Thank You

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- Trio Program
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Participants also wish to acknowledge the support of their research mentors, many of whom have contributed funding from their grants to support undergraduate research experiences.
## Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 a.m. – 3:00 p.m.</td>
<td><strong>American Cultural Studies Senior Thesis Colloquium</strong></td>
<td>Laboratory Sciences, 301</td>
</tr>
<tr>
<td>12:00 p.m.</td>
<td><strong>Welcome Remarks</strong></td>
<td>Laboratory Sciences, 300</td>
</tr>
<tr>
<td></td>
<td>Dean Joy Kiefer</td>
<td></td>
</tr>
<tr>
<td>12:05 p.m.</td>
<td><strong>Introduction of Keynote Speaker and Presentation of the Chancellor’s Award for Outstanding Contributions to Undergraduate Research</strong></td>
<td>Laboratory Sciences, 300</td>
</tr>
<tr>
<td></td>
<td>Chancellor Mark Wrighton</td>
<td></td>
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<tr>
<td>12:10 p.m.</td>
<td><strong>Keynote Address:</strong></td>
<td>Laboratory Sciences, 300</td>
</tr>
<tr>
<td></td>
<td>Professor Joseph Loewenstein</td>
<td></td>
</tr>
<tr>
<td>12:30 p.m.</td>
<td><strong>Diamond Skinner</strong></td>
<td>Laboratory Sciences, 300</td>
</tr>
<tr>
<td></td>
<td>“Now or Never: The Current State of Kenyan Theatre”</td>
<td></td>
</tr>
<tr>
<td>12:45 p.m.</td>
<td><strong>Molly Moog</strong></td>
<td>Laboratory Sciences, 300</td>
</tr>
<tr>
<td></td>
<td>“Art Actions and Airmail Paintings: Art during the Pinochet Regime in Chile, 1973-1989”</td>
<td></td>
</tr>
<tr>
<td>1:00 p.m. – 4:00 p.m.</td>
<td><strong>History Department Senior Honors Thesis Colloquium</strong></td>
<td>Laboratory Sciences, 250</td>
</tr>
<tr>
<td>1:00 p.m. – 5:00 p.m.</td>
<td><strong>Washington University International Review Conference on Migration and Identity</strong></td>
<td>Laboratory Sciences, 201 and 300</td>
</tr>
<tr>
<td>1:30 p.m. – 3:30 p.m.</td>
<td><strong>Poster Session</strong></td>
<td>Laboratory Sciences Building</td>
</tr>
</tbody>
</table>
# American Culture Studies Research Colloquium

Saturday, April 28, 2012  
10:00 a.m. – 3:00 p.m.  
Laboratory Sciences, Room 301  
Program Chair: Randall Calvert

## Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Presenter</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 a.m.</td>
<td><strong>Aaron Kacel</strong></td>
<td>“Men, Motherhood and Money: Changes in the Female Television Attorney from the 1990s to the 2000s</td>
</tr>
<tr>
<td>10:20 a.m.</td>
<td><strong>Rebecca Craig</strong></td>
<td>“Religiosity and Politics”</td>
</tr>
<tr>
<td>10:40 a.m.</td>
<td><strong>Genevieve Hay</strong></td>
<td>“Sharing Research, Sharing Methods: Creating a Digital Community for AMCS Students”</td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td><strong>Sarah Croop</strong></td>
<td>“Humachination”</td>
</tr>
<tr>
<td>11:20 a.m.</td>
<td>Break for Lunch</td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.</td>
<td><strong>Keynote Address</strong></td>
<td></td>
</tr>
<tr>
<td>1:00 p.m.</td>
<td><strong>Eric Hamblett, William Paulsen, Emma Tyler, &amp; Michelle Wiles (Course Project)</strong></td>
<td>“History of the St. Louis Jeff VanderLou Neighborhood and American Metropolitan Development”</td>
</tr>
<tr>
<td>1:20 p.m.</td>
<td><strong>Lucas Delort, Yad Nai, &amp; Alyssa Stein (Course Project)</strong></td>
<td>“Living on the Boundary: 2800 Cass Avenue in a Period and Place of Transition”</td>
</tr>
<tr>
<td>1:40 p.m.</td>
<td><strong>Andrea Hutner</strong></td>
<td>“The Real, the Unreal, and the Hyperreal: Disneyland and its Distorted View of Cold War Reality”</td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td><strong>Christopher George</strong></td>
<td>“Redefining American Fashion: How Modern Cultural Trends Launched a New Fashion”</td>
</tr>
<tr>
<td>2:20 p.m.</td>
<td><strong>Christopher McLamb</strong></td>
<td>“My President is Black: Hip-Hop Constructs a Political Role in 2008”</td>
</tr>
</tbody>
</table>
UNDERGRADUATE HISTORY HONORS SYMPOSIUM
Saturday, April 28, 2012
1:00 p.m. – 4:00 p.m.
Laboratory Sciences, Room 250
Program Chair: Mark Gregory Pegg, Professor of History

AGENDA

1:00 p.m. - 1:50 p.m.

