorist activity. Using a difference in differences research design, this study compared over 100 violent and non-violent country-depositions cases in order to determine the effect of violent autocratic depositions on the levels of respect for physical integrity and empowerment rights. Additionally, this study observed the effect violent depositions have on the number of terrorist incidents. This study found that on average violence during the deposition of an autocrat significantly increases the level of respect for human rights. This effect on human rights is strongest when only the most violent cases are observed. This study found no significant relationship between the presence of violence during a deposition and the post-deposition incidences of terrorism. These results contribute to the debate over what types of autocratic depositions are worth intervening in and what we can expect the results will be when violence is present.

**Losing Air Service: Determining Route Exits After Airlines Mergers**

*Emily Yang, Economics and Journalism*

*Sponsor: Professor John Lazarev, Economics*

Small communities depend on commercial air service as a source of economic development and access into the U.S. air transportation system. However, when two airlines merge, they potentially cut service to these regions. The airline loses profits if there are not enough passengers from these communities to cover route costs, and it cancels the route. The merged airline can further take advantage of its new network, trading in a route with fewer passengers for one with more. The goal of this research is to determine the demand and cost variables that affect airlines’ decisions to exit routes. Given past exit decisions, I estimated the probability of exit that depend on route distance, population, income and passenger share. Data from the 2008–2010 Delta Air Lines and Northwest Airlines merger was used for this analysis. After the data was analyzed, preliminary results revealed that a smaller population between route end points is more likely to lead to exit. I then create a network profit model to examine changes in pre- and post-merger periods. This study hypothesized that overall airline network profits should increase. This research can predict how airline networks adjust after a merger. These network changes impact smaller community air service, a concern for both antitrust policymakers and potential passengers.

**The Redefinition of Masculinity**

*Natascha Yogachandra, Journalism and Anthropology*

*Sponsor: Professor Brooke Kroeger, Journalism*

In examinations of adult sexual violence, including all forms of assault and trafficking, the predominant focus tends to be on the perpetrators, often male, and their primarily female victims. This research involves the multitude of men in this universe, both those who commit these heinous acts, and those who have taken up the cause of recovery for these female victims, either by providing legal support, leading youth groups, or analyzing the causes and effects of these crimes. A growing number of male activists across the United States are now establishing male-oriented groups for young students. Their purpose is to give boys the chance to rethink what it means to be a man, and to change the way they treat women and each other. Organizers say the construct works once the young men decide to participate, but getting their attention is often the biggest challenge. More funding and increased awareness are necessary before this new movement can create large-scale change.

**Assessing the Impact of Medical Tourism in Destination Countries**

*Kevin Yuan, Economics*

*Sponsor: Professor John Leahy, Economics*

“Open your new eyes on the beach at Juha”

–Bombay Hospital

The focus of this research is to assess and explain the economic and social effects of medical tourism on exporting countries. Applying neoclassical trade theory, the research attempts to quantify the effects on consumer surplus and quality of public healthcare following medical tourism. In a field that is dominated by normative claims, it was difficult to assess the direct effects that different variables have in promoting medical exports. To begin, a multiple linear regression of revealed comparative advantage of medical exports on the supply of doctors, health expenditure per capita, quality of sanitation infrastructure, and percent of population over 65. A country is said to have a comparative advantage in a service if it can produce it at a lower opportunity cost than another country. However, since this study utilizes data from 37 different countries, a uniform index is needed for comparison. By this measure, the study begins to elucidate which factors contribute most to the each country’s comparative advantage. Consumer surplus as the difference between prices in each period with a standard fixed constant. A time-series analysis is run to plot how these surpluses have fluctuated and changed over time. The changes in quality of healthcare are examined by measuring variations in expenditure on public health and prevention in the exporting country. This study will focus on 37 different countries with data being utilized from 2002—2011. This
research adds to the growing field of medical tourism by analyzing the distributional benefits that come with international trade. Despite its growing significance, it has been an understudied area in academia, where normative claims have driven many discussions. These discourses focus on the potential social effects of medical tourism including healthcare equity for vulnerable groups within destination countries but no empirical study has been conducted. This study has shown that the growth of medical tourism has been cyclical and inversely related to an economy’s performance.

Functional Convergence in Suspensory Primate Scapular Morphology
Elizabeth Zhou, Anthropology
Sponsor: Professor Terry Harrison, Anthropology

Homoplastic traits are those that arise independently among taxa as a result of similar functional demands. Because these characters do not imply shared ancestry, the ubiquity of homoplasy has emerged as a serious impediment to accurately reconstructing phylogenetic relationships, particularly in extinct species. In this paper, homoplasy is examined in scapular morphology of three genera of primates (Ateles, Hylabates, and Pygathrix) in which the shoulder has become adapted to independently acquired highly suspensory locomotion. Geometric morphometric analysis of Procrustes aligned shape data from 15 landmarks is used to compare the degree of morphological divergence from more quadrupedal outgroups and to assess influence of phylogeny and locomotor adaptation on patterns of possible structural convergence. The results indicated that while scapular shape is largely associated with functional demands, each taxon varies from the quadrupedal relatives in different ways. In contrast to highly convergent features on more distal portions of the forelimb, these results suggest that there is less functional constraint on the morphology of the scapula associated with suspensory behaviours.
The role of a liberal arts education is to give broad knowledge to students to prepare them to face the world. Students can often graduate from college without gaining the most basic understanding of the sciences. Some may even prefer this, believing that science is reserved for a specific segment of our society. In fact, since Leonardo da Vinci, science has been infiltrating all aspects of society, from communication to energy to medicine, from the vineyards of Bordeaux to the classrooms where philosophical debates take place. Thus, scientific knowledge and an understanding of the basic principles of how it is obtained is absolutely essential for anyone hoping to understand and contribute to the world. As the ultimate goal of a university is to spread and foster knowledge and truth, it must provide a strong scientific education to all students.

—Claude Desplan, Professor of Biology

Exploratory Analysis of Credit Agency Data to Aid in Early Detection of Diabetes
Dmitriy Afanasyev, Mathematics
Sponsor: Professor David Sontag, Computer Science

Medical practitioners as well as prediction algorithms often possess very limited and specific medical histories and are thus limited by this information when treating patients. Any background information on the patient could help sway decisions on how to better treat and diagnose a patient. This research uses a data set that provides a large amount of ethnic, socioeconomic and self-reported medical information on a group of patients. A variety of statistical techniques, such as logistic regression and Chi-Squared Tests of Independence, is applied to this data, in order to tease out unexpected relationships between income, ethnicity, medication and ailments. Then using factor analysis with tetrachoric correlation latent variables are discovered and applied in an effort to reduce the dimensionality of the data, which in the future will be used as auxiliary input to a diabetes prediction algorithm to help improve its accuracy in identifying type 2 diabetes before it can be diagnosed. Early identification of type 2 diabetes has the potential to improve the quality of health of the patient as well as decrease future medical costs, at least in part by preventing long term complications from accruing during undiagnosed diabetes.

The Aerodynamics of Flapping Flight
Natalie Agre, Physics and Mathematics
Sponsor: Professor Jun Zhang, Mathematics

Although there is a basic understanding about the drag force on a steadily moving body, the aerodynamics involved in unsteady flows are still very unclear. For example, the well-understood airplane wing only translates as it flies. In contrast, complicated creatures such as birds and insects both revolve and beat their wings during flight. In order to understand this type of flight there is a need to be able to characterize a revolving wing in both the flapping and non-flapping case. To address this question, this study designed a well-controlled, readily measurable physical experiment consisting of a revolving mechanical device with flapping wings. The research initially discovered that the drag on a non-flapping, revolving wing is surprisingly high. Since then this study quantified the drag on our device for non-flapping motion. Currently, the research is moving forward to measure the drag for the flapping case, with the ultimate goal of using this data to test and formulate drag
laws that apply to flapping flight. Preliminary results for the flapping wing demonstrate that there are regimes in which a quasi-steady aerodynamic theory works, and regimes in which it is no longer a good approximation of the forces.

**Self-Assembly of 3D DNA Crystals via a Liquid Bridge**  
Salman Ahmad, Chemistry  
Michael Mohsen, Chemistry  
**Sponsor: Professor Nadrian Seeman, Chemistry**

This lab previously reported a self-assembled 3D DNA crystal containing two independent tensegrity triangles in the asymmetric unit. This demonstrated the use of DNA to dictate the spatial arrangement of multiple asymmetric units in a three-dimensional lattice. The two triangles are annealed separately before crystallization. Macromolecular crystallization is primarily carried out by the hanging drop method, in which the DNA drop with mother liquor is suspended on a glass slide above a reservoir containing a higher concentration of precipitant than in the drop. This closed system forces vapor phase diffusion of water from the drop into the reservoir, promoting dehydration of the drop, and in turn, bringing together the DNA motifs to form a crystalline structure. Since the DNA motifs are immediately in contact upon suspension of the hanging drop, there is a possibility that crystallization occurs prematurely, i.e., before each triangle has completely hybridized. Using a liquid bridge, a buffer region between two DNA motifs was introduced so that they interact with each other strictly after passing through the buffer. Our goal is that this will produce a crystal with higher resolution. Using X-ray crystallography, the resolution of the crystals grown in capillary tubes can be compared to those previously grown by the hanging drop method. This process was carried out for 3D DNA tensegrity triangle motifs containing two, three and four helical turns per edge. Crystals were successfully grown for each of the three systems; obtaining diffraction data is the next step for confirming whether or not better resolution will be achieved.

**Increased Angiogenesis as Evidenced by Nestin-Positive Pericytes**  
Mohammed Alzoobaee, Biology  
Amritpal Saini, Mathematics  
**Sponsor: Professor Efrain Azmitia, Biology**

Previous studies generally focus on neuronal plasticity as a factor in the autism spectrum disorder; however, this study looked at vascular plasticity, a novel approach. Pericytes, the contractile cells of the human brain, are important in guiding angiogenesis, or the development of new blood vessels from pre-existing vessels. In control brains, we have observed that pericytes are involved in maintaining the integrity of the blood-brain barrier (BBB); whereas, in autism brains, pericytes are more transient and in an immature state. Through immunohistochemical staining techniques using nestin and α-SMA, we measure blood vessel volumes and pericyte densities within the STG cortex. In autism brains, nestin heavily labeled pre-capillaries and capillary vessels in all layers of the cortex at all ages analyzed; whereas in control brains, staining was absent after the age of eight years. These results are consistent with the hypothesis that angiogenesis is extended in the brains of autistic children and young adults, showing a persistent developmental period. This sustained angiogenesis in autism donors may impact the integrity of the BBB by regulating blood flow, coordinating the entry of microglial cells, and increasing the permeability of the BBB. The potential involvement of vascular plasticity, which is often overlooked and unexamined, may open up new avenues for understanding and treating autism.

**Assembly of a 2-Turn Tensegrity Square Motif with PX Edges**  
Sandra Armanious, Biology  
**Sponsor: Professor Nadrian Seeman, Chemistry**

It was recently shown that 2-turn DNA tensegrity square motifs can self-assemble via sticky-end interactions. The 2-turn motifs have either 5, 6, 7 or 8 bases between junctions of all form structures in either two-dimensional or three-dimensional structures. The ultimate goal is to use these DNA scaffolds to organize macromolecular compounds for atomic force microscopy (AFM) and X-ray diffraction studies. Of the macromolecules of interest are those involved in the process of recombination and are thought of binding a DNA motif called the Paranemic Crossover (PX) motif. The 4-turn DNA tensegrity square has edges that contain the PX motif and create 2D and 3D structures via sticky-ended cohesion. These structures will then be used to organize the PX-binding proteins for AFM (2D) and X-ray diffraction (3D) studies.

**Invariant Natural Killer T Cell Regulation of Anti-tumor Immunity Through Dendritic Cell Population Control**  
Joseph Aryankalayil, Biology  
**Sponsor: Professor Sandra Demaria, Pathology, NYU School of Medicine**

Invariant natural killer T (iNKT) Cells comprise a subset of immune cells that bridge the gap between adaptive and innate immunity. The importance of these cells is marked by their ability to rapidly respond to antigen recognition and promote the development of anti-tumor immunity in many tumor models. However, in iNKT-deficient mice bearing 4T1 mammary carcinoma it was
discovered that CD8+ T cells inhibited spontaneous metastases, suggesting iNKT cells are able to suppress the onset of CD8+ anti-tumor T cell responses. iNKT-deficient mice were also shown to have a markedly improved response to treatment with local radiotherapy and anti-CTLA-4 antibody. In order to determine if the improved response to treatment in the absence of iNKT cells was independent from the immunotherapy employed, 4T1-tumor bearing wild type (WT) and iNKT-deficient (iNKT/-) mice in our experiment were treated with local radiotherapy in combination with another antibody-mediated immunotherapy (CD137). Since dendritic cells (DCs) professionally present the tumor-associated antigen to NKT cells, this study sought to understand the mechanisms of the immunosuppressive function of iNKT by analyzing DCs through immunohistochemistry and flow cytometry. In vivo antibody-mediated blockade of CD1d was employed to prevent the interaction between iNKT cells and DCs, and act as a potential form of immunotherapy. The results were similar to the previously observed combination of local radiotherapy and anti-CTLA-4 antibody. The response to treatment with radiotherapy and anti-CD137 was markedly improved in the absence of iNKT cells, with 50% of the mice showing complete tumor regression and long-term survival. DC analysis in 4T1 tumors and tumor-draining lymph showed selective elimination of DCs cross-presenting tumor-associated antigens. In addition, CD1d blockade was able to restore the number of DC in WT mice, improve T cell priming and enhance response to treatment. The distinct immunosuppressive role of iNKT cells highlighted in this study has important implications for the future design and implementation of immunotherapies that target cancers in which iNKT cells are present the tumor-associated antigen to NKT cells, establish. This dye can be used as a universal model drug in other systems.

**Synthesis and Characterization of a 7-Amino-4-nitrobenzoxadiazole Dye as Model Drug on a Macromolecular Drug Delivery Scaffold**

**Sponsor: Professor Marcus Weck, Chemistry**

This study focused on the synthesis and characterization of a 7-amino-4-nitrobenzoxadiazole (NBD) dye with a cleavable linker. The dye was attached to a drug delivery vehicle as a model drug and tracer to study cellular uptake. In order to deliver this model drug into the cell, cell-penetrating peptides derived from a Herpes virus (HSV-1) was attached to the vehicle as well. Upon cell entry, the linker of the dye should be cleaved so that the dye gets detached from the vehicle. The uptake of the drug model will be studied by fluorescence microscopy, because NBD emits at approximately 530 nm. By observing the uptake efficiency via the synthesized dyes, the vehicle’s effectiveness as well as successful linker cleavage can be established. This dye can be used as a universal model drug in other systems.

**Stochastic Sight: Expression of Spineless(Ss) in the Eye of Drosophila melanogaster**

**Amrita Balgobind, Biology**

**Sponsor: Professor Claude Desplan, Biology**

Though poorly understood, stochastic gene expression is an important mechanism used to diversify cell fates. The eye of Drosophila melanogaster provides an excellent model to study the regulation of stochastic expression. The fly eye is composed of approximately 700 ommatidia, each of which contain eight photoreceptors. This research focuses on the R7 photoreceptors, which randomly take on either the pale fate (Rh3 expression) where the photoreceptors are responsive to shorter wavelengths of UV light, or the yellow fate (Rh4 expression) where the photoreceptors are responsive to longer wavelengths. Although this expression is stochastic, there is a consistently observed ratio where the R7 cells are 70% yellow and 30% pale. The transcription factor, Spineless(Ss), is expressed in the fly eye to determine these different cell fates in the R7 cells. This study discovered deletion mutations affecting regulatory regions upstream of the ss gene that affect
stochastic gene expression. These deletion line mutants were analyzed and determined that there were changes in Ss expression by using a Rh4 reporter (Rh4>GFP) as an indirect assay for ss expression. These experiments have provided insight into the mechanisms controlling stochastic expression, which has important implications for our understanding of the development of the various human systems.

Clinical Outcome and CD4+ differentiation in anti-CTLA-4/radiation and anti-CTLA-4/steroid therapy

Anuj Bapodra, Biology
Sponsor: Dr. Michelle Krogsgaard, Pathology, NYU School of Medicine

Combination of anti-CTLA-4 and radiation therapy with or without steroids is common in the management of melanoma patients. However, their clinical results and effects on immunity have not been examined in depth. This study observed the clinical and immune response of melanoma patients treated with anti-CTLA-4/radiation therapy and anti-CTLA-4/steroids. The patients in this study are treated with anti-cytotoxic T lymphocyte antigen 4 (CTLA-4) antibody, an antibody that has been associated with a positive clinical outcome. This treatment is effective because it enhances T-cell proliferation by inhibiting CTLA-4, a protein receptor that stops the T-cell response. The research analyzed a cohort of patients treated with anti-CTLA-4 antibody therapy at NYU Medical Center. This study examined differences in overall survival using log-rank test in patients treated with 1) anti-CTLA-4 with radiation therapy; 2) anti-CTLA-4 with steroids. Corticosteroids were administered to control symptoms (n=26) and/or toxicity (n=24). T cells were purified from patients; each represented by a minimum of two individual samples (before and after anti-CTLA-4 treatment). CD4+ T-helper cell subset phenotypes were characterized by their cytokine profiles by bead-based cytokine assays after stimulation using CD3/CD28 activation beads. Subsequently, the study determined the association between treatment type and concentrations of cytokine production. The cytokine data indicates the prevalence of specific Th (CD4+ T helper cell) subsets. This is because the CBA data shows what cytokines were released by the Th subsets, so it is possible to retroactively identify the most effective Th cells during the therapies correlated to the patients' clinical outcome. Patients treated with anti-CTLA-4 and radiation therapy given before, concomittant or after anti-CTL4 treatment (n=53) had better overall survival prognosis compared to patients treated with anti-CTLA-4 alone (N=83; p=0.02). Anti-CTLA-4 therapy with steroids (n=50) conferred better prognosis compared to anti-CTLA-4 alone (p=0.037). The combination of anti-CTLA-4 and radiation therapy induced T cells to produce more IL-2, IL-17a and TNFa over the 4 cycles of treatment compared to anti-CTLA-4 alone. Similarly, anti-CTLA-4 with steroid treatment increased the production of IL-2 and IL17a, but not TNFa, compared
to anti-CTLA-4 alone. No trend differences in IFN-γ, IL-4, IL-6 or IL-10 production were detected. The data suggests that the enhanced immune response may be explained by effects of radiation therapy and corticosteroids. Increased production of IL-17a and TNFα indicate skewing towards Th17 CD4+ subset since other cytokines showed no trend. The polarized Th17 has clinical significance due to higher anti-tumor activity than unpolarized Th subsets. The findings of this study have provided a better understanding of the clinical and immunological effects of anti-CTLA-4 therapy being conducted today.