ISAAC AMON: “For the Benefit of Their Souls: Inquisitors and Conversos after 1492”

MARC HENDEL: “Separate People, One People: Creating Jewish St. Louis, 1880 – 1940”

MADELYN SILBER: “From Seed to Mighty Tree: Susan Blow and the Development of the American Kindergarten Movement”

ALI KARAMUSTAFA: “An Imperial Actor in the Late Ottoman Empire: Performativity and Status in the Travelogues of Cenap Şehabettin”

2:00 p.m. - 2:55 p.m.


MICHAEL BRODSKY: “Britain’s Empire and the First World War: The Strategic Importance of Palestine”

TIMOTHY MORGAN: “Lyautey’s Divided City: A Defense of the Dual City Theory in its Unique Applicability Toward Settler-Colonial Subjugation”

DAVID LEVINE: “The Origins of Discontent: Pakistan, the Baghdad Pact, and the Foreign Policy of the Eisenhower Administration”

JACK MARSHALL: “Play Ball!: The Role of Baseball in the Evolution of California”

3:00 p.m. - 3:45 p.m.

ABBY SUNG: “Malaria, ‘Development’, and Eradication Illusions: the WHO and the Global Battle against Malaria in the Twentieth Century”


NATALIE KUTAT: “‘Education is a Weapon’: Portrayals of Stalin in Soviet and Post-Soviet Textbooks”

AARON KACEL: “Murder, Abuse and a Camera: The Fairness of the Gavel-to-Gavel Television Trial in the Case of People v. Steinberg (1987)”

JONATHAN KOVACS: “The Life and Death of an American Town: The Hamburg Massacre of July 1876 and the Rise and Fall of African-American Political Culture in Reconstruction South Carolina”

CLOSING REMARKS
UPPER MANTLE SEISMIC ANISOTROPY BENEATH WEST ANTARCTICA FROM SHEAR WAVE SPLITTING ANALYSIS OF POLENET/ANET DATA

Natalie Accardo
Mentor: Douglas Wiens

We constrain azimuthal anisotropy in the Antarctic upper mantle using shear wave splitting parameters obtained from teleseismic SKS, SKKS, and PKS phases recorded at 30 broad-band seismometers deployed in West Antarctica as a part of POLENET/ANET. We used an eigenvalue technique to linearize the rotated and shifted shear wave particle motions and determine the best splitting parameters. We visually inspected all results and assigned a quality rating based on factors including signal-to-noise ratios, particle motions, and error contours. The best results for each station were then stacked to get an average splitting direction and delay time. We conclude that the splitting results from anisotropy in the upper mantle, since the large splitting times cannot be accumulated in the relatively thin crust (20-30 km) of the region. Overall, fast directions in West Antarctica are at large angles to the direction of Antarctic absolute plate motion in either hotspot or no-net rotation frameworks, showing that the anisotropic fabric does not result from shear associated with the motion of Antarctica over the mantle. Stations within the West Antarctic Rift System (WARS), a region of Cenozoic extension, show fast directions subparallel to the inferred extension direction. Results from WARS and from Ellesworth Whitmore Mountains all show relatively large splitting times of 0.6 - 1.33 s. These results suggest upper mantle anisotropy that results from mantle flow and deformation related to the extensional deformation of the region. The results from the Pensacola Mountains deviate from the dominant fast orientation seen in WARS but appear to be approximately perpendicular to the strike of the mountain range. Stations in Marie Byrd Land (MBL) show inconsistent fast directions and a wide range of delay times (0.3 – 0.9 s), perhaps as a result of complex mantle fabric related to a possible MBL hotspot.

WHICH GENDER MAKES SMARTER STOCK RECOMMENDATIONS?

Ginika Agbim and Andong Cheng
Mentor: Ohad Kadan

Wall Street’s financial analysts release recommendations advising investors to buy, hold or sell a company’s stock, and some analysts’ recommendations are more sophisticated and profitable than those of other analysts. Past research suggests that women are better investors in the stock market because they are more risk averse and less overconfident than men.

Study one of this behavioral finance research is based on data of roughly 15,000 separate analyst recommendations from four top investment banks during 2007-2009. We analyze whether gender as an independent variable affects the performance of the stocks recommended on both short-run and annual returns. By comparing the differences in returns on stocks covered by male and female analysts, we explore which gender’s buy/sell/hold recommendations leave investors with more money in their pockets. We then compare gender effects before and after the 2008 financial crisis.

In Study two, we supplement our research by analyzing team data from an undergraduate investments simulation that mimics a real-world investment situation. We explore differences in risk-taking and portfolio performance, proxied by a Sharpe ratio, between male-dominated groups and female-dominated groups. This study is different from the previous study of professional analysts because 1. here analysts must make group decisions and come to agreements as a team, which may cause inter-group conflicts and sub-par performance, and 2. participants in this study are rookie analysts instead of professionals. Through this research, we hope to inform the financial world that the gender of an analyst may have interesting effects on one’s portfolio performance in the long run and in the short run.

UNRAVELING MECHANISMS OF RECRUITMENT LIMITATION IN TEMPERATE FOREST SEEDLING COMMUNITIES

Amal Al-Lozi
Mentor: Tiffany Knight

A central goal of community ecology is to identify mechanisms that shape community diversity and dynamics. Ecological mechanisms may be viewed through the lens of three fundamental processes: dispersal, ecological drift, and niche selection. These processes may have an especially strong influence on recruitment limitation of seedling communities, where spatial patterns created by dispersal may be modified by niche selection and drift along abiotic or biotic gradients. Here, the interplay between seed arrival and niche selection imposed by a dominant herbivore, white-tailed deer, during the assembly of temperate forest seedling communities is examined. In an
oak-hickory forest near St. Louis, Missouri, I censused all woody oak stems trees $\geq 10$ cm diameter in seven 0.5-ha sites, measured dispersal using seed traps, and censused the density and composition of woody seedlings. To examine effects of deer, each site was divided into a paired deer-exclosure and unfenced control treatment. Two main hypotheses are being tested: (1) seed arrival constrains local seedling diversity and increases variation in species composition among sites; (2) deer impose a biotic selection pressure on seedling diversity and composition. Results suggest that dispersal limitation may have a stronger influence than deer on seedling diversity and composition. Seeds of all species occurred in fewer than 30% of the seed traps, and the majority of traps captured only one or two of eight species, suggesting low seed arrival rates. Moreover, while deer had no influence on local seedling richness or community similarity, they negatively affected large-scale seedling richness. However, this latter effect was modest. Our study will continue to examine the potential role of deer as a niche selection pressure, including their effects on density dependent mortality of common and rare species. This large-scale experiment will help identify dominant sources of recruitment limitation in temperate forests.

**Examining Localization and Function of Cortically Aligned Proteins in *Tetrahymena Thermophila***

Tara Alpert and Sunaina Kapoor  
Mentor: Douglas Chalker

The purpose of this project is to examine two cortically aligned proteins in *Tetrahymena thermophila* that are up-regulated during conjugation. TDC1 is a tetratricopeptide repeat domain containing protein predicted to play a role in glycosylation. Atg16 is a protein that is homologous to proteins known to play a role in autophagy by complexing with the Atg5-Atg12 complex to form the autophagosome. Autophagy is a cellular process which mediates the degradation of large quantities of cellular material using vacuoles and lysosomes. Our approach for better understanding the localization and function of these proteins was to generate an YFP-tagged construct from the coding gene sequence. Over-expression of the constructs allowed us to visualize localization patterns in living cells with a fluorescence microscope. Both proteins were localized in a pattern which appeared to align with the ciliary rows in the cortex. The cortical localization of Atg16 is not obviously consistent with its putative involvement in autophagy. The TDC1 protein appears to associate with mitochondria, which in Tetrahymena are present in irregular arrays near the cell cortex. Experiments for both proteins are underway to further characterize their specific localizations and gain additional insights into the function of each.

**W.B. Yeats at the *Fin de Siècle*: The Construction of a National Symbolic and the Historical Imagination of Decay**

Natalie Amleshi  
Mentor: Vincent Sherry

Anglo-Irish poet W.B. Yeats wrestled with the nature of symbolic representation—and its attendant problems—throughout his career. In this paper, I contend that we can largely understand the diverse stylistic shifts throughout Yeats’s corpus as attempts to negotiate the relation between the objective and the subjective as mediated by the symbol. Recent Yeats criticism has been concerned with the relation between the political and poetic in his verse. Gauging the extent to which Yeats was either a post-colonial revolutionary or an aristocratic conservative, this critical discourse often characterizes Yeats as either an “Irish” or “British” poet. In this paper, I examine Yeats’s symbolism at the *fin de siècle* in order to present a more nuanced picture of Yeats’s idiosyncratic cultural nationalist program by demonstrating both the mutually-supporting nature of the poetic and political and the significant influence of Decadent *symbolisme* on Yeats’s literary imagination.

My analysis proceeds through a chronological, literary-historical study focusing on 1895-1904. First, I demonstrate how Yeats unites the Intellectual Beauty of Shelley with Irish popular folklore through the symbol of the rose in order to support his cultural nationalist ideal of creating a national symbolic. I then demonstrate the pervasive influence of French decadence in Yeats’s next volume, whose more arbitrary and suggestive language undermines his political ideal of a unified national symbolic. Finally, I argue that Yeats’s later adoption of an anti-symbolic poetry reflects his failure to articulate a unified and coherent theory of symbolism.

This study contributes to a critical movement interested in understanding the relationship between Yeats’s political and literary imaginations. Equally, it justifies the critically neglected position that maintains the significant influence of French Decadence on Yeats’s poetic imagination at the *fin de siècle* and thus troubles the simplistic binary between “British” and “Irish” by triangulating Yeats’s poetic influence to France.
**FOR THE BENEFIT OF THEIR SOULS:**
**INQUISITORS AND CONVERSOS AFTER 1492**
Isaac Amon
Mentor: Mark Gregory Pegg