The Hydrodynamic Benefits of Schooling
Alex Becker, Mathematics
Sponsor: Professor Leif Ristroph, Mathematics

Motivated by fish schooling and bird flocking, this study explored how multiple flapping wings or hydrofoils generate and interact with unsteady fluid flows. To simulate arrays of locomotors, a series of experiments that examine the dynamics of hydrofoils swimming in circles around a tank and thus swimming into their own self-generated flow field was created. This work investigated how vortices and complex time-dependent flow structures determine the collective behavior of these swimmers. The associated fluid flows and gather data for different flapping amplitudes was visualized. Additionally, two-wing results were compared with one-wing results to test whether ‘schooling’ wings involve different flows, and what benefits these flows provide. The results indicated that schooling does produce a hydrodynamic benefit for collective groups, resulting in up to a doubling of swimming speed. These results serve to provide a basis in which to examine the dynamics of group movement in a fluid.

Bicoid Binding Along Its Concentration Gradient in Drosophila melanogaster Embryo
Anastasia Beldovskaya, Biology
Sponsor: Professor Stephen Small, Biology

The correct temporal and spatial regulation of genes is critical during embryonic development. Proteins called transcription factors (TFs) directly bind to and regulate their target genes. Little is known about the effect of TF concentration on the activation of its targets. This question is addressed by studying the TF Bicoid in Drosophila melanogaster. Bicoid has been postulated to act as a morphogen, whose concentration gradient along the anterior-posterior axis of the embryo positions different cell fates. The goal of the experiments was to test whether Bicoid concentration is a critical factor for determining where Bicoid will bind along the genome. To achieve this goal, we needed to compare Bicoid-DNA binding profiles at different regions within the gradient. The available Bicoid-DNA binding data is from whole embryos and it does not take Bicoid concentration into account. To overcome this limitation, it was proposed to separate embryonic nuclei with different levels of Bicoid using the novel method of BiTS-ChIP and compare Bicoid-DNA binding at different regions of the embryo. The results could elucidate the relationship between Bicoid concentration and the activation of its target genes. It is possible to gain important knowledge about transcriptional regulation, which is universal for many living systems, including vertebrates.
variables. From a theoretical perspective, much of the research on this topic explores various unique properties of Benford’s Law, which can be used to test the “Benford-ness” of sequences and random variables. Beyond the theoretical characteristics of Benford’s Law, it also finds important applications in algorithm accuracy, accounting fraud detection, prime numbers, and even Twitter. This research explores many of these connections and applications, delving into an underlying structure of numbers for use in both number theory and big data analysis.

A Little Less Bratwurst? Steps Toward Reducing Meat Consumption in Germany
Marisa Bulkeley, Environmental Studies and German Studies
Sponsor: Professor Christopher Schlottmann, Environmental Studies

In August 2013, the German Green Party suggested a voluntary meatless day once a week in workplace cafeterias in order to promote more sustainable diets, provoking partisan pushback from Germans who felt they had the right to make their own dietary choices. This paper aims to address how the Green Party could implement this policy in a more culturally acceptable way for the German population. Although Germany is environmentally conscious in many other aspects, the country’s relationship with meat seems to take precedence over any ecologically sensitive notions. This research looks at behavior change campaigns in order to assess the most effective route for changing German diets. The researcher looked at psychological studies and previous campaigns, in Germany as well as internationally; to change deeply rooted behavior such as eating habits. These findings may help to tailor a specific approach to reducing meat consumption in Germany.

Purification of GFP Tagged Proteins
Jacob Carmichael, Biology
Sponsor: Professor Sevinc Ercan, Biology

This study seeks to identify what proteins are interacting with condensin proteins. The research will first focus on the dosage compensation complex (DCC), a unique condensin found in C. elegans. To identify the proteins interacting with the DCC, the researcher will purify dpy-27, a key component of the DCC. Purifying dpy-27 will also purify the entire DCC and any proteins bound to it. The purified proteins will then be subjected to mass spectroscopy, in order to identify what proteins are present. The method of purification is to use a GFP Binding Protein (GBP). Using GBP, the researcher can purify any protein that has been tagged with GFP, in this case dpy-27. The advantage of using GBP as opposed to a GFP antibody, is that a large amount of antibody must be used in order to purify enough protein for mass spectroscopy, which is expensive. GBP can be produced cheaply in bacteria. Antibodies also need to be cross-linked to the affinity beads during purification, or else they will be eluted along with the protein. GBP, however, remains bound to the beads due to the his-tag it contains. Using GBP, allows the researcher to study a wide range of the protein interactions occurring.

Using SNPs as Markers for Uncovering the Genetic Changes in Keratin 5 Gene in Cave vs. Surface Morphs of Astyanax mexicanus
Kyunglim Chae, Biology
Sponsor: Professor Richard Borowsky, Biology

Dramatic changes in habitat may impose selective pressures upon a species to evolve rapidly in order to adapt to the new environment. Cave morph Astyanax mexicanus, a cave dwelling fish, is one of such species which has gone through rapid adaptation to adapt itself to the cave environment by most notably losing its eyes and pigmentation. The two morphs of Astyanax that live on the surface and in the cave have many phenotypic differences caused by rapid evolution, but the genetic basis of the differences is poorly understood, in part because the genome of the surface morph is not sequenced yet, and the sequenced genome of the cave morph is mostly not annotated yet. This issue was solved by using SNPs (single nucleotide polymorphism) as markers for regions in the genome that may have undergone important changes, and picked out the gene keratin 5 (Krt5) of the cave morph as a potential gene that may contain important changes. Using the sequence of the cave morph, we sequenced the DNA of the keratin 5 gene of the surface morph. Comparison between the krt5 gene sequences of cave and surface morph identified several differences in base pairs and amino acids that may potentially alter the function of krt5 gene. Such identified differences supported the validity of using the SNPs as markers to pick out genes that may have undergone changes during evolution.

Controlling the Movement of Bimetallic Nanorods Using Boundaries
Clifford Chang, Chemistry
Sponsor: Professor Leif Ristroph, Mathematics

A theme of animal behavior is the control of movement toward a food source or away from harm. It has been known for almost a century that at the microscopic level an organism’s motility is influenced by chemotaxis, or movement toward or away from regions of high chemical concentration. Recently scientists have, for the first time, discovered a completely non-biological microscale particle called a nanorod that swims with chemotactic behavior— it “eats” hydrogen peroxide “food.” However research into this topic has produced two conflicting results. Observation
of these nanorods in crude preliminary experiments shows that they swim towards regions with more “food” while a mathematical description of their movements predict the opposite. Therefore the goal of this study is to refine the experimental technique used to observe chemotaxis of nanorods (already made) by creating a microfluidic device that will enable me to precisely control experimental parameters such as peroxide concentration and temperature. From that the researcher expects to see more conclusive experimental results that can be interpreted quantitatively by new mathematical models to either support or modify the existing hypotheses.

3D DNA Crystals Assembled from Tensegrity Square Motifs Containing 6 Nucleotides Between Junctions
Chien-Rong Chen, Biology
Taryn Jurgensen, Chemistry
Michael Mohsen, Chemistry
Anna Lo, Chemistry
Sponsor: Professor Nadrian Seeman, Chemistry

Control of the detailed structure of matter on the nanometer and micrometer scale is a central goal in chemistry. DNA nanotechnology facilitates the building of geometrical and topological motifs from DNA. Branched DNA molecules with sticky ends are useful for this purpose largely owing to the programmability of the sticky ends, thereby allowing control of intermolecular interactions. It allows for the formation and the atomic positional control of nanostructures in 1-, 2- and 3-dimensions. It was previously reported that a two-turn DNA tensegrity square containing either 5 or 7 nucleotide pairs between junctions can self-assemble into a 3D lattice. It was also demonstrated via atomic force microscopy that both squares could form two-dimensional arrays bearing square patterns with a spacing of 7 nm corresponding to the spacing between 2 contiguous squares. The present work successfully assembled a tensegrity square with 6 bases between junctions that form 3D crystals. Diffraction data has been collected for the crystals formed with 2-nt sticky ends (5.50 Å and NSLS-X25) and 1-nt sticky ends (3.12 Å at NSLS-X25). The unit cell dimensions for the 1-nucleotide sticky-end systems were found to be a = b = 69.163 Å (which correspond to two-turns of DNA) and c = 54.862 Å, with a space group of P3. The volume of the unit cell is 227,273.9 Å³. Current work is being done to test the formation of two-dimensional arrays via AFM.

Genetic Interactions Between Signaling Pathways that Regulate Starvation Responses
Sarah Choksi, Biology
Sponsor: Professor David Gresham, Biology

Eukaryotic cells use different signaling pathways and mechanisms in order to sense and respond to nutrient sources in their environment. TPK1, TPK2 and TPK3 are protein kinases that work in the PKA pathway to detect the presence of carbon. TOR1 works to detect nitrogen in the environment and also to control cell growth depending on environmental conditions. The goal of this project is to investigate the interactions between these signaling pathways that detect nutrient depletion in the environment and underlie the survival of nutrient starvation. In the absence of TOR1 cells starved for nitrogen rapidly die. In the absence of TPK1/2/3 cells starved for carbon rapidly die. These pathways converge on the regulation of cellular processes including transcriptional and translational regulation that underlies the response to nutrient starvation. The study aims to identify the extent to which these pathways functionally overlap by studying genetic interactions between TOR1, TPK1, TPK2 and TPK3. Since there are multiple proteins involved in similar pathways the goal is to compare double knockouts of TOR1 and TPK1, TPK2 and TPK3 compared to the single knockouts of these same genes. If the two signaling pathways do interact then the expected phenotype is that mutant strains with TOR and TPK1, TPK2 and TPK3 knocked out will die faster compared to just a single knockout strain. This research can further enable us to understand cellular responses to the environment. By studying whether the two signaling pathways interact we can further explain how eukaryotic cells respond to environmental stresses. As the TOR pathway is known to be involved in the tumor growth in mammals, research into this pathway and its interactions could lead to new anticancer agents.

Synthesis of Cyclic Endoperoxides
Abbie Chung, Chemistry
Sponsor: Professor Keith Woerpel, Chemistry

The development of new synthetic routes to cyclic endoperoxides, a class of natural products that exhibit potent bioactivities against malaria and cancer, is needed. The inherent stability of organic peroxides presents a formidable challenge in their synthesis. Two synthetic routes are introduced to generate five- and six-membered cyclic endoperoxides, common motifs present in this class of natural products. Progress has been made in the synthesis of five- and six-membered cyclic endoperoxides. To form the six-membered cyclic endoperoxide, intramolecular nucleophilic addition of hydroperoxides to epoxides in the presence of phosphomolybdic acid catalyst afforded cyclic endoperoxides, accompanied by a five-membered cyclic ether side product. In an attempt to avoid formation of the cyclic ether, the peroxide was installed onto the ketone and silyl-protected prior to epoxidation. Unfortunately, this alternative route gave an unidentifiable mixture of decomposition products, so studies are ongoing. When forming
five-membered cyclic endoperoxides, a chromium(VI)-
catalyzed oxidation of enone steroids was optimized using
molecular oxygen, N-hydroxyphthalimide, and less of the
toxic catalyst. Peroxides show considerable promise as
drug candidates. The methods described provide access to
the synthesis of complex, biologically active natural prod-
ucts and their analogues. It is anticipated these methods
will be applied to the synthesis of cyclic endoperoxides
with enhanced pharmacological profiles.

The Effect of Temperature on Shmirs
Jonathan Chung, Biology
Sponsor: Professor Christine Rushlow, Biology

Maternal gene products loaded into the oocyte control
the initial events of embryogenesis. Zelda is a transcription
factor that activates the zygotic genome of Drosophila
embryos; while Dorsal is another transcription factor that
helps set up the Dorsal/Ventral axis. For both proteins,
mRNA transcripts are loaded into the oocyte during oogen-
esis and are later translated. In a previous project, research
showed that a transgene targeting zelda mRNA is better
in creating and obtaining zelda mutants. This transgene
encodes a double-stranded RNA hairpin structure and is
expressed in the ovary where it will knockdown maternal
zelda expression by the endogenous microRNA pathway
(referred as zelda-shmir). It has been noted that the GAL4/
UAS system, by which the transgene is controlled, is
more efficient at higher temperatures. The research was
conducted to determine if flies grown at 29°C are more
efficient in knocking down expression of zld and dl. In
situ hybridizations were performed to assess if zld-shmirs
and dl-shmirs are affected for gene activation. The results
of this research demonstrate that the GAL4/UAS-shmir
system is more effective at 29°C.

Reciprocal Connectivity Between the Prefrontal Cortex
and Thalamus
Laura Craciun, Neural Science
Sponsor: Professor Adam Carter, Neural Science

The prefrontal cortex (PFC) is an important part of
the brain used for high-level behaviors like cognition,
emotion, and working memory. Dysfunction of the PFC
has been linked to various neuropsychiatric diseases like
addiction, schizophrenia, and depression. The thalamus is
another part of the brain primarily responsible for relaying
sensory signals to the sensory cortex. Interestingly, previ-
ous PFC anatomy has shown that it receives inputs from
two different parts of the thalamus: the mediodorsal (MD)
nucleus and nucleus reunions (NR). The purpose of these
two pathways is unknown. The goal of this research is to
characterize the anatomical, morphological and physi-
ological differences between the neurons connecting the
PFC to the MD and NR. The anatomy was done with ste-
reotoxic injections into the PFC with different anterograde
and retrograde tracers. Two-photon imaging will be used
to obtain images of these two thalamocortical neurons,
and whole-cell recording will be done to determine the
physiological properties of these neurons. Preliminary
anatomy data so far shows that there is a reciprocal con-
nection between the PFC and the two thalamic nuclei. The
purpose of this project is to gain insight into the circuitry
of the PFC with the thalamus, as it could lead to a better
understanding of cognitive functioning and various neu-
ropsychiatric diseases.

Differences Between the Fourth and Fifth IPCC Assess-
ments: Display and Presentation of Information
Dahlia Darwiche, Environmental Studies
Sponsor: Professor Dale Jamieson, Environmental Studies

The International Panel on Climate Change (IPCC)
works to provide the most updated climate information and
projections to inform the curious population, and influential
policy makers. The IPCC attempts to translate a growing
urgency in the changing climate through their analysis
of observations. This process of conveying information
involves framing the problems and the uncertainties that
come along with it. The IPCC’s fourth climate change
assessment, published in 2007, was not successful in cata-
lizing political action for climate change. Research pub-
lished after this publication brought attention to changes
that needed to be made to strengthen the communication
aspects of the assessments. This research will assess differ-
ces in climate change communication methods between
the fourth IPPC report (2007) and the fifth report (2013).
Differences in climate change presentation will be mon-
tored through both variations in key terms, such as those
designated to communicate uncertainty, and in methods
of using graphics to display information. Evaluating these
changes in presentation will lead to further insight in cli-
mate change communication. The results of the research
will also explain where the communication of climate
change might be headed in the future.

The Effect of Conductive Hearing Loss on Learning
Auditory Skills
Kevin Dell’Aquila, Neural Science
Sponsor: Professor Dan Sanes, Neural Science

One of the most significant consequences of hear-
ing loss is the impaired rate of auditory skill acquisition,
which may lead to deficits in language comprehension.
Since hearing loss generally arises from damage to the ear,
difficulties with speech comprehension could be due to
peripheral processing deficits. However, there is evidence
that central nervous system (CNS) deficits are caused by
ear damage, suggesting neural deficits could also contribute to speech comprehension problems. This research tested the auditory perceptual skills of animals reared with a form of hearing loss that does not damage the ear. Therefore, any observed perceptual deficits can be attributed to a CNS locus, and permit us to study these mechanisms independent of the ear. Gerbils, with their excellent low frequency hearing, were used in GO/NOGO tasks with tone stimuli to examine developmental hearing deprivation. The data has shown that internal decision-making noise in conductive hearing loss (CHL) gerbils is higher than normal hearing (NH) gerbils. By means of signal detection theory, the rate at which CHL gerbils reached optimal behavioral performance were compared to NH gerbils. Preliminary results demonstrate that the rate at which hearing loss gerbils reached optimal performance at predicted thresholds was slower than for normal hearing. The altered learning curve for the hearing loss gerbil suggests that auditory skill deficiencies in humans, such as diminished language comprehension, could correlate to altered neural mechanisms in the auditory cortex.

**Unzipping Meiosis: An Examination of the Centromere Pairing Mechanism in *Saccharomyces cerevisiae***
*Raj Desai, Biology*

Meiosis is a cellular process necessary for many organisms. It is maintained by checkpoints that prevent further progression of meiosis when mutated. One such checkpoint in prophase I involves phosphorylation of yeast protein Zip1 on the serine 75 residue as part of a process called centromere pairing, which facilitates faster alignment of homologous chromosomes. There is phosphorylation and cleaving by proteins Mec1 and PP4. In mutated PP4 cells, there is a Zip1-S75 hyperphosphorylation observed. However, not much is known about the subsequent events in the mechanism or what phenotypic consequences exist for this hyperphosphorylation. The research characterized the range of shift through point mutations on other Zip1 sites and also showed that PP4 defects lead to lower spore viability, a phenotype of meiosis I nondisjunction. A recovery in viability was found in a PP4 CKII double mutant, suggesting a possible role for this kinase in phosphorylation consensus sites. A similar viability was also shown in a CKII substrate, Fpr3, which functions in a checkpoint bypass system called adaptation. Further exploration into Zip1 centromere pairing and checkpoint adaptation systems could reveal more about this prophase mechanism and how it may fail, leading to nondisjunction, which contributes to diseases such as Down’s Syndrome.

**Reverse Micelle Assisted Synthesis of Porous, Organic Nanocapsules for Metal Nanoparticle Loading.**
*Megan Emmanuel, Chemistry*
*Sponsor: Professor Marc Walters, Chemistry*

Imaging, an essential tool in modern medicine, is employed for diagnosis, prenatal care, drug trials and testing. Contrast agents are often required for the efficacy of imaging because they enable the identification of specific tissues, anatomical features, and lesions. Therefore, contrast agents are of fundamental importance in modern medicine and the development of new contrast agents is now an important aspect of materials science. The use of gold nanoparticles has proven to be effective in ultrasound imaging, while iron oxides are useful agents for MRI imaging due to their strong magnetic capabilities. Further, iron oxides are biologically non-toxic and can potentially replace more toxic gadolinium based agents that are currently being used. The efficiency and cost-effectiveness of imaging contrasts can be increased by the synthesis of multimodal imaging agents—conjoined contrast agents that can be used for multiple imaging techniques. By combining gold and iron oxide nanoparticles within one multimodal system, the potential for early and accurate disease diagnosis would be greatly enhanced. Research has been done to synthesize metal-organic frameworks that can be used for imaging and transport purposes. This experiment, however, is geared towards designing and synthesizing a fully organic, biodegradable ligand to produce nanoscale, porous capsules. These capsules are used to encase and transport transition metal particles that can be used as contrast agents—namely, silver, gold and iron oxyhydroxide. Cetyltrimethylammonium Tris-glutaramide (CTA-TGA), a novel surfactant ligand, was synthesized and used to build reverse micelles that were further cross-linked to form porous particles. This research found that these capsules can take up transition metal cations at coordination sites. The metal cations are subsequently reduced to metal nanoparticles within the capsule. This organic capsule technology, through its ability to envelop and transport transition metal particles, can aid in the improvement of contrast agent design.