Jewish presence on the Iberian Peninsula had a long and influential history, spanning more than a millennium and a half. By the end of the fourteenth century, pressure had considerably increased on the Jews to convert to the Christian faith. In 1391 massive conversions occurred where tens of thousands of Jews were either forced to submit to baptism or sacrifice their lives. Jews who converted were known as “New Christians” as opposed to long established “Old Christians.” By the fifteenth century the Spanish Inquisition was instituted to investigate the behavior of these New Christians, judging whether they were secretly still “judaizing” and so heretics. Ines Lopez epitomizes the dilemma of *conversos*. She was born around 1465, it is believed that her (great) grandparents converted to Christianity, perhaps during the massive conversions of 1391. Although nominally a Christian, she apparently still retained Jewish rituals. In 1495 Ines was brought before inquisitors and questioned about her actions and their relevance to Jewish identity. She confessed to lighting candles on Friday nights, to not eating pork, and to preparing for the Jewish Sabbath on Saturday. Although she confessed ignorance as to the meaning of these rituals, the inquisitors judged her to have been Jewish. In 1496, she was sentenced to house arrest and was reconciled to the Church. Fifteen years later she was again interrogated; although now she was burnt at the stake for her “judaizing, backsliding” ways. This work evokes the life and world of Ines Lopez through her two trials.

**DISCOVERY OF NEW K4 BACTERIOPHAGE SLARP**
Sonya Anderson, Amy Krause, and Ruchik Patel
Mentor: Sarah Elgin

A unique phage, Slarp, was discovered in the soil at Washington University in St. Louis. Once the soil sample was retrieved, the phage infected *Mycobacterium smegmatis*, was purified, and a lysate was made. Slarp, is defined by its small, slightly turbid 2mm plaques, indicating its temperate nature. Slarp is part of the Siphoviridae family, a double stranded DNA virus that only infects bacteria. It has a circular head approximately 70nm wide, and a tail length of around 219nm long. When digested with *BsoBI*, it was determined that its genome length is approximately 34,000 base pairs. Based on these preliminary results, it was predicted that Slarp was a cluster N phage because of its unique digest maps, shorter genome size, and the lack of a knob on its tail (a characteristic of cluster K phages). Yet when looking at the DNA sequencing results, its genome length is approximately 57,250 bases and codes for 92 genes. Using Blast, many of Slarp’s genes were found to be similar to the only Cluster K4 phage Fionnbharth. Slarp has one insertion at gene 45 and deletes Fionnbharth’s genes 86 and 87. In addition, Slarp has protein differences in five other genes whose functions are unknown. Slarp’s plaques are less turbid than Fionnbharth’s, but more turbid than TM4, because TM4 lacks an integrase protein. Thus, this suggests an evolution of St. Louis phages. It would have taken multiple generations for these phages to evolve insertions and deletions in their genomes. Slarp is significant in its contribution to cluster K; only 27 phages in this cluster have been identified, of which this is the second K4 phage. Based on previous cluster K identifications, these phages may play a unique role in providing new tools for the genetic manipulation of *M. tuberculosis*.

**NOVEL SCREENING TOOLS FOR HIV-ASSOCIATED NEUROCOGNITIVE DISORDERS**
Tej Azad
Mentor: Beau Ances

With the onset of highly active antiretroviral therapy (HAART) in HIV-infected patients, frank dementia in this population has markedly declined. However, more subtle forms of HIV-associated neurocognitive disorders (HAND) have become more prominent. A recent multi-site study observed that 52% of HIV-infected adults had HAND, with Asymptomatic Neurocognitive Impairment (ANI) and Mild Neurocognitive Disorder (MND), being the most common forms, 33% and 12% respectively. Cognitive impairment has been reported to impair daily functioning regardless of whether patients reported symptoms. In the outpatient setting, the diagnosis and management of HAND can be extremely time-intensive and is often omitted in busy clinical settings. Therefore, brief screening tools are critical to identify persons early in the progression of HAND. The Montreal Cognitive Assessment (MoCA) and the AD-8, an 8-item interview, are simple neurocognitive batteries that have been previously validated in Alzheimer’s Disease but have not been used to assess for HAND. This study highlights that while these brief tools correlate well with formal neuropsychological screening, their sensitivities are lower than desired for a screening tool. Many of the subjects who were not identified by the screening tests had mild cognitive impairment. Evaluating these tools in individuals with Mild Neurocognitive Disorder rather than Asymptomatic Neurocognitive Impairment, or similar less severe conditions, may increase the sensitivity and clinical utility of these tools. The continued prevalence of milder forms of HAND in the HAART era may reflect prolonged patient life survival, inability of certain HAART regimens to penetrate the brain and reduce neuro-inflammation, or even HAART-induced neurotoxicity. Additional screening tools that can be performed in the office setting that can accurately identify HIV-positive individuals with HAND are critically necessary.