**Translation Does Not Increase mRNA Stability in *Saccharomyces cerevisiae***
*Victoria Mai Li Ettorre, Biology*
*Sponsor: Professor David Gresham, Biology*

Messenger RNAs (mRNAs) are intermediates in the flow of information from DNA to protein. Normal cellular function is controlled by regulation of mRNA abundance through the combined action of synthesis and degradation. The regulation of transcript production has been extensively studied, whereas the regulation of
mRNA degradation is poorly understood. Transcripts are decayed either 5' to 3' or 3' to 5' after deadenylation of the poly A tail. This study aims to test the hypothesis that engagement with the ribosome acts as a mechanism for transcript protection from degradation machinery. To test this hypothesis, the degradation of transcripts that are efficiently translated are measured and compared with transcripts that are not translated. The use of mRNAs encoding Green Fluorescent Protein (GFP) and an endogenous gene, GAP1 are utilized to test whether inhibition of translation by mutation of the start codon results in increased stability of the transcript. The GFP and GAP1 coding regions were inserted into a vector that allowed them to be controlled by a tetracycline-repressible promoter. With this promoter and the presence or absence of doxycycline (a tetracycline derivative), transcription can be controlled for each of these transcripts. This allows for the observation of the half-life of each of the functional transcript and their start-codon mutants. Quantitative PCR (qPCR) analysis for the GFP transcripts with mutated and non-mutated start codons showed that there was no difference in the half-lives of the transcript with and without translation. The experiment was repeated with GAP1, to confirm the lack of a protective effect by the translational machinery. This study contributes to our understanding of the post-transcriptional fate of mRNAs.

**A DNA Crystal Designed to Contain 3 Molecules Per Asymmetric Unit**

*Nina Fisher, Chemistry*

*Victoria Zlotnikova, Chemistry*

*Isabelle Levin, Individualized Study*

*Amritpal Saini, Mathematics*

**Sponsor: Professor Nadrian Seeman, Chemistry**

Tensegriy triangle DNA motifs self-assemble into a 3-D lattice through sticky end cohesion.\(^1\) While only a single motif was used to produce the first crystal lattice, in more recent experiments two different tensegriy triangle motifs have been shown to self-assemble into a single lattice with two molecules in the crystallographic unit.\(^2\) The motifs differed in the sequences of the strands that composed the triangle motif as well as in the sticky end bases that enable cohesion between the motifs. However, sticky end cohesion was achieved between the separate motifs by designing sticky ends so that each molecule was complementary to the other and not to itself.\(^2\) This research extends this method by using three different triangle motifs to form a lattice. We predict that the motifs will arrange themselves in a 3-way alternating pattern via complementary sticky end cohesion, thereby self-assembling into a crystalline lattice.


**Composition and Properties of the Spore Coat Polysaccharides in Bacillus subtilis**

*Matthew Gallitto, Biology*

**Sponsor: Professor Patrick Eichenberger, Biology**

The goal of this research project is to determine the carbohydrate composition of the spore coat in the endospore-forming organism *Bacillus subtilis* and to analyze the properties of mutant spores that are unable to incorporate polysaccharides in their envelope. The understanding of the spore glycan composition is essential, as this may ultimately increase the potential for finding novel treatment options to combat spore-forming pathogens that invade the human body. There are several sporulation genes such as *spsl*, *ytdA*, *yfnH*, and *cgeA* encoding carbohydrate synthesis enzymes that may be involved in the production of spore polysaccharides. This study adapted a protocol using fluorescently labeled lectins to stain the carbohydrates present at the spore surface and outer layers of the spore coat. Various mutants that are missing at least one of the four known layers of the spore coat due to the inactivation of specific genes (*spoIVA*, *safA*, *cotE*, and gene cluster *cotXYZ*) were analyzed. Additionally, knockouts inactivating genes encoding the putative spore polysaccharide synthesis enzymes (*spsl*, *ytdA*, *yfnH*, and *cgeA*) were screened with the same protocol. Using fluorescence microscopy and lectin screening kits provided by Vector Laboratories, multiple carbohydrates were searched for on various layers of the spore coat. With spore to background signal strength ratios of over a 1.4 threshold, it was demonstrated that mannose, α-galactose, and N-acetylglucosamine are likely present on the spore coat. Although this research is ongoing, multiple mutants have already been tested for carbohydrate presence and locations are gradually being confirmed. Novel understanding of the spore coat composition and assembly mechanisms will allow researchers to make connections to similar pathogenic spore-forming organisms such as *Bacillus anthracis*, the causative agent of anthrax, or *Clostridium difficile*, which can provoke diarrhea following antibiotic treatments, potentially helping us advance our abilities to fight against harmful bacteria.

**Soap-Film Parachute**

*Likhit Ganedi, Mathematics*

**Sponsor: Professor Leif Ristroph, Mathematics**

In fluid dynamics, a fascinating set of problems involve flexible shapes interacting with flows. These
poorly understood problems occur prevalently in nature. Everyday examples include leaves rolling up in a breeze or the flapping of a flag. These problems are very complex, and they can benefit from lab experiments where factors are well controlled. This research studied the interaction of elastic bodies in flows by designing an experiment in which air flow inflates a soap film. Imagine a solid ring that is spanned by a film and dropped in air, forming an inflated surface. This surface will change its shape due to aerodynamic forces, creating a ‘soap film parachute’. What shapes will evolve from the soap-film, and how will it depend on drag and velocity? A rotating device is used to experimentally simulate the dropping of soap film in air. Using this device, the study found a family of steady shapes and also unusual relationships between shape and drag.

Kornblum Oxidations Using Triphenylphosphine Oxide

Anupriya Gaguly, Chemistry
Sponsor: Professor Keith Woerpeil, Chemistry

This research serendipitously found that certain bromides can react with triphenylphosphine oxide to yield an aldehyde. These reactions are similar to a Kornblum oxidation\(^1\), which is a reaction that produces aldehydes from bromides, using dimethylsulfoxide as a nucleophile. The general scheme for a Kornblum oxidation is given below. The project explores and tries to optimize the conditions and substrate for this newly found synthetic reaction. This research is significant for the scientific community because new synthetic reactions can be useful for those in the pharmaceutical industry or in academia. The synthesis of certain compounds such as drugs or natural products can be sensitive or unyielding to existing synthetic reactions. Therefore, proposing new synthetic routes can be useful.

\(^1\) Kornblum, N. J. (Am. Chem. Soc. 1959, 81, 4413–4414).

Genotyping Germline Variants in the hTERT Promoter Region in Multiple Cancers

Gabrielle Gussin, Biology
Sponsor: Dr. Vijai Joseph, Sloan-Kettering Institute for Cancer Research

Telomerase is a ribonucleoprotein complex responsible for adding DNA sequence repeats to the ends of eukaryotic chromosomes. Elongation of the telomere region prevents degradation of the chromosomal ends following multiple rounds of DNA replication. Failure of DNA polymerase to replicate telomeric ends causes progressive shortening of DNA strands during cell division and subsequent senescence. The human reverse transcriptase (hTERT) gene encodes the catalytic subunit of telomerase and is expressed at significant levels in about 90% of human tumors, whereas expression in normal cells is extremely low\(^1\). Ectopic expression of hTERT increases chromosome instability and is a key mediator for malignant transformation of human cells. Association of germline variants in the TERT promoter with breast and ovarian cancer risk has been shown in a large GWAS\(^2\).

Recently, sequencing of the region upstream of the TERT translation start site revealed a common single nucleotide variant (SNV) in multiple cancers. These findings led us to genotype this variant in several hundred cases of DNA in order to determine the prevalence of the SNV in different cancer cohorts. It was found that the allelic frequency of the rare variant did not differ significantly between cancer cases and the control group. These results suggest that hTERT mutants in this region of the promoter do not confer an increased predisposition to cancer development.


Self-Assembly of Magnetic Colloidosomes via Binding of Biotin and Streptavidin

Tarikul Islam, Chemistry
Sponsor: Professor Stefano Sacanna, Chemistry

Everybody uses colloids. Without realizing it, we encounter colloidal particles such milk, mayonnaise, oil in water, and lotion in our everyday life. Colloid chemistry is a branch of science that deals with suspensions made of evenly distributed particles whose diameters range from 1 to 1000 nanometers. Thus, colloids bridge the gap between macroscopic and microscopic universe because they have properties from both systems. This gives them unique, specific and adaptable functions. Currently, the self-assembly of colloids into controlled three-dimensional structures is of great interest to researchers because of their potential applications in biomaterials, drug delivery, stability of petroleum, and photonics. The purpose of this research is to assemble well-defined magnetic colloidosomes via the interaction between streptavidin and biotin. To control the self-assembly of colloids into elastic shells around a core particles, we have looked to nature for this inspiration. By utilizing the strong binding affinity between biotin and streptavidin, this study hopes to create a template for self-assembly of magnetic colloidosomes. The template would allow two different colloidal particles to recognize and selectivity bind to each other, while excluding preventing the formation of bonds between colloids of the same type. To achieve this, a novel biotinylated triblock polymer has been synthesized. When this triblock is grafted to the surface of a trimethoxysilyl propyl methacrylate (TPM) oil droplet, it created a significant level of specific binding between biotinylated TPM, and commercially available
magnetic streptavidin particles. The advantage of this system is that it allows for the control movement of these particular colloidosomes by manipulating their magnetic properties. Ultimately, the hope is to develop selectivity permeable magnetic colloidosomes with a hollow core that can be used to transport and encapsulates drugs, vitamins, and other micromolecules. Lack of an efficient transport system results in inadequate biodistribution of these molecules, which leads to a limited therapeutic response but also to numerous side effects to healthy organs.

The Effects of Minocycline on Spinal Cord Ischemia in Rats
Erum Jaffrey, Biology
Sponsor: Professor Esperanza Recio-Pinto, Anesthesiology, NYU School of Medicine

The incidence of paraplegia following surgery or endovascular stenting of the thoracic aorta remains unacceptably high, despite advances in anesthetic and surgical management. Reducing the current paralysis rate is achieved by interventions, which are mostly physical in nature. There is a need to find or develop pharmacological compounds administered prophylactically and aimed at further lowering the patient risk of spinal cord ischemia. Minocycline is a tetracycline derivative, and has been used for many years in humans at low doses. There is mounting pre-clinical evidence for a new use of this old drug. Minocycline appears to be neuroprotective in several animal models of cerebral ischemia, stroke and inflammation; however, these effects are uncertain. Here, this study used a model of spinal cord ischemia in which the thoracic aorta was occluded with a 2F Fogarty Catheter for 18 minutes under isoflurane anesthesia. A high intravenous dose, 10mg/kg, of minocycline hydrochloride was administered thirty minutes prior to aortic occlusion in a group of rats. Spinal cord tissue was collected forty-eight hours after reperfusion, and processed for histological staining (H&E and GFAP+). Quantification of GFAP+ areas indicated that relative to controls, ischemia induced significant astrogliosis in white matter (p<0.0001) and in gray matter (p<0.0001) of thoracolumbar spinal cord sections-areas caudal to the occlusion. Minocycline significantly reduced astrogliosis in these areas (white matter, p<0.05; gray matter p<0.0001). The data indicates that in addition to its reported inhibitory effects on microglia, minocycline may modulate the glial response to injury via inhibition of reactive astrocytosis. Minocycline also protected against neuronal damage as evidenced by an increased percentage of intact spinal cord tissue and decreased vacuolation in gray matter. Together, the data indicates that a single, high dose of minocycline administered prophylactically may be helpful in alleviating severe behavioral deficits in a model of spinal cord ischemia in rats.

Interplay of NPK Nutrients Coordinates Growth and Development Across Arabidopsis Ecotypes
Tim Jeffers, Biology
Sponsor: Professor Gloria Coruzzi, Biology

For plants, Nitrogen(N), Phosphorous(P), and Potassium(K) act as primary nutrients and signals that control gene expression, which in turn coordinates growth and development. Many studies describe responses to varying concentrations of a single nutrient. However, few investigate the response from the signaling interactions of all three nutrients. In a project inspired from a classic 1962 experiment, this study created a NPK matrix with specific combinations of 9 N-concentrations and 4 PK-concentrations, for the model plant Arabidopsis. After two weeks, biomass and root architectural traits of plants per treatment were measured. As a result, optimum biomass was dependent on a balanced nutritional composition: Low-N/Low-PK and High-N/High-PK treatments had higher biomass than imbalanced treatments. To test how this composition dependent effect on growth varies across ecotypes of Arabidopsis, a pilot experiment will be conducted by growing 16 ecotypes in a condensed NPK matrix. If this screen’s results show the response to nutrient composition is distributed across ecotypes in a trade-off fashion, where some perform better in Low-NPK over High-NPK conditions, a genome-wide association study will be conducted to identify the genetic features associated with Nutrient Use Efficiency. The long-term goal of this project is to engineer crops for more efficient NPK fertilizer use.

Visualizing The Recognition of A Bulky DNA Lesion By Eukaryotic Nucleotide Excision Repair System Via Cy5 Fluorescent Labeling
Hyeeun Jeong, Biochemistry
Sponsor: Professor Nicholas Geacintov, Chemistry

Polycyclic aromatic hydrocarbons (PAH) such as benzo[a]pyrene (BaP), are products of combustion of fossil fuels and are therefore ubiquitous in our environment. BaP and structurally related PAH have carcinogenic properties when they are metabolically activated in human cells to diol epoxides that form pre-carcinogenic DNA lesions. Once incorporated into DNA, these lesions interfere with DNA transcription and replication mechanisms, thus causing mutations. However, cellular defense mechanisms can remove and repair DNA lesions formed by either sunlight or by PAH. The initial protein that plays a central role in initiating global-genome NER by recognizing different DNA lesions is called XPC (xeroderma pigmentosum C). This experiment is being conducted with the yeast XPC orthologue, Rad4. Rad4/XPC lesion-recognition protein does not recognize all DNA lesions equally effectively, and
some DNA lesions are overlooked altogether. This project investigated the binding of Rad4 protein to an unmodified 50-mer double stranded DNA sequence and to a 50-mer double stranded DNA sequence with a (-)-trans-anti-B[a] PDE-dG lesion derived from benzo[a]pyrene by varying the concentration of NaCl. Binding was visualized and measured by annealing the lesion strand with a complementary strand DNA that has been fluorescently labeled with Cy5 and then performing gel electrophoresis. This study observed in the annealing step that the ratio of Cy5 single strand DNA to BP-modified single strand DNA for optimal binding was 1:2 while the optimal ratio for Cy5 complementary strand and unmodified single strand DNA was 1:1. This also observed decreasing binding of Rad4 on duplex with increasing concentration of NaCl. Understanding the effects of ionic strength on the binding of XPC or Rad4 to duplex DNA, and its impact on the NER efficiency, is important for accurately assessing human exposure to such environmental carcinogens and the risk for developing cancers.

**Differentiation of EPIYA vs. EPIYT Polymorphisms in *Helicobacter pylori* CagA Virulence Factor B-Motifs**  
**Shawn Jindal, Biochemistry**  
**Sponsor: Professor Martin Blaser, Medicine, NYU School of Medicine**

*Helicobacter pylori* is a microaerophilic human gastric bacterium. It is commonly associated with chronic gastritis and gastric ulcers, as well as the development of stomach cancer in humans. The virulence factor CagA is injected into host epithelial cells and deregulates cell proliferation, motility, polarity and apoptosis, leading to cancer development. The conserved tyrosine residue in the EPIYA motif, a repeated amino acid sequence in cagA, represents the site of phosphorylation of CagA proteins by host cell kinases. Researchers noticed that some *H. pylori* strains of Western origin also possess an EPIYT motif on the CagA protein. There is evidence that EPIYT motifs in the B-domain of CagA affect cell-signaling pathways differently than EPIYA motifs. This project aims to establish a PCR-probe system to detect EPIYA vs. EPIYT in B-domains of CagA. The PCR-probe system would then be applied to biosamples obtained from mouse model and human patients. Preliminary PCR studies successfully differentiated between the EPIYA and EPIYT polymorphism, but mutations between the two were not observed. The biological and clinical difference between the two polymorphisms will also be studied. The PCR-probe system may ultimately serve as an efficient diagnostic tool used to classify *H. pylori* from infected patients.

**Design of a 4-Turn Symmetric DNA Tensegrity Square with PX Edges**  
**Michael Alexander Jong, Chemistry**  
**Jessica Somberg, Biochemistry**  
**Sandra Armanious, Biology**  
** Sponsor: Professor Nadrian Seeman, Chemistry**

It was previously demonstrated that DNA tensegrity triangles containing 2-, 3- and 4-turns per edge can self-assemble into designed 3D crystals via sticky-ended cohesion. Moreover it was found that 2-turn DNA tensegrity squares both can form 2D, but not designed 3D lattices. Recently, it was shown that a 3-turn DNA tensegrity triangle containing triplex edges can also self-assemble into designed 3D lattices. In the present work, this study expands the notion of using DNA motifs in the edge of a DNA square. We designed a 4-turn symmetric DNA Square using a paranemic crossover motif for the edges that has been programmed to associate into a 2D lattice structure. Preliminary gel data have shown that the designed strands assemble into a unique structure characterized by a single band formed on a non-denaturing gel. Closer examination by atomic force microscopy is needed to determine the exact geometry of the structure formed by the square motif. Future applications include the ability to create two- and three-dimensional structures that can manipulate and program protein interactions not generally found in nature.

**Bioactivity of Two Traditional Medicinal Plants: Ocimum tenuiflorum and Petiveria alliacea**  
**Jenish Karmacharya, Biology, Borough of Manhattan Community College, CUNY**  
**Sponsor: Professor Jeff Hedrick, Biology, Borough of Manhattan Community College, CUNY**

Antioxidants are beneficial for our bodies due to their ability to reduce the effects of oxidative stress, an accumulation of free radicals. Evidence indicates that free radicals are one of the major underlying causes for many degenerative diseases such as diabetes, cancer, Alzheimer’s and cardiovascular diseases; even the process of aging itself. The beneficial properties of natural products are often associated with their chemical composition. This study’s objective is to investigate the anti-oxidant activity and total phenolic content of two plants—Ocimum tenuiflorum (Holy basil) and Petiveria alliacea (guinea weed). For experiments, plant samples were ground and dissolved in DMSO. Antioxidant activity and total phenolics content were quantified using the ABTS assay and the Folin-Ciocalteu method, respectively, in three independent experiments. The results indicated that both plants have a high total phenolic content, which correlated to high antioxidant activity in a dose-dependent manner. Furthermore, both plant extracts did not show any toxic effects in
mammalian fibroblasts, up to (100µg/ml) as indicated by the MTT-method. In conclusion, O. tenuiforum and P. alliacea qualify as promising plant candidates against degenerative diseases due to their high total phenolic content, corresponding to their antioxidant activity—while having non-toxic effects towards mammalian cells.

**Thermoregulation: Heat Stress, Exercise, and Circulation**

Tessa Kelly, Mathematics

Sponsor: Professor Charles S. Peskin, Mathematics

The mammalian body’s ability to monitor and respond to its internal temperatures allows it to exist in a wide range of environmental conditions. This research presents a six-cylinder, four-layer model of human thermoregulation, built in MATLAB, intended for study of dual conditions of heat stress and exercise. This enables study of conditions at which human testing is unethical. The model is based developments made to Stolwijk’s 25-node general model, in particular the work done by Xu and Werner. The code is adaptable with respect to most external and internal parameters, including: exertion, time to max exertion, body composition, air temperature, radiant temperature, and relative humidity. The model outputs frames showing heat transfer across the tissue, and then plots variables such as maximum evaporative heat loss, heart rate, and stroke volume over time. Experimentation with the model suggests that the convective properties of blood sufficiently homogenize the temperature gradient across tissues that the central differential equation describing conductive heat transfer may be simplified. This could substantially save on computing power, enabling more detailed studies to be done at a significantly reduced computing cost.

**Modeling IDH1 Mutation in Human Embryonic Stem Cell Derived Neuronal Cell Types**

Themasap Khan, Neural Science

Sponsor: Dr. Dimitris George Placantonakis, Neurosurgery, NYU School of Medicine

Gliomas are primary brain tumors with an incidence rate of over 20,000 new cases in the US annually, a poor prognosis and limited therapeutic options. Gliomas are categorized according to World Health Organization (WHO) defined pathological grade. Despite chemoradiotherapy and surgery, grade II/III gliomas eventually transform into IV gliomas leading to neurological defects and eventual death. Isocitrate dehydrogenase (IDH), an enzyme involved in cellular metabolism, is mutated in up to 80% of malignant grade II and III gliomas. IDH1, one of the cytosolic variants of IDH, is the most commonly mutated form. These mutations are thought to occur early in gliomagenesis; they are a gain-of-function causing the mutated IDH to convert alpha-ketoglutarate (αKG) into 2-hydroxyglutarate (2HG). Accumulation of 2HG leads to epigenetic alterations that may contribute to tumorgenesis. Our hypothesis is that IDH1 is a driver of gliomagenesis. The research is testing this hypothesis by overexpressing the mutant (R132-IDH1) in different stages of the human neural lineage, which we will derive in vitro from human embryonic stem cells (hESCs). These experiments are being done in order to identify critical driver mutations that may serve as valuable therapeutic targets.

**The Effect of Antibiotic Treatment on the Population of Segmented Filamentous Bacteria and Bifidobacterium species in Non-Obese Diabetic (NOD) Mice**

Joanne Kim, Biology

Sponsor: Professor Martin Blaser, Medicine, NYU School of Medicine

Through its effects on the gut microbiota, a use of antibiotics can alter the development of the immune system and autoimmunity. This study is investigating the effect of early life antibiotic treatment on the development of the gut microbiota and subsequently, the development of type 1 diabetes (T1D) in non-obese diabetic (NOD) mice. To test this hypothesis, NOD mice were given three therapeutic doses of a veterinary macrolide tylosin early in life (PAT). The research focused on two immunogenic bacterial populations, segmented filamentous bacteria (SFB) and Bifidobacterium. SFB is important in promoting the differentiation of T-helper 17 cells within the murine small intestinal lamina propria, and may alter the development of T1D in NOD mice. This study hypothesized that PAT treatment will decrease the abundance of both SFB and Bifidobacterium species in NOD mice. Data from 16S high throughput sequencing showed that 10 fecal samples of a total of 566 fecal samples had counts greater than zero for SFB throughout the experiment. We performed qPCR on these 10 fecal samples with SFB counts from the sequencing data to confirm SFB quantity. The SFB counts from sequencing correlated highly with the qPCR quantifications using Spearman non-parametric correlation (p<0.01; r=0.86); however, it was not possible to assess the effect of PAT on SFB within our colony of NOD mice due to the low prevalence of colonization. Bifidobacterium species are enriched by human milk oligosaccharides found in breast milk and there is evidence that breastfeeding protects against T1D development. To determine the effect of PAT on the absolute abundance of Bifidobacterium, we developed a qPCR assay specific for the genus Bifidobacterium. In NOD mice, control male mice had higher absolute quantities of Bifidobacterium species in fecal samples compared to PAT-treated male mice (p<0.05). These findings indicate that PAT antibiotic treatment can change prevalence of gut Bifidobacterium species and consequently affect diabetes development.
**Identification of BTB Domain Proteins Involved in Sleep Regulation in Drosophila**

**Junwoo Kim, Neural Science**

**Sponsor:** Professor Nicholas Stavropoulos, Neuroscience and Physiology, NYU School of Medicine

Sleep is a highly conserved and evolutionarily ancient behavior in animals, yet the purpose and function of sleep are still not well understood. The finding that *Drosophila melanogaster* exhibits a sleep-like state has allowed the use of powerful genetic tools to identify genes involved in regulating sleep. Several years ago, *insomniac*, a mutant that severely reduces the duration and consolidation of sleep was identified in a forward genetic screen. The protein encoded by *insomniac* functions in neurons and is a member of the BTB/POZ superfamily. Previous studies have shown that some BTB domain proteins function as substrate-specific adaptors for the Cullin-3 (Cul3) ubiquitin ligase complex. Consistent with these findings, neuronal RNAi against Cul3 recapitulates the short sleep phenotype of *insomniac* animals. To test whether BTB domain proteins other than *insomniac* may be involved in the regulation of sleep, an unbiased reverse genetic screen of approximately half of the 80 identified BTB domain proteins in *Drosophila* was performed using RNAi. Knockdown of a number of genes from several distinct BTB subfamilies yielded a short sleep phenotype. These findings suggest that additional BTB domain proteins may have a role in regulating the duration and consolidation of sleep.

**Crystallizing a DNA Trefoil Knot on a DNA Scaffold**

**Sean Kim, Chemistry**

**Eileen Shannon, Chemistry**

**Sponsor:** Professor Nadrian Seeman, Chemistry

A key goal in structural DNA nanotechnology is to control the structure of matter at an atomic level, utilizing the innate property of DNA to bind spontaneously to complementary Watson-Crick sequences. Three-dimensional motifs made of DNA, such as the tensegrity triangle motif, which produces a rhombohedral unit, have been designed to produce predictable crystalline lattices. Recently, a trplex forming oligonucleotide (TFO) was used to recognize specific locations of a tensegrity triangle with three helical turns per edge. By incorporating the TFO sequence into other molecules, it may be possible to attach moieties which do not typically crystallize on their own to the scaffolding. One such molecule is the 3-fold symmetric DNA trefoil knot. This project aims to obtain an X-ray diffraction structure of the trefoil knot by attaching it to the cavity of the tensegrity triangle lattice utilizing triple-helical interactions within the duplex regions of the triangle. However, the small cavity size of the three-turn triangle limits the ability to attach such large moieties. Therefore, this research proposes a more universal system, which attaches the moiety outside of the triangle, resulting in one attached moiety per rhombohedral unit. This will be achieved by utilizing the helicity of DNA to determine the exact length of the TFO sequence necessary to attach and to orient the moiety toward the inside of the unit cell.

**Spatial Patterning of Neuronal Progenitors in the Optic Lobes of Drosophila melanogaster**

**Clara Koo, Biology**

**Sponsor:** Dr. Filipe Pinto-Teixeira, NYU Center for Developmental Genetics

**Sponsor:** Professor Claude Desplan, Biology

The generation of neuronal diversity requires temporal and spatial patterning of neuronal progenitors. In the *Drosophila* embryonic nerve chord, temporal specification has been shown to rely on the necessary and sufficient sequential expression of different transcription factors (TF’s) in the neuronal progenitors, the neuroblasts. Interestingly, a different temporal sequence of TF’s is used by neuroblasts of the developing medulla neuropil in the *Drosophila* optic lobe, illustrating the generality of this strategy. An intriguing question is how temporal and spatial strategies are coordinated. Here, the study investigates neurogenesis in the Inner Proliferation Center (IPC), a region in the *Drosophila* optic lobe believed to give rise to the lobula neuropil. We performed an antibody staining screening for ≈150 TF expressed in the IPC and found no evidence of temporal patterning of IPC neuroblasts. Instead, the study found that IPC neuronal progenitors are spatially patterned. Additionally, a screen of more than 100 Gal4 lines specific to the IPC and lobula neuropil allowed us to perform a clonal analysis and identify individual lobula neuron identities, and confirm their developmental origin to the IPC. These results provide a unique opportunity to test the implementation of a spatial patterning strategy in neuronal production and learn how it contributes to the specification of cellular identity.

**Inhibition of eIF4E/eIF4G Interaction via 4EGI-1 Rescues Multiple Hippocampal Phenotypes of Fragile X Syndrome in Mice.**

**Rosie (So Yeon) Koo, Neural Science**

**Sponsor:** Professor Eric Klann, Neural Science

**Sponsor:** Professor Emanuela Santini, Neural Science

Fragile X syndrome (FXS) is one of the most common forms of inherited mental retardation, characterized by intellectual disability and autistic behaviors. FXS is caused by mutations in the *FMR1* gene, which is located on the X chromosome. The gene product, FMRP, is an mRNA-binding protein in soma and dendrites that is involved in different steps of RNA metabolism and further regulates the synthesis of key molecules in receptor signaling. Specifically, FMRP has been...
shown to interact with the initiation factor eIF4E and regulate translation as a suppressor through the specific eIF4E-binding protein CYFIP1 (the cytoplasmic FMRP-interacting protein 1) (Napoli et al., 2008). Thus, animal model with genetic deletion of FMR1 (Fmr1 KO), many target mRNAs are deregulated, resulting in exaggerated proteins synthesis and a series of synaptic and structural phenotypes in the hippocampus, such as enhanced protein synthesis-dependent long-term depression (LTD; Huber et al., 2002) and increased dendritic spine density (Dölen et al., 2007) caused by altered protein synthesis (Quin et al., 2005) and defective synaptic actin dynamics. In other words, the imbalance between protein synthesis and actin dynamic remodeling is responsible for those phenotypes in Fmr1 KO mice. This study examines whether inhibition of translation can restore the balance between protein synthesis and actin remodeling. It has been demonstrated that pharmacological inhibition of eIF4E/4G association via 4EGI-1 is effective in normalizing behavioral and synaptic autism-like alterations in eIF4E transgenic mice (Santini et al., 2013). Thus, an inhibitor of translation initiation factors eIF4E/eIF4G interaction, 4EGI-1, is used to block protein synthesis and to study if 4EGI-1 can effectively reverse the multiple hippocampal phenotypes observed in Fmr1 KO mice. Furthermore, this study examines how 4EGI-1 regulates the synthesis of signaling molecules in p-21 activated kinase (PAK) signaling pathway, which is involved in regulating actin dynamics (Hayashi et al., 2007; Dolan et al., 2013), and in Rac, which which is an upstream regulator of PAK, changes the equilibrium between CYFIP1 and its association with either eIF4E or Wave regulatory complex (WRC) and thereby, contributes to both regulation of protein synthesis and actin dynamics (De Rubeis et al., 2013). This research found that 4EGI-1 is efficient in preventing the multiple hippocampal phenotypes observed in Fmr1 KO mice. According to IP data, Rac was overactive in Fmr1 KO mice. When treated with 4EGI-1, the increased activity of the Rac/PAK pathway displayed in Fmr1 KO mice was normalized. Lastly, 4EGI-1 treated Fmr1 KO mice were better at contextual discrimination test than FXS mice, which have been reported that they do not have strong contextual fear conditioning. Overall, the findings suggest that an alternative therapeutic strategy to treat FXS is to restore the balance between protein synthesis and actin dynamics via modulation of eIF4E.

**Triplex-Recognition of a Three-dimensional DNA Motif**

Olga Krestyaninova, Chemistry  
**Sponsor:** Professor Nadrian Seeman, Chemistry

DNA can be programmed to self-assemble into two or three-dimensional structures through Watson-Crick hybridization of sticky ends attached to motifs derived from crossover strand exchange. Triplex-forming oligonucleotides (TFOs) have been used previously to target a duplex region between the junctions of a 3-turn tensegrity triangle motif. The motif consists of three helices directed along linearly independent directions and forms a three-dimensional crystalline lattice stabilized via sticky end cohesion. It has also been demonstrated that it is possible to target an oligopurine sequence that spans a crossover junction. Here, this research used a TFO to target one edge of a 2-turn asymmetric triangle motif containing an appropriately embedded oligopurine binding site which spans one of the junctions. Formation of DNA triplex within the motif was characterized by non-denaturing gel electrophoresis. Bands with a lower mobility were clearly evident for the modified motif molecules in the presence of the TFO. The research also targeted a TFO containing a photo-cross-linking agent, psoralen, at its 5’-end; the cross-linked products were analyzed on a denaturing gel. Results indicate that a TFO can be targeted specifically to a site spanning the junction in the tensegrity triangle motif. Triplex formation could be exploited to direct any reactive group to unique locations within a DNA nanostructure.

**Identifying Putative Transcription Factor Binding Sites in the Ci-COE Minimal Enhancer**

*Jonathan Lee, Biology  
**Sponsor:** Professor Lionel Christiaen, Biology*

Congenital heart disease occurs in 4 to 5 out of every 3000 live births (Bom et al., 2012). To improve the prognosis of such individuals, human heart development must be elucidated to develop effective treatments. The ascidian model *C. intestinalis* is a prime candidate for investigating the gene regulatory networks involved in cardiac development, due to the similarity of their cardiac development. This project investigated the effect of targeted mutagenesis in a minimal enhancer for the transcription factor COE. COE is a factor that is necessary and sufficient for trunk ventral cell (TVC) differentiation into atrial siphon muscle (ASM) instead of cardiac precursors. However, the upstream factors directing this specific expression of COE have not yet been determined. To identify these factors, putative binding sites as located by Matinspector software within the minimal COE enhancer were targeted for mutagenesis with custom primers. These mutagenized segments were ligated into plasmids, upstream of fluorescent reporter proteins. The fluorescence of these mutant reporter constructs were compared to a wild-type reporter to assess differences in expression. It was found that a mutant construct with three simultaneous mutations in three Ets1/2 binding sites created down regulation of GFP expression as compared to the wild-type. This indicates that Ets1/2 may act upstream of COE to influence its expression, which in turn affects the heart vs. ASM fate choice of the TVCs. The identification of factors such as Ets gives clues as to what genes influence heart vs. pharyngeal muscle choice in vertebrate heart precursors.
Regulation of Dorsoventral Patterning in Drosophila
Christina Leong, Biology
Ruta Ziukaite, Biology
Sponsor: Professor Christine Rushlow, Biology

Throughout the past several years, the discovery of Zelda (Zinc finger early Drosophila activator) has fueled a new wave of developmental research exploring the different mechanisms behind gene activation in the Drosophila embryo. Zelda is a key transcription factor that activates genes during the maternal-to-zygotic transition (MZT) by binding to specific DNA sequences called TAGteam sites, which include CAG-GTAG and related sequences. In addition to Zelda, Dorsal also plays an important role in early Drosophila development. Dorsal is a transcription factor that forms a morphogen gradient in Drosophila embryos and is responsible for proper dorsoventral patterning. In wildtype embryos, the levels of Dorsal are higher in the ventral-most region and lowest in the dorsal-most region. This study hypothesizes that Zelda potentiates Dorsal activity in the neuroectoderm region, where the Dorsal morphogen gradient is shallow. Furthermore, this study demonstrates that the amount of Zelda bound directly to the enhancer may influence the expression of a wide variety of target genes throughout the MZT.

Relaxation Times of Li-6 and Li-7 as a Function of Isotope Concentration
Xueqian Li, Chemistry
Sponsor: Professor Alexej Jerschow, Chemistry

Until recently, the only method to test and visualize electrochemical changes occurring inside a Lithium Ion Battery was to disassemble it. Once deconstructed, microscopy techniques are used to investigate the electrode surface and the electrolyte composition. The introduction of MRI techniques allows for a non-destructive mode of analyzing a functioning battery. To support this development, lithium isotopes are investigated through NMR spectroscopy to reveal spectroscopic properties of electrolyte and electrode materials as well as insight on electrolyte dynamics. Lithium solutions of varying isotopic concentrations are prepared by dissolving appropriate amounts of LiCl salt into H2O and D2O. Different pulse programs are executed on a 500 MHz Bruker NMR spectrometer to obtain the longitudinal (T1) and transverse (T2) relaxation times of the prepared solutions. The T1 and T2 relaxation times of LiCl solutions are then examined as a function of isotope concentration. In agreement with the theory, both the T1 and T2 relaxation times decrease with increasing concentration. This reveals fundamental properties and clarifies the relaxation behavior of lithium isotopes at different concentrations. The results of this research will be used to enhance MRI techniques as well as the ability to interpret images and spectroscopy data obtained for batteries and battery materials.

Calcium-Release-Activated-Calcium (CRAC) Channel Deficiency Leads to Reduced Mitochondrial Metabolism and Biogenesis
Jayson Lian, Chemistry
Sponsor: Dr. Stefan Feske, Pathology, NYU School of Medicine

Upon depletion of endoplasmic reticulum (ER) Ca2+ stores, plasma membrane-bound Ca2+-release-activated-Ca2+ (CRAC) channels open and allow extracellular Ca2+ to enter the cell. This influx of extracellular Ca2+ due to CRAC channel activation is called store-operated Ca2+ entry (SOCE), a major signaling pathway necessary for chemokine and cytokine production, and activation and proliferation of immune cells. CRAC channels operate through a coordinated mechanism involving ORAI1, a hexameric pore-forming plasma membrane channel, and an ER-Ca2+ sensor protein stromal interaction molecule 1 (STIM1). Four CRAC-channel deficient patients, suffering myopathy, ectodermal dysplasia, autoimmunity, and immunodeficiency, are characterized for mutations in ORAI1 and STIM1. Three novel mutations in ORAI1 were discovered that completely abolish protein level expression and SOCE, while the fourth patient suffered a previously characterized mutation in STIM1. These CRAC-channel deficient patients’ cells are studied for mitochondrial dysfunction and altered metabolic regulation. All four CRAC-channel deficient patients expressed reduced mitochondrial oxygen consumption, mitochondrial ATP production, mitochondrial protein content, and flux through the electron transport chain. Further, these cells exhibit an increased glycolytic capacity. The study of these mutations further elucidates the mechanisms behind CRAC channel function and immunodeficiency, and gives implications for the metabolic role CRAC channels may play in human cells.