LOCAL EDUCATIONAL DEVELOPMENT AS A METHOD OF REDUCING OF POVERTY AND SOCIAL EXCLUSION IN CEARÁ, BRAZIL

Tessa Baizer
Mentor: Derek Pardue

Ceará, a state in the Brazilian Northeast, is known for its extreme levels of poverty and underdevelopment. Wealth disparities have led to high dropout rates and low employability among marginalized youth, which have in turn led to social exclusion and a greater proclivity for engagement in criminal behavior. In recent years, local governments have created numerous development projects in an attempt to diminish the saliency of risk factors and provide a proper education for disadvantaged youths. This research looks closely at two such projects: a series of artistic mobile efforts in Aracati, Ceará, and a community center in Fortaleza, Ceará. The work looks specifically at the currents and ideas that caused each to come about, as well as the major players involved in each decision making process. The main element that connects both projects is their heavy reliance on funding from foreign development organizations. Initially, this project was an attempt to find how using large amounts of money from outside institutions influenced the particulars of each project. Popular literature holds that partnering with such institutions is harmful, as they have an undue influence on the scope of individual projects. This becomes especially salient given that both projects were unable to meet the goals they intended to reach. Rather than place the blame on the institutions themselves, however, this work argues that the organizations involved had minimal influence on each project. Instead, the onus for individual failures lies in problems with the way that each municipal government chose to create these projects, which did not properly address the needs of the population. This research is thus a rebuttal of the conventional research on development programs, and aims to discuss the ways in which the problems inherent to each project studied could possibly be mediated.

CARTEL QUEENS: MEXICAN NARCAS AND THE VISUAL CULTURE THEY CREATE

Sara Baker
Mentor: Ignacio Sánchez Prado

Through song, soap opera and sensationalist journalism, female Mexican cartel bosses stamp themselves into the visual culture of Mexico. The internalization of this type of media within Mexican visual culture confirms machista stereotypes of women. This research studies how narcorridos, the telenovela La Reina del Sur and online newspapers present cartel women and influence visual culture. In sum, narcorridos highlight that feminine strength comes from beauty and sex rather than intellect. In narcorridos, women tend to gain power through the re-appropriation of male characteristics that make them symbolically inefficient as transformative cultural personas. La Reina del Sur offers opportunities to examine the use of the female body and persona in cartel-related visual culture and make judgments regarding national identity and gender. In essence, the show claims that powerful women are both dangerous and man-like; they are only salvageable through a return to their roles as mothers. Finally, written press perpetuates a certain imagination of these women and works on a critical level to shape national identity. Forging national identity around the convoluted imagination of a woman wrapped up in the drug trade offers a challenge for gender negotiation in Mexico as well as challenges for a future in which Mexican institutions must re-shape the imagination of popular audiences to support the state as a venue for female empowerment.

STRUCTURAL AND FUNCTIONAL EVOLUTION OF ISOPROPYLMALATE DEHYDROGENASES IN THE LEUCINE AND GLUCOSINOLATE PATHWAYS

Sherifat Balogun
Mentor: Joseph Jez

Glucosinolates are sulfur-containing molecules produced as either defense compounds or chemical attractants in the Brassicales order of plants, which includes Arabidopsis thaliana. In humans, some of these molecules function as cancer-prevention agents because of their ability to promote apoptosis and induce detoxification enzymes. Although the oxidative decarboxylation catalyzed by isopropylmalate dehydrogenase (IPMDH) is needed for the synthesis of leucine and glucosinolates, little is known about this family of enzymes in plants. Therefore, determining the structure of each isoform is of importance if we ever want to genetically modify glucosinolate levels in foods like broccoli and horseradish. In this research, IPMDH1-3 was expressed and purified for protein crystallization. The gene for each Arabidopsis IPMDH isoform was inserted into pET28a expression vector and then transformed into Escherichia coli. Each isoform was purified by a combination of nickel-affinity and size-exclusion chromatography. To date, crystals of AtIPMDH2 and AtIPMDH3 have been obtained. Importantly, the 2.25-Å resolution structure of AtIPMDH2 was solved by molecular replacement and is the first detailed molecular architecture of a plant IPMDH. Through substrate modeling and site-directed mutagenesis of AtIPMDH2, a collaborator has shown that the glucosinolate chain-elongation activity of AtIPMDH1 is derived from the variation of a single amino acid in the active site. Future work will include crystallization of AtIPMDH2 with its substrates and further mutagenesis of the key residues in the active site to better understand how this enzyme catalyzes the decarboxylative formation of glucosinolates and leucine.
**Regulation of Intestinal Epithelial Proliferation by Type I Interferons**

Alexandra Barger  
Mentor: Thaddeus Stappenbeck

The intestinal epithelium is a critical barrier against pathogens, toxins, and commensal bacteria. Its homeostasis is maintained in part by constant turnover of epithelial cells. Stem cells at the base of the intestinal crypts generate new enterocytes, which migrate upward to take the place of older cells shed into the lumen, but the mechanisms regulating the rate of migration are not completely understood. Our lab previously demonstrated that mice deficient in Irgm1, an immunity-related GTPase, have increased cellular proliferation in their intestines, as measured by number of mitotic figures and depth of intestinal crypts. These mice also have constitutively higher serum levels of Type I interferons (IFNs). From this data, we hypothesized that the elevated Type I IFNs in Irgm1 knockout mice led to increased turnover of their intestinal epithelium, and that this phenotype would be reversed in mice deficient in both Irgm1 and Ifnar, the IFN alpha/beta receptor. To measure intestinal epithelial cell turnover, we first optimized a protocol for sequentially labeling proliferating cells with two different thymidine analogs. By examining the relative migration distances of the labeled cells we were able to determine the rates of cellular migration in both the knockout and the wild-type mice. Our results show that the intestinal epithelial cells of Irgm1 knockout mice migrate more quickly than do those of wild-type mice, indicating a higher turnover rate, and that the turnover rate returns to wild-type levels in Irgm1 x Ifnar double-knockout mice. These findings are interesting, given that Type I IFNs in wild-type mice are normally elevated during viral infection. A higher rate of intestinal epithelial turnover during viral infection could be beneficial to the host, as it could help eliminate infected epithelial cells.