Design of a Self-Assembled 3D DNA Origami-Based Crystal
Jia Ji Lin, Chemistry
Sponsor: Professor Nadrian Seeman, Chemistry

Upon depletion of endoplasmic reticulum (ER) Ca2+ stores, plasma membrane-bound Ca2+-release-activated-Ca2+ (CRAC) channels open and allow extracellular Ca2+ to enter the cell. This influx of extracellular Ca2+ due to CRAC channel activation is called store-operated Ca2+ entry (SOCE), a major signaling pathway necessary for chemokine and cytokine production, and activation and proliferation of immune cells. CRAC channels operate through a coordinated mechanism involving ORAI1, a hexameric pore-forming plasma membrane channel, and an ER-Ca2+ sensor protein stromal interaction molecule 1 (STIM1). Four CRAC-channel deficient patients, suffering myopathy, ectodermal dysplasia, autoimmunity, and immunodeficiency, are characterized for mutations in ORAI1 and STIM1. Three novel mutations in ORAI1 were discovered that completely abolish protein level expression and SOCE, while the fourth patient suffered a previously characterized mutation in STIM1. These CRAC-channel deficient patients’ cells are studied for mitochondrial dysfunction and altered metabolic regulation. All four CRAC-channel deficient patients expressed reduced: mitochondrial oxygen consumption, mitochondrial ATP production, mitochondrial protein content, and flux through the electron transport chain. Further, these cells exhibit an increased glycolytic capacity. The study of these mutations further elucidates the mechanisms behind CRAC channel function and immunodeficiency, and gives implications for the metabolic role CRAC channels may play in human cells.

Crystal Design of a Self-Assembled 3D DNA Origami-Based Crystal
Jia Ji Lin, Chemistry
Sponsor: Professor Nadrian Seeman, Chemistry

One of the main goals in structural DNA nanotechnology is to design 3D macroscopic objects with an underlying robust structure through precise molecular control. Previously it was demonstrated that a DNA triangle motif can self-assemble via sticky-end interactions to form 3D crystals. 3D DNA tensegrity structures with bundles of DNA double helices have also been shown to self-assemble from DNA origami. It has been suggested that crystallization of 3D DNA structures with a DNA origami-based tensegrity triangle motif is possible and could be analyzed using X-ray diffraction. In the present work, this hypothesis is tested by designing the motif based on the previous successful DNA tensegrity triangle and studying the self-assembly of the 3D crystal.
motifs formed. X-ray diffraction data will enable a determination of the possibility of self-assembling a 3D crystalline lattice based on the DNA origami-based tensegrity triangle.


The Differential Responses of Primary and Secondary Visual Cortices to Texture Stimuli
Alisa Liu, Neural Science
Sponsor: Professor Lynne Kiorpes, Neural Science

The visual system is composed of cortical areas activated by different stimuli. The function of primary visual cortex, or V1, is well understood, but the secondary visual cortex, or V2, is more elusive. The difficulty in understanding V2 is due to its nonlinear transformations and the similarity of its responses to V1 to certain stimuli. V2 may be involved in global processing, or the integration across receptive fields to represent complex structures. Most stimuli do not contain these structures. Therefore, the response of V2 to natural images, which have them, would provide more insight into its function. However, these features cannot be captured parametrically. Portilla-Simoncelli textures provide a solution. They are representative of the real world and statistically controllable. This research studied the differential responses evoked by textures and non-textures using psychophysics and EEG. This study is significant because it found an elevated first harmonic EEG responses to textures, a unique response we believe is characteristic of V2. It also has clinical applications. People with amblyopia and autism have global processing deficits. By determining its developmental time course in visually normal and clinical populations, this study could develop more efficient therapies that target global processing during this critical period.

Determining the Localization of Polysaccharide Synthesis Proteins on Bacillus subtilis Spores
Brian Liu, Biology
Sponsor: Professor Patrick Eichenberger, Biology

Bacillus subtilis is a bacterial model organism for understanding cellular differentiation. Most complex organisms undergo a process called cellular differentiation where highly regulated modifications in gene expression produce morphological changes that characterize one cell type to another. B. subtilis is an important model system because during starvation, it is capable of forming highly resistant endospores to ensure its survival, including a spore envelope composed of polysaccharide and more than seventy coat proteins. Many of its spore coat proteins’ functions are still under research and in this study, four putative polysaccharide synthesis enzymes were analyzed for their properties and localization on the spore: YfnH, YpqP, YtcA, and YtcB. Through clumping assays, This study showed that YfnH knockout mutants readily clump which implied a possible change of the spore surface structure. Using dual labeling fluorescence microscopy, both YfnH-YFP and YpqP-CFP have very similar localization in the mother cell of B. subtilis. In addition, fluorescently tagged YtcA and YtcB also showed localization in the mother cell. The data shows a possible pattern of the polysaccharide synthesis enzymes adding sugars on the spore surface through an intermediate rather than directly.

The Impact of Phosphates on the Resolution of Self-assembled 3D DNA Crystals
Anna Lo, Chemistry
Sponsor: Professor Nadrian Seeman, Chemistry

It has been previously reported that a two-turn DNA tensegrity triangle with 2-nucleotide (nt) sticky ends (GA:TC) can self-assemble into rhombohedral three-dimensional crystals with a resolution of 4.9 Å at beam line NSLS-X25. The tensegrity triangle is a robust motif consisting of three double-helices organized in an over-and-under three-fold symmetric pattern. It has also been demonstrated that the addition of a phosphate group to the 5’ ends of each strand improved the resolution to 4.1 Å at the same beam line. In the present work, this study crystallized motifs with 3’ phosphate as well as both 3’ and 5’ phosphates on all the strands. X-ray diffraction analysis revealed that crystals with 3’ phosphates diffracted to 4.4 Å and those with both 3’ and 5’ phosphates had a resolution of 5.15 Å, comparable to crystals that were previously produced without any phosphates. The addition of phosphates on both ends of the strands did not adversely affect the integrity of the self-assembled structure. Results from our lab also indicated that motifs with 1-nt (G:C) sticky end gave crystals that diffracted to 3.4 Å at beam line NSLS-X25. In accordance with this result, the researchers also crystallized 1-nt motif with 3’ and 5’ phosphates (4.80 Å) and are currently conducting trials on combinations of 3’ phosphates on the different component strands. The further advancement of DNA technology can provide viable, controlled macro-structures that can act as scaffolding for smaller matter.

Ligand-gated Ion Channels Regulating Sleep
Charalambia Louka, Neural Science
Sponsor: Professor Nicholas Stavropoulos, Neuroscience and Physiology, NYU School of Medicine

Drosophila melanogaster is an organism whose sleep state shares key similarities with mammalian sleep and can be used to identify genes that function within the brain to promote the duration and consolidation of sleep. Although
studies in other organisms have shown that genetic mechanisms are important for sleep regulation, we are only just beginning to identify the essential genes in this process. The role of such genes can be studied with RNA interference (RNAi), which reduces the activity of specific genes within the brain of *Drosophila*. A large-scale RNAi screen was conducted to assay the functional requirement of genes encoding ligand-gated ion channels in sleep regulation by monitoring the sleep-wake cycles of flies with reduced gene activity. The research identified several conserved genes whose function in the brain is crucial for normal sleep. These preliminary findings suggest that neuronal excitation and inhibition via ion channels play a key role in regulating sleep. Additional research can further dissect the function of these genes in the fly brain, and in the long-term, provide a foundation for understanding how these evolutionarily conserved genes may function within other animals, including humans, to promote normal sleep.

**Unleashing the Power of General Purpose Graphic Processing Unit (GPGPU)**

*Yi Lu, Computer Science*

Sponsor: Professor Mohamed Zahran, Computer Science

Graphic Processing Unit (GPU) is first originated to handle images and videos. However, with the development of more sophisticated software applications, researchers and professionals start to explore GPU for executing more general applications, trying to leverage GPU’s massive data processing capability, hence the name, General Purpose Graphic Processing Units (GPGPU). In fact, the majority of world’s supercomputers are based on GPGPUs. Despite all that, using GPGPU in general purpose applications is far from an easy task and users often find out that the performance of applications running on GPGPUs are not as fast as they’ve expected. This research work proposes a way to make GPGPUs more generic. There are two main criteria when writing code for GPUs: correctness and performance. Most programmers can produce correct code and even show performance enhancement over sequential code. But getting more than 10x average performance enhancement is very hard and this is what we are trying to achieve. During the first phase of the research, kernel applications are categorized by measuring them using characteristics matrices and then using statistical tools to group kernel applications (A kernel is the code executed on GPU). During second phase, performance results are compared with theoretical peak performance reported on the GPU and analyze different key factors within each group that can explain the performance gap. Finally, at the third phase, a software tool is developed that can automatically combine the above two operations and give suggestions on optimizations. This tool can be a great help for the GPGPU user community. It allows the professional software developer to enhance application performance; it gives a lot of information to the compiler designers in order to further improve compiling process. In addition, hardware researchers can also benefit from this tool by understanding how the interaction of hardware with software affects the performance of applications that run on GPGPU.

**Analyzing Function and Structure of AP24 protein**

*Michael Lu, Biochemistry*

Sponsor: Professor John Spencer Evans, NYU College of Dentistry

AP24 is an intracellular matrix protein found in the nacre layer of the mollusk shell *H. rufescens*. Currently, there is not a lot of information on the 146 amino acid long protein. This study is designed to increase the scientific knowledge of AP24 and its’ role in calcite formation by conducting biomineralization assays. Data was collected using various biophysical instruments to learn about AP24’s molecular and physical characteristics. Some of the instruments used were Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM) and Circular Dichroism. It is seen that AP24 is an aggregation prone protein that increases particle aggregation when the protein has sugar modifications. It is also observed that with the addition of AP24 during calcite biomineralization, clusters of calcite crystal growth formed. Imaging shows that AP24 does not modify crystal growth but collects them. The data collected will serve as a control when conducting future combinatory protein experimentation on AP24 and another protein found on the nacre layer, AP7.

**Optimizing Brain Machine Interface: Information Across Cortical Layers**

*Caroline Luk, Neural Science*

Sponsor: Professor Bijan Pesaran, Neural Science

By directly connecting the brain to a motor neuroprosthetic, brain machine interfaces (BMIs) can functionally restore mobility in paralyzed patients. Successfully developing a brain machine interface requires the ability to accurately decode neural signals. As a result, neuroprostheses are commonly studied in awake behaving non-human primates; however, technical challenges prohibit the successful development of a fully functional brain machine interface. Specifically, the widespread use of fixed geometry microelectrodes prevents the study of neural signals across various depths of the motor cortices. Therefore, the neural and functional organizations across depths of the motor regions critical for operating prosthetic devices are not well known. The current study uses chronically implanted multielectrode arrays with moveable microelectrodes to sample neural activity at various depths within the premotor cortex. Results show that there is greater spiking activity at...
Alzheimer’s Disease (AD) is the sixth leading cause of death in the U.S. and is characterized by problems in memory, thinking, and behavior, which develop slowly over time. The neuropathology of AD is associated with tangles of abnormal accumulations of phosphorylated tau and the presence of amyloid beta (Aβ) in the parenchyma as plaques and vessels. A particular concern with immunization for AD is cerebral microhemorrhages associated with increased cerebral amyloid angiopathy (CAA). In this project, the innate immune system, via the Toll-like Receptors 9 (TLR9) that recognize unmethylated cytosine-guanosine-rich DNA oligonucleotides (CpG ODNs), is pursued as a way to effectively activate macrophages/microglia, dendritic cells, and B cells. The study explored this treatment through the transgenic mouse model SwDI, which expresses severe early-onset CAA. By using immunohistochemistry with different antibodies to visualize amyloid, microglia, astrocytes, and blood vessels, the study determined that there was a significant reduction in the total vascular and parenchymal amyloid burden. The research concluded that there was no associated neuroinflammation, such as increased astrocytosis and microgliosis, observed in CpG ODN treated mice. The CAA burden was lowered without increased microhemorrhages. This novel treatment approach can potentially serve as an effective, non-toxic therapeutic method for AD in human.

Characterization of Glycogen Phosphorylase from E. histolytica
Chelsea Marin, Psychology
Sponsor: Professor Burt Goldberg, Chemistry
Sponsor: Professor Daniel Eichinger, Microbiology, NYU School of Medicine

Entamoeba histolytica is an anaerobic parasitic protozoan that invades and resides in the lower digestive tract of humans, subsequently causing amebic dysentery. These parasites exist in two forms: cysts, composed of N-acetylglucosamine, and trophozoites (the form that causes invasive disease). Through the action of glycogen phosphorylase, the glucose that forms the cyst is rapidly released from the organism’s large glycogen stores. To date, neither of the E. histolytica glycogen phosphorylases has been characterized. In order to characterize these enzymes, researchers will start by cloning the gene into a bacterial vector, and then transform the recombinant plasmid into a bacterial expression system to express the protein. After expression, the study will then utilize a coupled spectrophotometric assay and determine Michaelis-Menten kinetics. The only drug currently available to treat amebic dysentery is metronidazole, an antibiotic intended to eliminate the invading trophozoites. Preliminary results have shown that E. histolytica glycogen phosphorylases are prokaryotic in origin (obtained by lateral gene transfer,) and thus inherently different from human counterparts. In line with these results, the research indicates that the metabolic pathway for glycogen phosphorylasis, specifically the glycogen phosphorylase enzyme, is a potential target for a new chemotherapeutic treatment.

The Role of Chinmo and BMP Signaling in Competition among Germline Stem Cells in the Adult Drosophila Testis
Shally Margolis, Biology
Sponsor: Professor Erika Bach, Biochemistry and Molecular Pharmacology, NYU School of Medicine

Adult stem cells are of great interest in medicine as they are essential for maintaining tissue homeostasis, but the mechanisms that allow stem cells to occupy their niche, the microenvironment that maintains them, are still poorly understood. The Drosophila testis is widely used to study these mechanisms, as its niche must maintain two distinct populations of stem cells: the germline stem cells (GSCs) and somatic cyst stem cells (CySCs). The JAK/STAT target gene chinmo is expressed in both GSCs and CySCs but plays distinct roles in each. While chinmo is required for the self-renewal of CySCs, we show here that a loss of chinmo does not perturb the self-renewal of GSCs, but rather, chinmo-deficient GSCs have a competitive advantage for occupying the niche. By generating heritably labeled chinmo-mutant GSC clones, we show that the ability of these cells to colonize the niche is achieved in part through Bone Morphogenetic Protein (BMP) signaling. Therefore, this study concluded that BMP signaling is normally inhibited by chinmo in GSCs in order to prevent takeover of the niche. Taken together, our results identify for the first time factors that endow male GSCs with a competitive advantage to occupy their niche in vivo.

Helicity Estimation of 2'-O-Methyl DNA/DNA Hybrid Duplex Using Two-Dimensional Arrays
Michael Mohsen, Chemistry
Sponsor: Professor Nadrian Seeman, Chemistry

DNA nanotechnology entails the use of nucleic acids to...
design and fabricate constructs of structural and topological importance as well as utile nanoscale devices. DNA is an apt candidate for this type of work because of its high level of programmability, a consequence of its base-pairing interactions and sticky ends. These properties allow us to attain a much greater level of control over the structure of matter on the nanoscale than could be attained previously. 2′-O-methyl DNA is a nucleic acid variant that assumes only the A-form, and is thought to have dominant helicity when hybridized with standard DNA. This has potential use in DNA nanotechnology: DNA can assume several forms, most commonly A-DNA and B-DNA, and the ability to control the helical form would introduce another feature which can be used to build more robust structures. However, many of the properties of this nucleic acid that would make it useful to DNA nanotechnology are as of yet uncharacterized. This research used a system composed of two double crossover (DX) tiles constructed from a hybrid of 2′-O-methyl-DNA and standard DNA,1 in order to determine the helicity of the hybrid. The resulting 2D arrays2 were visualized using atomic force microscopy (AFM) and the helical repeat of a 2′-O-methyl DNA/DNA hybrid duplex has been determined to be 12.1 base pairs per turn.

1 Lukeman, Mittal, Seeman, Chemical Communications, 2004, 15, 1694; Sherri Rinker, Yan Liu, Hao Yan, Chemical Communications, 2006, 25, 2675.

Divide and Concrete: An Alternative Approach to Concrete
Stephanie Morales, Environmental Studies Honors
Sponsor: Professor Mitchell Joachim, Gallatin School of Individualized Study

After water, concrete is the most used building material in the world with a legacy of historical use, from the Roman Pantheon to Louis Kahn’s Salk Institute. Concrete’s ubiquity is a result of its fire-resistant quality, its relative low cost, and its highly accessible components. But its production and use also represents 18% of anthropogenic greenhouse gas emissions. Concrete recycling and new materials, such as hemp-crete, wood-crete, and fly-ash concrete, exist today that can reduce resource depletion, energy use and waste in the concrete industry. This study investigates why these more environmentally friendly materials are not yet widely used. The research provides a comparison chart of 10 concrete alternatives on the market today and in the research stage, data from practicing architecture firms about their use of concrete alternatives, a case study of a well-known concrete building that could be rebuilt with concrete alternatives, and suggestions for further research to fill the gaps of knowledge in the field of concrete alternatives.

Designer Ecosystems: How Uncertainties in Ecological Restoration Objectives Could Lead to a Future of Human Designed Ecosystems
Jennifer Moskel, Environmental Studies
Sponsor: Professor Katie Schneider, Biology

Restoration ecology is an emerging field that has grown rapidly throughout the past three decades. Policymakers and the public have embraced restoration as an important solution for both mitigating and adapting to climate change. The field of restoration ecology, however, is currently at a theoretical crossroads, with significant uncertainties surrounding the motivations and objectives of ecological restoration projects. The lack of consensus is complicated by the dynamic nature of ecosystem interactions and by the emergence of novel ecosystems as a result of climate change. Without directed ethical and ecological guidelines for restoration in our rapidly changing and increasingly degraded environment, we run the risk of entering an era of “designer ecosystems” where politicians, ecologists, managers, and engineers shape ecosystems to benefit human interests without considering the broader ecological implications. This research presents a literature review of the current understanding and criticism of the three major methods used to determine restoration objectives, along with an analysis of the motivations driving restoration projects, and contributes to an ongoing discussion about the goals of restoration.