**Digital Networked Communication in Latin America: How the Blossoming of Social Media in Mexico and Brazil Affects Political Discourse, Governmental Transparency, and Citizen Participation in the Political Process**

Daniel Barsky  
Mentor: Ignacio Sánchez Prado

Online social networking has revolutionized the field of global communications. Millions of people are becoming increasingly connected with each other as the Internet penetrates our global culture and changes the dynamic of information sharing. In Latin America, where traditional news media holds disproportionate influence over political discourse, people are beginning to form online networks, as they engage in public dialogue and act collectively to influence public opinion. While substantial research exists on Internet usage statistics and blogging communities in Latin America, scholars have yet to determine the link between online communication and political activism among Latin American citizens. This research presents a comprehensive analysis focusing on two countries, Mexico and Brazil, and demonstrates how social media and Internet communications shape political discourse, foster governmental transparency, and encourage citizen participation in the political process. By tracking hundreds of political social media accounts, analyzing influential blogs, and examining the Mexican and Brazilian political climates, this work investigates how digital networked communication can increase access to political information and improve the quality of democracy in Latin America.

**From the Whores’ House to the Husband’s Domicile: Labeling the Culprit of Venereal Diseases in Semi-Colonial Egypt**

 Parsa Bastani  
Mentor: Nancy Reynolds

From Mehmed Ali’s consolidation of power in 1805 to the mid-twentieth century, venereal diseases functioned as a public source of anxiety and a site for larger debates about the intersections of gender, class, and sexuality in Egypt. An examination of archival documents, newspaper articles, and medical journals from the Egyptian semi-colonial period dealing with venereal diseases reveals that the years immediately after Egyptian independence in 1922 represented a unique, transitional moment in which elite men contested and articulated ideas of nationhood. Elite men determined each group’s status in the nation according to their reproductive and sexual value. Bourgeois women, on the other hand, were reproductively and sexually valuable, allowing them to enter the confines of the nation if they remained venereal disease free. Among the groups of marginalized people, lower-class prostitutes were the worst off. Because they were sexually valuable to middle- and upper-class men but not reproductively valuable, they functioned in a dangerous, liminal space in which they could be neither the sites of larger state reforms nor prove their value by spawning children. This narrative of venereal disease control in the early semi-colonial period demonstrates the historically dynamic process through which male elites repeatedly sought to dictate the terms of disempowered groups of peoples’ citizenship in order to substantiate their own political power and determine the nation’s development.
Acquisition of the Critical Elements of Tool Use in Chimpanzees in the Goualougo Triangle

Eviana Bell
Mentor: Crickette Sanz

Chimpanzees (*Pan troglodytes troglodytes*) from the Goualougo Triangle in the Republic of Congo exhibit a distinct range of tool using behaviors. This longitudinal study sought to investigate the cognitively complex process of tool use acquisition in infant, juvenile and sub-adult chimpanzees. The goal was to determine the progression and ages in which specific tool using behaviors appeared. The study analyzed 42 hours of video collected by remote video monitoring units placed at termite nests in the Goualougo Triangle. To determine the ages of tool use acquisition, the videos were coded for the presence of developmental critical elements that represent different types of tool use proficiency. Critical elements ranged from identifying a hole on a termite mound, to manipulating tools, to making a tool. Preliminary results have given approximate ages of critical element emergence, such as the first identification of a hole in a termite mound occurring at half a year old, and the first manipulation of a fishing tool occurring at about a year old. More complex critical elements such as perforation tool use and the insertion of a puncture tool did not occur until ages four and five, respectively. Females showed overall higher counts of critical elements, and an earlier minimum age of acquisition of critical elements such as 'Make Tool' and 'Use Perforate Tool'. This study reveals a complex tool use acquisition process that deserves further investigation through studies extending over a longer period of time and comparative studies between sites.

Health Care Reform That Almost Wasn't: How Rhetoric Shaped the 2009 Health Care Debate

Kelsey Berkowitz
Mentor: Randall Calvert

The Obama Administration's health care reform legislation, the Patient Protection and Affordable Care Act, was one of the most contentious pieces of legislation to have ever moved through Congress. Yet in the early months of the Obama Administration, members of both parties in Congress stated their desire to approach health care reform in a bipartisan way. In this analysis I attempt to solve the puzzle of why, given that the two parties had stated their willingness to work together to devise and pass health care reform legislation, the legislation’s passage was far from certain up until the very end. The rhetoric of the two parties during the debate is analyzed using computational linguistic analysis coupled with traditional textual analysis to understand how that rhetoric influenced the debate’s progression.

North Sarah HOPE VI Mixed-Income Community: A Progressive, Yet Inadequate Approach to Catalyzing Urban Revitalization Efforts in Downtown St. Louis

Caleb Bess
Mentor: Margaret Garb

The United States Department of Housing and Urban Development HOPE VI program provides funds to municipal housing authorities and private developers to demolish deteriorating public housing projects and replace them with mixed-income communities. North Sarah, a mixed-income community due for completion in the fall of 2013, strives to improve living conditions for low-income residents and serve as a catalyst for reinvestment in the North Central neighborhood of St. Louis. Although North Sarah contains an extensive Community and Supportive Services Plan to connect residents with services like job training and early childhood education, it will be plan difficult for the plan to overcome weakened infrastructure in the city of St. Louis. I argue that while North Sarah represents a commendable attempt to develop an effective mixed-income community, pre-existing social and economic conditions within the North Central neighborhood, and the city of St. Louis at large, jeopardize its potential for success. Through situating North Sarah within the context of the city of St. Louis's history of decline and policy evaluations of the HOPE VI program, I demonstrate how North Sarah is unable to address potentially debilitating social and economic conditions that will affect the economic self-sufficiency of its residents.

Investigating the Casein Kinase II Regulatory and Catalytic Subunits in Tetrahymena

Rahul Bhansali and Mohit Iyyer
Mentor: Douglas Chalker

The Casein Kinase II (CKII) heterotetramer is a well conserved protein in eukaryotes. Studies have shown this protein to be involved in cell cycle regulation, apoptosis, DNA repair and many other processes. Our study investigates the gene expression and protein localization of the two subunits that form CKII. The gene encoding the catalytic (alpha) subunit (*Ttherm_01000180*) is 1.836 kbp, while the gene for the regulatory (beta) subunit (*Ttherm_00780530*) is 2.055 kbp. Understanding the function and localization of these subunits is significant as it may be involved in a variety of pathways in Tetrahymena, and the majority of kinases in Tetrahymena still lack functional knowledge. We performed rtPCR analysis to confirm the microarray expression profile on Ciliate.org. The catalytic subunit showed
constant expression while the regulatory subunit was highly induced during conjugation. An expression construct containing a YFP fusion was then created in order to localize the proteins in vegetative and conjugating Tetrahymena. Both the catalytic and regulatory subunits showed a transition from ubiquitous expression in the cytoplasm to expression in isolated foci in the macronuclei over the course of conjugation. This was surprising because none of the homologies showed nuclear localization, suggesting that the CKII heterotetramer may have an interaction with a transcription factor or a DNA repair pathway in developing macronuclei. In addition, a Western Blot and sequence analysis was done in order to confirm the proper protein was studied. Lastly, as both proteins showed similar localization patterns, a co-localization and co-immunoprecipitation is under way to further confirm the interaction of the CKII subunits.

CEREMONIAL PLANT USE AT A CADDO SITE IN SOUTHWEST ARKANSAS
Rosemarie Blewitt
Mentor: Gayle Fritz

This work describes the paleoethnobotanical assemblage from a Caddo ceremonial center in southwest Arkansas, the Tom Jones site (3HE40). The presence of members of the Eastern Agricultural Complex as well as likely domesticated amaranth at this site is unexpected in this region and creates new questions about subsistence practices in this area. The makeup of the assemblage from the Area 7 cookhouse context suggests that Eastern Agricultural Complex crops had ceremonial importance at the Tom Jones site. This site also presents an opportunity to define a plant assemblage from a Caddo cookhouse, a structure type that is not well understood.

THE AL-AKHAWAYAN UNIVERSITY MIMOUNA CLUB: PERCEPTIONS OF JEWS IN MOROCCO
Rachel Braun
Mentor: Seth Graebner

This research examines the Mimouna Club at Al-Akhawayan University in Ifrane, Morocco. This is a student organization at an American-style school in Morocco dedicated to Moroccan Jewish history and culture, founded by and comprised of Muslim Moroccan students. This work first examines the founding goals and missions of the club, as well as reactions, both positive and negative, toward the club from other students at Al-Akhawayan, the school administration, as well as local and international media. The work goes on to examine the historical narrative presented by the Mimouna Club of a harmonious existence between Moroccan Jews and Moroccan Muslims throughout history as contrasted with the enmity narrative which they are attempting to dispel.

SYNTHESIS OF HYDRATED MAGNESIUM CARBONATES IN SUPPORT OF CARBON DIOXIDE MINERAL SEQUESTRATION RESEARCH
Allison Brenner
Mentor: Sophia Hayes

Carbon dioxide mineral sequestration is the process through which carbon dioxide is captured and converted into more stable mineral carbonates. Current research is considering carbon mineral sequestration by reacting carbon dioxide with naturally occurring minerals, such as brucite (Mg(OH)₂) and forsterite (Mg₂SiO₄), to form different magnesium carbonate phases that are concentration, pH, and temperature dependent. In this project, we are developing a method to synthesize and characterize pure forms of some of these magnesium carbonate phases, specifically the minerals nesquehonite (MgCO₃·3H₂O), hydromagnesite (4MgCO₃·Mg(OH)₂·4H₂O), and dypingite (4MgCO₃·Mg(OH)₂·5H₂O). The carbonate crystals were synthesized from magnesium chloride (MgCl₂) and solid sodium bicarbonate (NaHCO₃) in deionized water. The different product crystals were analyzed using powder X-Ray Diffraction, Raman Spectroscopy, and solid-state Nuclear Magnetic Resonance (NMR) techniques in order to determine both their identities and chemical structures. We present experimental measurements that support the ongoing research on carbon dioxide mineral sequestration by providing pure mineral standards (as well as the conditions in which these minerals form) to enable more in-depth study of their physical properties.