Characterization of αβ TCR:CD3 ectodomain Interactions through 2-Dimensional Mechanical Assays, Mutagenesis and Crosslinking
Vidushan Nadarajah, Biochemistry
Sponsor: Professor Michelle Krosggaard, Pathology, NYU School of Medicine

The T cell receptor on T cells interacts with the peptide-major histocompatibility complex on antigen presenting cells to trigger adaptive immune responses. This requires the coordinated activities of several TCR-associated molecules, which include the CD3γ, δ and ε chains which are noncovalently associated with the TCR. How pMHC ligand binding to a TCRαβ heterodimer subsequently initiates signaling via the CD3 molecules is currently unknown. Through NMR studies, possible regions of CD3 interaction on the 2B4 αβ TCR have been identified. Mutations have been introduced into these proposed interacting regions on the TCR and are being confirmed as sites of interaction through UV crosslinking experiments. To further determine the importance of these residues in CD3 interaction, cytokine production is being measured by ELISA assays and CD3 phosphorylation is being analyzed by western blotting. The binding affinity and kinetic rates of these mutated TCRs are being measured through two-dimensional mechanical-based assays which analyze the first seconds of contact and
measure force-dependent off-rates. Based on these studies, antibodies and other small molecules can be generated which can bind to the CD3 subunits to increase T cell sensitivity to foreign pathogens and cancers or bind to TCRs to decrease T cell activity in auto-immune diseases.

**Bioremoval of Heavy Metals from Wastewaters by Spent Tea Leaves**
Michelle Naïdo, Science Department, Borough of Manhattan Community College, CUNY
Rada-Mayya Kostadinova, Science Department, Borough of Manhattan Community College, CUNY
Gabriela Sikorska, Science Department, Borough of Manhattan Community College, CUNY
Sponsor: Professor Abel Navarro, Science Department, Borough of Manhattan Community College, CUNY

When mining industries do not discard residues properly, waste waters contaminated with heavy metals can negatively affect living environments. Spent peppermint (PM) and green tea (GT) leaves were used as potential adsorbents of copper (II) and zinc (II) ions in aqueous solutions. Equilibrium parameters such as acidity, mass of adsorbent, heavy metal concentration, presence of crowding agents and salinity were studied to optimize the adsorption in batch experiments at room temperature. Adsorbents were characterized by TGA, FTIR and SEM techniques and their surface and porosity determined by wet experiments. It has been shown by experimental data that adsorption of copper (II) is maximized at pH 7 using PM with an adsorbent mass of 100mg. On the other hand, copper (II) adsorption with GT is maximized at pH 6, with an optimum adsorbent mass of 100mg as well. Zinc (II) was greatly adsorbed at pH 6, with optimum adsorbent masses of 150mg and 200mg for PM and GT, respectively. Furthermore, the adsorbents also reached their highest adsorption in the absence of salts and crowding agents with maximum initial concentrations of copper (II) and zinc (II) of 100ppm and 110ppm, respectively. Adsorbent characterization indicates the presence of alcohol and carboxyl groups as the most relevant active sites on the adsorbents. Surface and porosity studies also evidence a good competitiveness with the conventional adsorbents.

**Vital Improvements to the Youth Risk Behavior Survey: A Logical Approach**
Bryan Nelson, Mathematics and Psychology
Sponsor: Aimee Nelson, BSN, RN; Duke University Medical Center

In Massachusetts, the Youth Risk Behavior Survey is administered every other year in randomly selected public high schools. In order to examine its effectiveness, students in the Hamilton-Wenham School District were tested for self-esteem levels, surveyed on dietary and exercise tendencies, completed a short-term memory test, and filled out a brief meal log. Participants showed a strong association between self-esteem and strictness of their diet as well as a strong association between the percentage of calories eaten from carbohydrates and short-term memory. In women, there were strong negative associations between self-esteem and exercise frequency and between the percentage of calories from sugar and short-term memory. Further, in men, there was a strong negative correlation between the percentage of calories from fat and short-term memory as well as a strong positive correlation between the percentage of calories from protein and short-term memory. Lastly, there was a statistically significant difference between the amount of sleep students in the Hamilton-Wenham School District get and what doctors recommend. There is now evidence that the Massachusetts Youth Risk Behavior Survey should also be testing to ensure that students are sleeping adequately, eating properly, and should more accurately assess their self-esteem.

**Creating Higher Resolution Self-Assembled Crystals from Larger DNA Motifs**
Sabrine Obbad, Chemistry
Sponsor: Professor Nadrian Seeman, Chemistry

Three-dimensional crystals can be self-assembled from a DNA tensegrity triangle via sticky end interactions. The symmetric triangle contains 3 unique strands combined in a 3:3:1 ratio: 3 crossover, 3 helical and 1 central strand. A 3D crystal based on a DNA tensegrity triangle with 2-turns per helical edge diffracted to 4.9 Å on beam line NSLS-X25. It was later reported that addition of 5'-phosphates to DNA strands improves the resolution of these crystals to 4.1 Å at NSLS-X25. Also, triangles with 1-nucleotide (nt) (G:C) sticky ends combined with 5'-phosphates yielded crystals that diffracted to 3.0 Å at the same beam line. A similar but larger motif with 3-helical turns per edge was studied. The research successfully crystallized motifs with 1-nt and 2-nt sticky ends and 5'-phosphates on all combinations of the crossover, helical and central strands. In addition, the sticky ends are flanked by a GC base pair, which improved resolution in the 2-turn motif. Improvement in resolution of these crystals could lead to this lattice being used as a framework to host macromolecular guests. Larger motifs with bigger cavity sizes, such as triangles with 3- and 4-helical turns per edge, are more suitable for this purpose.

**Mechanisms for Regulating Dorsoventral Gene Expression in Drosophila Embryogenesis**
Kevin O’Brien, Biology
Sponsor: Professor Christine Rushlow, Biology

Zelda (Zinc finger early Drosophila activator) is a key transcriptional activator of genes in Drosophila embryos.
Zelda (Zld) has been illustrated to target and bind to specific DNA sequences (CAGGTAG) designated as TAG sites (Liang et al., 2008). Once bound to these sites, Zld is then able to activate transcription of target genes in the early embryo. This research project tested the expression patterns of two Dorsal (Dl) target genes known to bind Zld—brinker (brk) and short gastrulation (sog)—in transgenic Drosophila embryos containing a modified number of TAG sites in their respective enhancer regions. The research hypothesized that as the number of Zld binding sites increases, the corresponding expression patterns of the genes increase/broaden. By performing in-situ hybridizations for 25 different transgenic Drosophila lines to examine their gene expression patterns, the hypothesis was supported. Examining the molecular mechanisms in Drosophila that regulate gene network activity can provide insights into the regulatory mechanisms within our own genome. In this way, we will be better equipped to control the abnormal gene activity in cancer, for instance, in the effort to assuage (or even preempt) its deleterious effects in affected individuals.

**Phosphate Biosorption by Novel Biomaterials: An Asset Against Eutrophication of Water Resources**

Karla Ortiz, Anthropology, Borough of Manhattan Community College, CUNY

Sponsor: Professor Abel Navarro, Department of Science, Borough of Manhattan Community College, CUNY

This study evaluates the potential of raw spent peppermint tea (PM), raw spent green tea (GT), powdered purple corn cob (PC) and yellow corn cob (YC) as adsorbents of phosphate as a model fertilizer. Phosphate and nitrate are responsible for the algal bloom (eutrophication) that has a negative impact in aquatic life. Batch experiments were carried out at room temperature as a function of pH, adsorbent dose, initial concentration of phosphate and the presence of salts and heavy metals. Maximum adsorption capacity was observed at pH 10 with a minimum mass of 50 and 75 mg for YC and PC, respectively. Equilibrium data was fitted to important isotherm theories, obtaining a qmax of 34 and 42 mg/g for YC and PC. Heavy metal experiments confirmed a strong electrostatic adsorption mechanism for PC and a mixed electrostatic/size affinity for YC. The use of raw PC and YC opens up new alternatives of inexpensive and environmentally friendly adsorbents for phosphate.

**Screen to Identify Which Rhythmically Expressed Genes are Involved in Circadian Rhythms in Drosophila**

Nushra Paracha, Biology

Sponsor: Professor Justin Blau, Biology

Circadian rhythms are 24-hour cycles of physiological activity regulated by an internal circadian clock. Drosophila melanogaster were used as a model organism in this screen and their circadian clock mechanisms are largely conserved with mammals. The clock is driven by a transcriptional feedback loop involving the genes Clock, cycle, timeless, and period. The screen started with a set of transcripts that exhibit rhythmic expression and tested which are involved in maintaining circadian rhythms. The research focused on transcripts that were expressed in the master circadian pacemaker neurons (LNvs) and were more highly expressed shortly after dawn than shortly after dusk. To test if these genes affect behavioral rhythms, their expression was reduced in LNvs using RNAi and their locomotor activity was measured.

**Development of an Improved Sensor for Detection of O-GlcNAc Signaling**

Anika Paradkar, Economics and Pre-Health Studies

Sponsor: Professor Lara Mahal, Chemistry

O-GlcNAcylation is a post-translational modification of cytoplasmic proteins with single sugar molecule O-linked β-N-acetylglucosamine (O-GlcNAc). O-GlcNAc cycles on proteins in a way analogous to phosphorylation, where addition or removal of the sugar determines the activity of the substrates it modifies. O-GlcNAc is an important signaling mechanism, which when deregulated, has shown to be associated with pathological states such as cancer,
type II diabetes, and cardiovascular and neurodegenerative diseases. Recent evidence points to a role of O-GlcNAc in a protective response employed by cells during stress, where increasing O-GlcNAc levels during early reperfusion improves functional recovery and attenuates tissue injury in cardiac muscles in ischemia reperfusion (IR) models. Other studies have shown that during ischemia reperfusion, O-GlcNAc plays a role in preservation of mitochondrial membrane integrity as well as regulation of autophagy, a degradation process triggered in IR. This illustrates the role of O-GlcNAc within subcellular components. Our lab developed a collection of FRET (Fluorescence Resonance Energy Transfer) based sensors for real time detection of O-GlcNAc activity. Limited space in mitochondria and other small compartments prompted us to develop a better version of the sensor by swapping the FRET acceptor. The improved version displayed increased dynamic range, allowing us to detect signals in compartments as small as mitochondria, providing the scientific community with the tools to study O-GlcNAc cycling in real time at a much higher resolution.

Self-Assembly of Asymmetric DNA Tensegrity Triangles Containing Both One and Two Nucleotide Sticky-Ends

Ian Passman, Biochemistry
Sijia Xu, Chemistry
Kendyl Barron, Chemistry
Anthony Osuala, Chemistry
Bumsoo Kim, Chemistry
Sponsor: Professor Nadrian Seeman, Chemistry

A DNA tensegrity triangle with two helical turns per edge was designed to self-assemble via sticky ends into a 3D DNA crystal. This motif was three-fold symmetric, tailed by two-nucleotide (nt) sticky ends (GA:TC) and diffracted to 4.9 Å at beam line NSLS-X25. The sticky ends were flanked by CG base pairs on one end and AT on the other. Recent results showed that sticky ends flanked by CG pairs on both ends yielded crystals that diffracted to a higher resolution (4.07 Å) at the same beam line. Moreover it was also shown that shorter sticky ends (1-nt G:C) improved the resolution to 3.0 Å at the same beam line. In the current work we used asymmetric 2-turn tensegrity triangle systems with a combination of 1- and 2-nt sticky ends, all flanked by CG base pairs. The sequences of the three helical domains of the motif were unique and this facilitated the use of different sticky ends on each edge of the triangle. Scaffolding of guests for macromolecular crystallization purposes is more valuable with a system that is not three-fold rotationally averaged.

Myocardial Noncompaction-Hypertrabeculation and Cell Proliferation Genes: A Final Common Pathway

Sebastian Pionbo, Chemistry and Biology
Sponsor: Professor Colin Phoon, Pediatrics, NYU School of Medicine

During embryonic development, the developing heart undergoes a compaction process to form a mature, multi-layered myocardium. In some instances, this compaction process is “arrested” and noncompaction-hypertrabeculation (NCHT) occurs. Currently, very little is known about the mechanisms underlying this key component of heart development. In this study, all genes implicated in NCHT were reviewed. Additionally, each gene’s relation to cardiomyocyte proliferation in both human and mouse models were examined while analyzing individual gene impacts on various human diseases. Through an extensive literature analysis, this research proposes a unifying mechanism for this developmental anomaly and hypothesize that NCHT is a result of abnormal cardiomyocyte proliferation. With this unifying mechanism in mind, possible genetic therapies for a multitude of diseases may be investigated in the future.

Role of S6K1 Mutations in Autism

Sudeep Pisipaty, Neural Science
Sponsor: Professor Eric Klann, Neural Science
Sponsor: Dr. Henry Colecraft, Physiology and Cellular Biophysics, Columbia University Medical Center

Protein function dictates cellular function and is a cornerstone of learning and memory in the brain. The control of protein function can occur at the mRNA translational level as well as in behavior and cognition. A major regulator of neural protein synthesis is mammalian target of rapamycin (mTOR) complex 1 (mTORC1). Studies have shown that mTORC1 is dysregulated in many forms of autism, including Fragile X Syndrome (FXS) and Tuberous Sclerosis Complex (TSC). An enzyme located downstream of mTORC1 is p70-S6 ribosomal Kinase 1 (S6K1) which is involved in the modulation of several steps of protein synthesis and is deregulated in FXS condition, and perhaps other major forms of autism. Manipulation of S6K1 thereby bears therapeutic value not only in FXS but also in autism broadly. Studying S6K1 mutants allow us to study small genetic variations (SNVs), some of which have been uncovered in autism to play a role in disease severity. These genetic variations include missense, nonsense or frame shift mutations. The goal of this research project is to characterize one SNV, which we have found in autistic patients in S6K1. This study mutagenized human S6K1 cDNA and introduced SNV of interest and expressed both wild-type (WT) and mutant (EQ) cDNA in HEK 293 cells. Following insulin stimulation to activate mTORC1-driven translation we found that the mutant was refractory to activation as measured...
from the phosphorylation of S6K1, eEF2, S6235, S6240. This research is currently investigating the impact of this mutation on basal levels of translation in HEK 293 cells. It is believed that further structure function analysis of this and other mutants of S6K1 prevalent in autistic individuals would be important to understand the variation of translation control in autism.

The Role of AthZIP1 in Nutrient Foraging

Teresa Qi, Biochemistry
Sponsor: Professor Gloria Coruzzi, Biology

The basic leucine zipper (bZIP) transcription factor (TF) family regulates multiple biological processes in response to internal and external cues in eukaryotic organisms. An Arabidopsis S1-group bZIP protein, AthZIP1, is known to affect the plant’s response to sugar availability and external stresses. This study aims to examine the role of AthZIP1 in systemic long distance signaling to coordinate nitrogen supply and demand for the entire plant. A split-root system has been used to investigate systemic signaling, by creating two primary roots in the same plant and exposing them to different nitrogen treatments. Plants generally respond by increasing root growth in nitrogen-rich regions. Transgenic Arabidopsis with AthZIP1 overexpression (35S:bZIP1) and AthZIP1 knockout (bzip1) were analyzed using the split-root system. The root architecture was analyzed using ImageJ to compare lateral root growth in different local environments for each genotype. The research suggests that the systemic response is not dependent on AthZIP1, however, the overall lateral root growth is repressed in 35S:bZIP1, but de-repressed in bzip1. Combined with an abnormal leaf morphology observed in 35S:bZIP1, the results reveal a link between bZIP1 expression and shoot/root development, possibly through the control of plant hormones like auxin.

Man to Monkey: Category Structure in Non-Human Primates

Michael Rabadi, Neural Science
Sponsor: Professor Lynne Kiorpes, Neural Science

Human adults effortlessly label and categorize objects. These categorical boundaries have previously been represented as a ‘perceptual-map’—a high-dimensional psychological map that is computed by comparing the likelihood of confusing objects. Recent studies have demonstrated that the high-dimensional population response of inferior temporal cortex neurons in the macaque may be similar to human-defined categories. However, the neurophysiological studies are conducted in monkey cortex and it remains unclear how monkeys categorize objects. In the current study, this study utilized an odd-man out task, where the subjects were asked to select the odd one of three stimuli, despite variations in the exemplars of the distractor category. The research generated perceptual-maps for two Macaca nemestrina that were trained on eight human-defined categories. While the monkeys performed similarly, there were some differences in category definitions. The monkeys’ performance on the task also differed from humans. By understanding the perceptual experiences of monkeys, it will help gain a stronger understanding of the computations that the brain employs for object recognition.

Recruitment of the Tumor Suppressor PALB2 to DNA by Human RPA

Ariana Rabinowitsch, Biochemistry
Sponsor: Professor James Borowiec, Biochemistry and Molecular Pharmacology, NYU School of Medicine

Human replication protein A (RPA) is an single stranded DNA (ssDNA) binding protein essential for DNA replication, recombination and repair. RPA phosphorylation in response to genotoxic stress has been shown to stimulate chromosomal DNA repair. It is thought that the phosphorylation cascade is vital for the recruitment of DNA repair factors such as the BRCA2/PALB2 complex to stalled or collapsed replication forks for RPA removal and subsequent RAD51 recruitment. PALB2 is known to complex with BRCA2 to direct it to DNA lesions as well as to directly bind ssDNA and RAD51. It has been shown that there is a direct interaction between PALB2 and RPA and that these proteins localize together in vivo. Through co-IP assays PALB2 has been found to interact with RPA at a region within the first 100 amino acids of the MRG15 binding domain of PALB2. The interaction between this domain referred to as MRG15.1 and a DNA binding domain on the N terminus of RPA1 is under analysis. The interaction sites between PALB2 and RPA can potentially be targeted by molecular inhibition to disrupt DNA repair in cancerous cells.

Effect of 5’-Phosphate on the Self-Assembly of 2-Turn Tensegrity Triangle 3D DNA Crystals

Sadeea Afreen Rahman, Biology
Munsath Ashraf, Biology
Meet Barot, Chemistry
Daniel Simon, Chemistry
Sean Kim, Chemistry
Victoria Zlotnikova, Chemistry
Sponsor: Professor Nadrian Seeman, Chemistry

The 2-turn symmetric tensegrity triangle motif can self-assemble into 3D crystals via sticky-ended cohesion. The triangle contains 3 unique strands combined in a 3:3:1 ratio: 3 crossover strands, 3 helical strands, and 1 central strand. The double helices are organized in an over-and-under three-fold symmetric pattern. Previously reported crystals diffracted to 4.9 Å at beam line NSLS-X25. The addition of 5’-phosphate (P) groups improved
Anorexia nervosa (AN) is an eating disorder characterized by self-imposed starvation and oftentimes excessive exercise, causing malnutrition and severe weight loss. As a result, there is a 10-20% mortality rate for patients afflicted with this disease, the highest of any psychiatric disorder. AN occurs more often in females than males (at about a 10:1 ratio), and the age of onset is almost always during adolescence. AN is associated with a very high rate of relapse, suggesting that there could be some lasting biological change in afflicted individuals. Activity-based anorexia (ABA) is a rodent model of AN in which animals are food-restricted and provided with running wheels. Paradoxically, the animals become hyperactive even throughout the limited period of food access. This research created a relapse paradigm by inducing ABA twice, with a short recovery period in between. Our study sought to investigate whether there is a change in the expression of the α4 subunit of the GABA receptor in area CA1 of the dorsal hippocampus of female pubertal mice following the induction of this relapse paradigm of ABA. Results could provide valuable insight into the etiology of this disorder (which is at present unknown) and lead to possible courses of treatment.

The Potential of Rooftop Hydroponic Farming in New York City
John-Peter Roberto, Environmental Studies
Sponsor: Professor Tyler Volk, Biology

Importing food contributes significantly to the carbon footprint of cities. While New York City has attempted to minimize these emissions by increasing its supply of locally grown food, most of these efforts have focused on using the city’s highly limited ground-level space. As a result, much of the city’s usable space remains unused, and rooftop space constitutes a significant proportion of the remaining space. Hydroponic greenhouses constitute an effective way to use this space for agriculture, as they can be placed on rooftops that cannot support the weight of soil-based agriculture, and also produce yields approximately 15 times greater than that of conventional urban farming. While their cost does constitute a barrier, Gotham Greens, a New York City-based operator of hydroponic greenhouses, has demonstrated the profitability of hydroponic greenhouses. This study looked to estimate available rooftop space by focusing on northern Brooklyn, an area noted for its abundance of rooftop space, and calculating the portion of this space that is suitable for hydroponic greenhouses. In addition, policy recommendations designed to encourage the proliferation of hydroponic greenhouses are suggested. The findings of this study present...
hydroponics as an underutilized yet highly suitable type of urban agriculture for New York City, as well as other large urban areas.

**Dissociating Two Forms of Altruism**

*Jonathan Rosenthal, Neural Science*

_Sponsor: Professor Jay Van Bavel, Psychology_

This study examines the nature of human altruism. Altruism refers to acting with the intention of benefiting another. However, little research has distinguished two forms altruism may take. In an empathic form, a person may act to please another based on what the other wants—for example, giving a gift that the recipient wants. In a paternalistic form, on the other hand, a giver may apply his or her own standards of what is best for the recipient—for example, parents buying a teenager an SAT calendar might not make the teenager happy, but reflects what the parents think will be best for the teenager. Researchers ran an experiment in which participants learned about the preferences of others and then made altruistic choices benefitting the others. This study examined the extent to which people used a recipient’s standards of happiness or their own standards of what is best. Additionally, this study tested whether individual differences in empathy predict the type of choices people make. This work contributes to psychological understanding of human altruism by dissociating two possible forms altruism can take.

**A Two-dimensional DNA Array Dictated by Signal Transmission**

*Jennifer Saad, Chemistry*

_Sponsor: Professor Nadrian Seeman, Chemistry_

A variety of DNA motifs have been used to self-assemble one-dimensional (1D) and two-dimensional (2D) lattices with controlled geometry. Padilla et al. demonstrated active self-assembly of DNA double crossover (DX) tiles using a signaling mechanism. In this process, information that a binding event has occurred between two tiles is transmitted to and activates a second binding site on the other end of the motif. Binding information is transmitted through toehold mediated strand displacement within these tiles. The described self-assembly process occurs in a linear fashion. Adleman et al. used the double-double crossover (DDX) complex to self-assemble high-density, planar structures that were doubly connected by two adjacent pairs of complementary sticky ends. In the present work, the signal transmission process to two dimensions using a DDX complex were also designed, while two different DDX tiles that alternate in a 2D array was extended. Signals can be introduced by the addition of internal loops and recognition sequences. Such tile-based structures can be used to implement algorithmic self-assembly which is a variation on DNA-based computing. Research in this field can open up possibilities to allow the construction of information-rich DNA tile arrays as scaffolds for more complex nanomaterial assemblies.


**DX Staged Self-Assembly**

*Amritpal Saini, Mathematics*

_Sponsor: Professor Nadrian Seeman, Chemistry_

This study demonstrated an efficient mechanism to construct hierarchical nanostructures using larger complexes rather than single tiles. Intermolecular contacts in self-assembled DNA structures are directed by sticky-ends. The theory behind this work is an algorithmic assembly process that requires $O(\log(N))$ bins for the fabrication of an object containing $N$ tiles. An experimental method was developed to produce linear assemblies of DNA double-crossover tiles of any desired length, $N$, using a set of six unique tiles. Each of the six tiles has varying sticky end sequences. Assembly of these structures through operator-controlled stages led to an experimentally feasible process of a proposed hierarchical self-assembly process. This study optimized the conditions and succeeded in constructing monomer and dimer tiles, and preliminary data for tetramer tiles was obtained. Assembly of these structures was characterized by non-denaturing polyacrylamide gel electrophoresis and the linear assemblies were visualized by atomic force microscopy. Results confirmed that tile assemblies of the desired lengths were formed. The research aimed to extend experimental design from a linear constraint to two-dimensional and, finally, three-dimensional structures. This mechanism can be used to fabricate a large range of discrete shapes from a relatively small set of unique DNA strands that can be reused in various different target structures.


**How is Adaptive Reuse Activated?: Tracing the Shift from Principle to Practice in the Brooklyn Navy Yard’s BLDG 92.**

*Nicolette Sanfilippo, Environmental Studies*

_Sponsor: Professor Anne Rademacher, Anthropology_

Ecologically mindful adaptive reuse is an opportunity for old and underutilized structures to preserve historical value and reduce economic and environmental costs associated with demolition and new construction. As urbanization and human populations are increasing globally, adaptive reuse is key design approach through which architects and urban planners can reduce resource consumption, mitigate...
harmful environmental impacts, and retain historical and cultural information embedded in urban infrastructure. BLDG 92 located in the Brooklyn Navy Yard is examined in this research as a case study for adaptive reuse. This research identifies the social, economic, and political factors that enabled adaptive reuse to take shape in BLDG 92 through a mixed methods approach that includes both a comprehensive literature review and interviews. The findings of this research map out the ways in which multiple forces compete and interact to reach the final implementation of adaptive reuse. This research also compares the fate of BLDG 92 to similar buildings in the Brooklyn Navy Yard. In doing so, it identifies factors that facilitate ecologically mindful adaptive reuse and ones that deter it, which will help guide future efforts in this field.

**How Does Spatial Attention Affect Spatial Resolution?**
*Christina Sauma, Psychology*

*Sponsor: Professor Marisa Carrasco, Psychology*

The visual system must interpret an overwhelming amount of information to make sense of a visual scene. One way we effortlessly understand our visual environment is by selectively allocating our attention to one location at a time. Spatial attention allows the visual system to ignore irrelevant information to focus on the relevant information and improves spatial resolution, that is, the ability to discriminate fine details. Two proposed mechanisms through which spatial attention modulates visual processing to enhance spatial resolution are gain enhancement and tuning. Spatial attention affects both the gain and tuning of the neuronal response; however, thus far there is no behavioral evidence for a spatial tuning mechanism. Participants completed a detection task in which spatial attention was manipulated by cueing either one (focused attention) or all (distributed attention) target locations. Performance improved when participants were cued to attend to one location, with spatial attention enhancing participants’ ability to detect the target. Furthermore, spatial attention increased participants’ spatial sensitivity (gain) and selectivity (tuning) to the target location, supporting the idea that spatial attention narrows spatial tuning around the target location to exclude surrounding noise. These results show behavioral evidence of both gain enhancement and spatial tuning with spatial attention.

**A Three-Dimensional Lattice Formed by a 3D Double-Crossover Motif**
*Eileen Shannon, Chemistry*
*Ho Jae Lee, Biochemistry*

*Sponsor: Professor Nadrian Seeman, Chemistry*

DNA’s ability to self-assemble into double stranded helices based on Watson-Crick base pairing allows it to be programmed to form immobile junctions and geometric structures. One such structure is the tensegrity triangle, which can self-assemble into a 3D crystal via sticky end interactions. The purpose of developing such systems is to provide a macromolecular scaffold, capable of binding, orienting and juxtaposing a variety of molecules. However, larger motifs, when crystallized, have been found to have lower resolutions—possibly due to the lack of rigidity that a short duplex provides. The research used a tensegrity triangle whose edges consisted of double-crossover (DX) DNA, a motif that forms two parallel, interlinked double helices in order to strengthen and stiffen DNA-based structures. Two flavors of the motifs were studied: one with 27 nucleotide pairs between junctions and the other with 28. The motif with 27 inter-junction nucleotide pairs diffracts to ~22 Å. The central strand in the motif with 28 inter-junction pairs completes 8 helical turns and is expected to give better quality crystals. Optimization of crystal growth conditions is underway to improve the resolution of the crystals.

**Formation of DNA Crystals Using Only Base Stacking Interactions**
*Eileen Shannon, Chemistry*
*Chirag Shah, Economics*
*Sean Kim, Chemistry*

*Sponsor: Professor Nadrian Seeman, Chemistry*

The field of DNA nanotechnology is built on the assumption that, by using sticky ends, it is possible to program DNA to form a predictable crystalline lattice. This study attempts to form crystals using only base-stacking stabilization, which minimizes the contact of hydrophobic surfaces with the aqueous medium. Sticky ends were removed from the two-turn tensegrity triangle motif and replaced the end duplexes of each arm with 5'-CG-3' (on each strand). A similar motif consisting of 5'-TG-3' paired with 5'-CA-3' and 5'-TC-3' paired with 5'-AG-3' duplex blunt arms was used in a previous experiment to study the effects of sticky-end length for crystal resolution, but did not form crystals. The 5'-GC-3' duplex was chosen for this experiment based on data showing that it provides the greatest stabilizing energy out of all possible nucleotide combinations. The crystals were set up in hanging drops under several different conditions and annealing protocols. By examining the effect that base stacking has on the crystallization of DNA, it may be possible to use both the stabilizing effects of base stacking and sticky-ended cohesion in order to create highly optimized DNA self-assembly structures.

**Anionic Peptoid Oligomers as Inhibitors of Calcium Phosphate Precipitation and Crystal Growth**
*Peter Smith, Chemistry*

*Sponsor: Professor Kent Kirshenbaum, Chemistry*

Salivary statherin and acidic proline-rich proteins are
Antimicrobial Cyclic Peptoids Inducing Transmembrane Pore Formation in Methicillin-Resistant *Staphylococcus aureus*

*Peter Smith, Chemistry*
*Sponsor: Professor Kent Kirshenbaum, Chemistry*

Antimicrobial peptides (AMPs) represent an important component in the innate immune system with broad and potent activity. This research investigated the use of N-substituted glycine oligomers, peptoids, as AMP mimics with similar antimicrobial potencies. The antimicrobial mechanism of action varies among different AMPs, but many penetrate bacterial cell membranes, leading to cell lysis. This study previously hypothesized that amphiphilic cyclic peptoids act by a similar pore formation mechanism against methicillin-resistant *Staphylococcus aureus* (MRSA). The research demonstrates that the antimicrobial activity of the peptoids is attenuated with the addition of a polyethylene glycol osmoprotectant to cell suspensions, indicating protection from a loss of osmotic balance. This decrease in antimicrobial activity is more significant with larger osmoprotectants, indicating that peptoids form pores with initial diameters greater than 2.0 nm. Peptoid induced membrane disruption observed by scanning electron microscopy resulted in a loss of membrane viability, as pore diameters expanded to greater than 200 nm after 24 h of treatment. These studies signify that cyclic peptoids exhibit a mechanism of action that rapidly targets the cell membrane of MRSA.

Reclaiming Past Mistakes: Trends in Uranium Contamination Cleanup on the Navajo Nation

*Preeth Srinivasaraghavan, Environmental Studies*
*Sponsor: Professor Colin Jerolmack, Environmental Studies*

From 1944–1986 the United States government extracted four million tons of uranium ore from the Navajo Nation. Mining companies employed Navajo miners without warning them of the potential deleterious health and environmental effects of radioactive contamination. After operations concluded, they left behind more than 500 abandoned mine claims with uranium, radium and other radionuclides. It was not until 2007, at the request of the U.S. House Committee on Oversight and Government Reform that an interagency effort was made to address the contamination. This research sought to identify the environmental factors that were correlated with successful cleanup of the Navajo Abandoned Mine Lands Reclamation Program (NAMLRP) and the Environmental Protection Agency (EPA) Five-Year Plan and offer predictions of imminent cleanup. Examining data from the NAMLRP and EPA categorized mine claims into three categories: completed, projected and ongoing. Results indicate that uranium production, proximity to mill sites, host rock and gamma radiation were correlated with completed cleanup at Skyline Mine. Cleanup is needed at two ongoing mines: Cameron and Cove Transfer Stations. This study highlights the history of environmental injustice on the Navajo Nation and offers a perspective on its future.

Bispectral Index Poor Predictor of Awareness with Potential for Recall in Patients Undergoing General Anesthesia

*Grace Tobin, Biology*
*Sponsor: Professor David Glick, Pritzker School of Medicine, University of Chicago*

Unintentional intraoperative awareness, or Anesthesia awareness (AA), though relatively rare, is significant complication of general anesthesia. AA is defined as the experience and explicit recall of sensory perceptions during surgery. Such episodes can be traumatic to patients, with up to about 70% subsequently developing post-traumatic stress disorder. Efforts to reduce the incidence of AA have resulted in the development of monitors designed to measure the depth of anesthesia. One such monitor is the bispectral index monitor (BIS), which processes EEG signals to produce a depth of sedation score. BIS scores are separate from any direct measurement of memory formation and retention. The purpose of this study was to determine whether BIS can measure a patient’s ability to form memories at varying points during general anesthesia, evidenced by post-operative recall of stimuli. BIS monitor readings were taken as words were presented to patients, and as specific preoperative events (such as transport to operating room) occurred. Patient recall
Long-term Durability and Dose Escalation Patterns in Infliximab Therapy for Psoriasis
Cindy Tsui, Computer Science
Sponsor: Professor Jacob Levitt, Dermatology, Icahn School of Medicine

Psoriasis is a chronic, inflammatory skin disease affecting 3% of the population. Dosing of infliximab medication for psoriasis is FDA-approved at 5mg/kg, administered at weeks 0, 2, 6, and then every 8 weeks. Data reveals the prevailing reason for discontinuation of infliximab treatment to be loss of clinical response, resulting from human anti-chimeric antibodies (HACAs). Patients who develop HACAs require dose intensification to optimize the treatment regimen, with the dosage increased to 10mg/kg up to every 4 weeks. Furthermore, concomitant immunosuppressive medications, e.g. methotrexate, lead to decreased HACA detection in the serum of psoriasis patients, theoretically extending infliximab durability. Since its approval for Crohn’s disease and rheumatoid arthritis in the 1990s, infliximab has proven safe at these intensified doses. However, health insurance companies often reject this dosing regimen due to lack of data. While dose escalation is well documented for other diseases, limited studies address this practice in psoriasis. This research shows that infliximab dose escalation to be well tolerated in our patient cohort and confirm that concurrent methotrexate is associated with significantly improved maintenance of clinical response. Our experience with infliximab regimens, higher than recommended in the package insert, supports the efficacy and safety of dose escalation in treating psoriasis.

Analysis of W63G EmrE’s Binding Affinity to TPP+ and Erythromycin Using ITC and Tryptophan Fluorescence Assay
Abhinay Tumati, Chemistry
Sponsor: Professor Nathaniel Traaseth, Chemistry

There is a vast amount of structural information on soluble proteins but much remains to be discovered about membrane proteins. EmrE is a 110-residue membrane protein, which effluxes drugs out of *Escherichia coli* using proton-coupled active transport. Prior analyses on WT EmrE using isothermal titration calorimetry and NMR studies have shown the protein to bind and expunge several quaternary ammonium compounds (i.e. ethidium bromide). In order to further understand EmrE’s affinity to particular drugs, this study used single-site mutagenesis to replace the 63rd tryptophan residue of EmrE with a less sterically hindered glycine residue. The mutant protein’s growth was induced in BL21 *E. coli* cells using 1mM IPTG. After purifying the protein, we used ITC and tryptophan fluorescence assays in order to determine W63G’s ability to bind TPP+ and Erythromycin. Both ITC and fluorescence assay data showed that the mutated protein had low binding affinity to both ligands. From these results, we anticipate that the mutation of the highly conserved tryptophan residue changes the chemical makeup of EmrE’s active site. By analyzing how EmrE recognizes and transports antibiotics, we hope to combat various antibiotic resistance diseases by targeting specific protein residues that are integral in removing drugs from a pathogen.

Possible Source
Adrian Vatchinsky, Physics
Sponsor: Sarah Burke-Spolaor, NASA JPL, California Institute of Technology
Sponsor: Joseph Lazio, NASA JPL, California Institute of Technology

This study presents a search for fast radio bursts (FRBs) in legacy VLA Archival data from June 2003 at 330MHz, motivated by the recently published 2013 Thornton et al. paper on the discovery of four millisecond long FRBs in archival Parkes Observatory data. The two candidates in this study do not exhibit any periodic behavior and are uncorrelated with known nearby radio emitting sources. The candidates are also located within a few arcsecond of cataloged galaxies. In both cases, the data was split in frequency and confirmed that the candidates are visible in both frequency sub-bands. Furthermore, this study used a threshold of 6.5 standard deviations indicating these candidates are unlikely to be background noise or instrumental error. If these two candidates prove to be FRBs they can serve as evidence that FRBs are not localized or somehow related to the Parkes observatory from which all FRB have been reported so far and should motivate further studies of archival data to better understand the distribution of these events. This research was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.
Validation of Ts-Biotag as a Novel Transgenic Mouse for Non Invasive Multimodal Imaging of Tumor Angiogenesis on a Subcutaneous Melanoma Tumor Model

Eugenia Volkova, Chemistry/Chemical Engineering and Physics
Sponsor: Professor Daniel Turnbull, Structural Biology and Radiology, NYU School of Medicine

Angiogenesis is the development of new blood vessels from pre-existing ones and represents a crucial process for both normal development and disease progression. Multiple studies have correlated the degree of tumor angiogenesis with tumor grade, malignancy, and prognosis. Furthermore, visualizing and quantifying tumor angiogenesis represents a powerful approach for early cancer detection and monitoring disease progression and patient response to anti-angiogenic therapies. Therefore, there is a clear need for sensitive in vivo imaging modalities allowing for non-invasive, longitudinal characterization of tumor neovascularity and its relationship to disease progression. Moreover, vascular targeted imaging offers the potential to address specific molecular and functional abnormalities underlying the process of tumor development. Ts-Biotag transgenic mice generated by Bartelle et al. effectively biotinylate endothelial cell membranes expressing Tie2, one of the main biomarkers of actively developing vessels. In the current study, non-invasive imaging modalities: infrared imaging (NIR), ultrasound (US), contrast-enhanced magnetic resonance imaging (MRI) and fluorescence microscopy were used to validate the Ts-Biotag model as a novel approach to targeted imaging of tumor angiogenesis in a melanoma mouse model. Image data sets were assessed for selective labelling of melanoma tumor neovascularisation by immunohistochemical analysis of CD31, an endothelial cell marker, and its co-localization with Tie2 expression; to specifically identify actively developing vessels. Tumor vessels were also characterized based on morphology, location, and density at different tumor stages. Phenotypic and histological analysis of the Ts-Biotag model indicates the ability to acquire diverse spatio-temporal information on tumor angiogenesis via multimodal imaging. These results also suggest that Ts-Biotag mice can be utilized as a robust model for future preclinical studies of tumor angiogenesis in a variety of tumor models, including in vivo analyses of the effects of novel and existing anti-angiogenic cancer therapies.


Mathematics of Genome Architecture

Gregory Vurture, Mathematics
Sponsor: Dr. Michael Schatz, Quantitative Biology, Cold Spring Harbor Laboratory

Although the genomes of a few key model organisms have been sequenced, the vast majority of species in the world have not. Without an established reference sequence, the most basic properties of their genome architectures will be unknown, including their size, heterozygosity, and repeat composition. These properties can be coarsely estimated at great effort and expense using various experimental approaches, but today the DNA of an organism can be directly measured at low cost using Illumina short read sequencing. Algorithms exist that attempt to reconstruct the full length sequence from these data, but they are not always accurate or complete if the genome is too complex. To address this, this research developed a reference free quantitative model from which we can infer characteristics of complex genomes such as size, heterozygosity, and ploidy. This research confirmed the validity of the algorithm with dozens of simulated and real genomes in which the true values are known. This method was also applied to several large novel plant genomes to directly contribute to our understanding of them. All of the software will be made available open-source for researchers across the world to use.

Ubiquitin Proteomics Unveils Global Mechanism of Stress Response in Saccharomyces cerevisiae

Aditi Vyas, Mathematics
Sponsor: Professor Christine Vogel, Biology

A common feature of stress is the generation of damaged proteins that need to be degraded. Ubiquitination, which has been suggested as a sensor of stress, is involved in the ubiquitin-proteasome pathway that is responsible for degrading damaged proteins. Ubiquitin (Ub) is a highly sensitive molecule, and its levels start to increase when the cell undergoes stress. Our results show that there is a common ubiquitination response to different types of cellular stress. Yeast cells (Saccharomyces cerevisiae) were subjected to heat shock, osmotic stress, and oxidative stress, and the Ub response over time was studied. The global Ub levels show a distinctive increase in response to all three stressors. Polyubiquitin chains are formed through the conjunction of ubiquitin molecules to each other. The subtype of K48-linked polyubiquitin is considered to be canonically involved in the ubiquitin-proteasome pathway. In contrast, the K63-linked subtype is not linked to degradation. K48-linked polyubiquitin levels showed a marked increase under stress, while the K63-linked polyubiquitin showed no response to stress. Finding a common response to stress in the cell will have useful medical and pharmaceutical application by providing a single overarching mechanism as a target, thus reducing the complexity of treatments.
Copy Number Variation of Transposable Elements in Trichomonas vaginalis
Elisha Wang, Biology
Sponsor: Professor Jane Carlton, Biology

Transposable elements (TEs) are pieces of movable DNA which have been shown to have significant implications for genetic variation and adaptation in different species. The Maverick TE family is a large DNA transposable element that is abundant in the protist Trichomonas vaginalis, a sexually transmitted parasite that infects the vagina of women and the urethral tract in men. Although the T. vaginalis genome is known to contain a high number of TEs, how these influence T. vaginalis genome evolution and certain parasite traits remains unknown. This project explores the copy number variation (CNV) of Maverick TEs in the genomes of T. vaginalis isolates from different geographical regions and with varying levels of drug (metronidazole) resistance. This study used 38 isolates from 6 different regions and qPCR analysis to test if variation in Maverick copy number has implications for phenotypic differences such as parasite cell size and drug sensitivity. These phenotypic differences may have resulted from parasite adaptation to its host environment. Establishment of a correlation between TE abundance and phenotype may provide insight to possible mechanisms of drug resistance and virulence in T. vaginalis.

Localization of GABA Receptors in Response to Anorexia Nervosa
Jia-Yi Wang, Neural Science
Sponsor: Professor Chiye Aoki, Neural Science

Anorexia nervosa (AN) is an eating disorder with high relapse and mortality rates. It also has a high comorbidity rate with anxiety disorders such that the existence of an anxiety disorder in adolescents constitutes a greater risk factor for the development of AN. Expression of extrasynaptic α4β2δ GABA receptors (GABARs) in pyramidal neurons of the hippocampus has been shown to be affected in a rodent model of AN known as activity-based anorexia (ABA). This model emulates the symptoms of extreme weight loss and hyperactivity seen in human AN patients. In addition to the extrasynaptic α4β2δ GABARs, the expression of synapatic α1β2γ GABARs and GABAergic innervation on pyramidal cells may also be affected by ABA. Electron microscopy with immunocytochemistry was used so that differentiating between membranous and intracellular localization of GABAA receptor subunits is possible. Based on the data, there was no significant difference in α1 subunit expression or GABAergic innervation on pyramidal neurons after undergoing ABA suggesting that the effect of ABA is specific to extrasynaptic α4β2δ GABA receptors. Ultimately, understanding the fluctuations of GABAA receptors and GABAergic innervation that occur as result of AN may lead to better pharmacological treatments for anorexic patients.

Simulation Shapes Episodic Memories: An Investigation of the Interdependence between Motor and Memory Systems
Alyse Wexler, Neural Science
Sponsor: Professor Xing Tian, Psychology

Motor and memory systems are essential to the formation of our mental representations of the world. While previous studies have demonstrated the way in which motor systems and memory systems contribute to these representations independently, little is known about the interaction of these two systems. This study explored the potential interdependence between motor and memory systems, utilizing motor simulation to induce internal motor operations. Through a novel paradigm which allowed for the objective quantification and manipulation of mental imagery performance, the research tested the hypothesis that better motor simulation performance would shape stronger episodic memories. The research findings highlight that motor simulation performance does interact with episodic memory; however, a dissociation between motor simulation’s effects on two different forms of memory—familiarity and recollection—indicate that motor simulation does not always have a facilitating effect on memory, but that the conditions of motor simulation and memory’s relationship are memory-type specific. The results also highlight the complexity of this potential interdependence between motor simulation and episodic memory, calling for further exploration of the processes underlying this relationship.

Self-Assembly of 3D DNA Crystals Using Two-Turn Tensegrity Triangles with CG Pairs Flanking the Sticky-Ends
Joe Wu, Chemistry
Sponsor: Professor Nadrian Seeman, Chemistry

A DNA tensegrity triangle motif, consisting of three helices whose axes are directed along linearly independent vectors, self-assembles via sticky ended interactions to form a 3D lattice. The length of the sticky ends used in this design was two nucleotides (nt) and produced crystals with a limited diffraction of 4.9 Å at NSLS-X25. This structure was three-fold rotationally averaged by sticky-end selection and larger versions are expected to be useful for scaffolding macromolecules. Recent results show that the sticky-end sequence has an impact on the resolution of the crystals: a 2-nt sticky-end sequence AA:TT had a better resolution (4.75 Å) compared to the previously reported GA:TC sticky end at NSLS-X25 beam line. In this context, researchers have designed and crystallized a two-turn
symmetric tensegrity triangle having a CG pair flanking the sticky-end region. X-ray diffraction studies revealed that the resolution for that structure to be 4.07 Å at NSLS-X25 beam line. Experiments are currently being conducted on a two-turn asymmetric tensegrity triangle also having a CG pair flanking the sticky-end region. This application will probably be most usefully realized with scaffolding that is not three-fold rotationally averaged.


Localization of SMN Protein in the Axonal Compartment of Cranial and Spinal Motor Neurons

Ilona Yagudayeva, Biology
Sponsor: Professor Esteban Mazzoni, Biology

Spinal Muscular Atrophy (SMA) is a neurodegenerative disease characterized by low levels of Survival Motor Neuron (SMN) protein. Though SMN is ubiquitously expressed, SMA primarily affects spinal motor neurons (sMNs), suggesting that the non-nuclear activity of SMN protein in the axonal compartment of sMNs is key to understanding their sensitivity to low levels of the protein. While spinal motor neurons degenerate during SMA, a subset of cranial motor neurons (cMNs) remains intact. Therefore, this study hypothesized that cranial motor neurons are resistant to low levels of SMN protein because they accumulate higher levels of SMN protein in the axonal compartment than do spinal motor neurons. To investigate this hypothesis, this study set out to quantify localization of SMN protein in the axons of cMNs and sMNs, which exhibit variable sensitivity to low levels of the protein. To quantify localization of SMN protein in the axonal compartment of cMNs and sMNs, a highly efficient programming system was utilized to generate pure cMN and pure sMN populations in vitro from embryonic stem cells (ESC). ESC can be differentiated into motor neurons by the activity of three transcription factors. The expression of Ngn2-Is1-Phox2a (NIP factors) and Ngn2-Is1-Lhx3 (NIL factors) programs spinal and cranial motor neurons, respectively (Mazzoni, E.O., et al.). This study performed immunocytochemistry on cMNs (programmed with NIP factors) and sMNs (programmed with NIL factors), staining for Beta-III-tubulin, expressed with NIL factors, staining for Beta-III-tubulin, expressed in all neurons, to visualize the entirety of the cell and for SMN, to visualize the localization of SMN protein in the axons of the two subtypes of motor neuron. After analysis of three biological replicates, this study found that there is no significant difference in SMN protein localization in the axonal compartment of cranial and spinal motor neurons under the conditions of this experiment. The results suggest that the intrinsic resistance of cranial motor neurons to neurodegeneration may not depend on localization of SMN protein in the axon. However, during the course of these experiments the motor neurons were cultured without their cellular partners, preventing them from acquiring complete cellular maturity. Novel culture methods are currently being developed and will aid in allowing motor neurons to make synaptic connections with muscle, which will enable the study of mature sMNs and cMNs. This is important to investigate because understanding cMNs intrinsic resistance to neurodegeneration is key to understanding and treating SMA and other similar neurodegenerative diseases.

The Cis-Regulatory Logic Controlling Defective Proventriculus (dve), a Critical Regulator of Rhodopsin Expression in the Drosophila Eye

Jenny Yan, Biology
Sponsor: Professor Claude Desplan, Biology

Sensory system development requires regulatory networks that govern differential receptor gene expression, allowing organisms to react to environmental cues. The transcription factor Defective Proventriculus (Dve) is crucial for the expression of light-detecting Rhodopsins in the Drosophila eye. Upstream transcription factors Orthodenticle (Otd), Spalt (Sal), and Spineless (Ss) tightly regulate dve expression, yet how these inputs are integrated remains unclear. This study aims to elucidate the cis-regulatory logic by (1) identifying the cis-regulatory elements controlling dve, (2) determining whether Otd, Sal, and Ss regulate these elements, and (3) determining the temporal dynamics of these regulatory inputs. The dve reporter gene constructs were generated covering the dve locus. Two constructs exhibiting strong reporter expression in photoreceptors were found. The regulation of these elements was characterized by crossing reporter lines into mutant or ectopic expression flies for Otd, Sal, and Ss. This research found that Otd and Sal regulate one construct, while Otd, Sal, and Ss regulate the other. By observing reporter expression at distinct stages of fly development (larva, pupa, and adult), the research also determined that the regulation of these elements vary temporally. Understanding the mechanism behind dve regulation may provide insight into developmental processes of other species sharing the general mechanism in cell-fate determination.

Study of L-cystine Crystal Growth and Step Density in Presence of Proteins as Macromolecular Additives

Anthony Yu, Chemistry
Sponsor: Professor Michael Ward, Chemistry

L-cystine is the primary crystalline component of L-cystine kidney stone growth, a hereditary disorder that results from mutation in the SLC3A1 or the SL7A9 gene. Proteins and bio-macromolecules are known to play important roles in biomineralization, controlling nucleation,
growth morphology, and surface adhesion of crystals. Common urinary proteins (bovine osteopontin, human serum albumin, apo-transferrin, Tamm-Horsefall protein, lysozyme, and chondroitin sulfate) were used as additives to study L-cystine crystal growth and crystal step spacing. Initial SEM images revealed a propensity for the urinary proteins to adsorb on the (001) face of L-cystine crystals. In situ AFM growth experiments performed on hexagonal plate crystals exhibited a decrease in step velocity with the addition of proteins at the nanomolar and micromolar scales. Micromolar concentrations of chondroitin sulfate and apo-transferrin additives showed a clear decrease in step densities, while nanomolar concentrations did not. This distinction between nanomolar and micromolar concentrations suggests a surface energy threshold to change the step’s critical length that is only crossed with sufficient protein incorporation. These studies exemplify various crystal growth interactions under normal urinary conditions, which can provide a deeper understanding of L-cystine stone formation at a near molecular level. This understanding could eventually lead to alternative forms of kidney stone inhibition that may eliminate inefficiency and negative side effects of current treatments.

**Voluntary Exercise During Adolescence Increases Excitability of Hippocampal Neurons Through Alterations of the GABAergic System**

Irene Yu, Neural Science

**Sponsor:** Dr. Chiye Aoki, Neural Science

Activity-based anorexia (ABA) is an animal model for Anorexia nervosa (AN), an eating disorder occurring most frequently in adolescent females. Food restriction and voluntary exercise are two components crucial to inducing ABA and are hallmarks of AN. Animals vulnerable to ABA exhibit reduced GABAergic inhibition, but how exercise and food restriction interact to cause this remains unknown. To investigate the isolated effects of the exercise component on the hippocampal GABAergic system, adolescent female rats were divided into exercise-only (EX, running wheel access) and control (CON, no wheel access) groups, with no food restriction. The brain tissues of these animals were labeled for a GABA production catalyst (GAD) to visualize GABAergic synapses under an electron microscope. Quantitative analysis of cell body and dendrite profiles in hippocampal area CA1 shows that the EX group has a significantly lower ratio of GAD contact than the CON group. Findings of the study suggest that while the exercise component of ABA reduces GABAergic innervation, food restriction may be more influential. Furthermore, decreasing GABAergic innervation increases pyramidal cell excitability and could increase anxiety but improve cognitive functions (e.g. memory) that rely on pyramidal cells. Further investigation is warranted before promoting exercise as a non-pharmacological treatment for anxiety disorders.

**BET Proteins in Embryonic Stem Cell Pluripotency and Maintenance**

**Stephanie Yuen, Biology**

**Sponsor:** Professor Eva Hernando-Monge, Pathology, NYU School of Medicine

Bromodomains and extra-terminal (BET) proteins are known to mediate interactions between histone modifications and transcriptional machinery. This research examined the role of BET proteins in the regulation of embryonic stem cell (ESC) identity through the use of potent, small-molecule inhibitors that displace BET proteins from the chromatin. By inhibiting BET proteins, this study found that ESC properties, such as the ability to form distinct colonies, embryoid bodies, and ability to be continually passaged were disrupted and undermined. Expression levels of key pluripotency genes were reduced while genes associated with neuro-ectodermal lineage were up-regulated. When investigating the contribution of individual members of the BET protein family, it was discovered that only BRD4 depletion phenocopied the effects of BET inhibition on ESC colonies and gene expression. BRD4 maintains the transcription of core stem cell genes such as OCT4 and PRDM14 by occupying their super-enhancers (SEs), large regulatory elements associated with key cell identity genes, and recruiting to them CDK9, the catalytic subunit of the transcriptional elongation complex pTEFb. Our findings demonstrate the functional role of BET proteins in stem cell pluripotency and maintenance, which can be used in regenerative medicine and advance the field of BRD4-governed transcriptional networks.

**Modeling the Thermodynamics and Mechanics of Filament Assembly**

Chengzhao “Richard” Zhang, Physics, Mathematics

**Sponsor:** Dr. Gregory Grason, Department of Polymer Science and Engineering, University of Massachusetts Amherst, Amherst, MA

**Sponsor:** Professor Alexander Grosberg, Physics

Biofilm filament assembly is a process by which chiral filaments (collagen and DNA molecules) assemble into rope-like bundles. While the general phenomenon of filament assembly has been observed, its underlying physical mechanism is not sufficiently understood, specifically in regard to the interplay between helical geometry of filaments and inter filament binding. In this project a coarse-grained model of a pair of cross-linked helical filaments was developed, whose optimal structure and free energy landscape are determined using Monte Carlo method. Phase diagram analysis is utilized to investigate how the optimal structure
of the assemblies depend on the key parameters, including the helical geometry of filaments as well as stiffness of the crosslinkers and the filaments. The results of this study have shown that the relative stiffness of the crosslinkers to filament torsional mechanics regulates the “cooperativity” of cross-linking bonding. Through this project researchers hope to gain better understanding of how individual chiral filaments assemble themselves into their self-twisted, coiled coil morphology.

Characterization of Endometrial Cancer Stem Cell Niche and Radioresistance of Endometrioid Adenocarcinoma
Michael Zhang, Computer Science
Sponsor: Professor Christopher Lange, SUNY Downstate Medical Center

Cancer Stem Cells (CSC) is responsible for the maintenance and growth of the tumor, making them excellent targets for cancer treatment. This new knowledge has necessitated the development of a model of the CSC microenvironment or niche. The study of the niche may help identify new treatment targets for various cancers and provide insight into tumorigenesis. To recreate an in vivo like niche, this study used the Hybrid Spheroid Assay (HSA), a 3D feeder based culture that does not utilize any stem cell specific growth factors to induce or maintain stemness. In this study, the HAS was used to recreate the CSC niche of endometrioid adenocarcinoma using tumor samples from patients. This study used immunocytochemical analysis to visualize the CSC architecture before and after radiation treatment. The research found that endometrial CSCs are of mesenchymal origin, contrary to the previous notion that they are of epithelial origin. This fact alone makes endometrial CSCs resistant to radiation and also calls into question whether this cancer has been wrongly classified. The HSA yields good potential for personalized medicine as each patient’s CSCs can be cultured and tested for chemotherapy or radiation sensitivity, thereby reducing side effects and improving quality of life for the patient.