BRITAIN’S EMPIRE AND THE FIRST WORLD WAR: THE STRATEGIC IMPORTANCE OF PALESTINE
Michael Brodsky
Mentor: Elizabeth Borgwardt

In the winter of 1916–17, Britain transformed its military strategy by advancing the Egyptian Expeditionary Force across the Sinai Desert and into Ottoman lands. A momentous decision that irrevocably shaped modern Middle Eastern history, this research explores the reasons accounting for Britain’s entrance into Palestine during the First World War. Disheartened by stalemate on the Western Front, Britain sought military victories and a means of improving national morale. In search of alternative theaters of war, Palestine appeared both viable and attractive. Not only would it divert troops from slaughter in France and Belgium, but it presented a deep-seated romantic and
religious allure. Laying territorial claim to Palestine would also improve Britain's standing in the region, as well as bolster its postwar bargaining position. After Germany announced its policy of unrestricted submarine warfare, protecting existing shipping lanes, particularly to India, became a matter of vital necessity. As the Suez Canal's defense grew in importance, the danger of Ottoman assault was deemed unsustainable. Palestine was consequently sought as a strategic defensive barrier. Turning to the Anglo-Zionist alliance, I investigate prejudice and exaggeration associated with perceptions of Jewish influence. After evaluating international Jewish leverage, especially within Russia and the United States, Britain concluded that “world Jewry” was an interest group worth courting. Prompted by Chaim Weizmann and a notable entourage of Zionists, Britain decided to endorse a pro-Zionist agenda. By so doing, the Government hoped to secure widespread Jewish support, thereby strengthening its political and financial standing. Britain thus altered its Near Eastern strategy, resolving to advance troops past the Suez Canal and stake claim to the land of Palestine.

**ANATOMY AND BIOPHYSICS OF PROFESSIONAL VOICE**

**“HANDBOOK OF HEALTHY SINGING: ENVIRONMENTAL CONTEXTS FOR THE COLLEGE VOICE”**

Alainna Brown  
Mentor: Nicole Aldrich

The college setting presents many potential environments for young adult singers with moderate to no professional voice training. Everything from alcohol consumption to sexual exposure can affect the overall health of the musical voice production system. After exploring the anatomy and biophysics that underlie the human singing voice, I conducted an extensive literature review of the effects of factors common in the college environment, ultimately resulting in “Handbook of Healthy Singing: Environmental Contexts for the College Voice.” This handbook first introduces basic anatomy and biophysics of vocal folds, breathing muscles, and other components of human voice production, accessible by musicians and scientists alike. Following this tutorial, the handbook explores environmental factors one by one, defining their effects on various vocal anatomies, explaining the relevant biophysics, and in some cases providing information about resources specific to the environmental factor. Topics include and are not limited to: alcohol, caffeine, dehydration, exercise, gastrolaryngeal acid reflux (due to diet and other factors), smoking, air quality, vocal fatigue from misuse or overuse, hygiene, diet, medication, illicit drug use, hormones and stress, sexual activity, and the varied effects of professional and amateur choral singing. In the future, this handbook will become a multimedia web-based tool for use by voice instructors, students of vocal pedagogy, a capella and other non-professional student singing organizations, professionally-led college/university chorales, and anyone else with an interest in the college-aged singing voice.

**MOTOR LEARNING EFFECTS OF TRIAL-BY-TRIAL ERROR OBSERVATION IN NOVEL HAPTIC ENVIRONMENTS**

Alainna Brown  
Mentor: Kurt Thoroughman

Movement through an environment relies on exacting feedback from immediately previous movements in order for the brain to adjust future movement accordingly. This feedback contributes to fine haptic learning (“adaptation”), allowing humans to navigate novel environments. A difficulty in testing haptic adaptation, though, due to this level of precision, is differentiating training and testing of movement. Unlike other psychophysical testing, the movements involved are learned (trained) as they are performed (tested). One way to circumvent this issue is through observational learning. Previous studies in the Thoroughman lab have utilized a hand-held robot manipulandum capable of producing forces opposed to hand movement and a target-reaching game which challenges subjects to persist in reaching through fields of varying resistance. Significant adaptation to the experienced forces occurs within an hour of testing. Interspersing periods of observation of an actor performing the same task within a set of reaching movements allows the observing participant to perform much better initially on test of that motion than someone who has had neither observational training nor actual experience making the motion.

However, in one experiment, there is a significant offset in the motor adaptation produced by observational learning versus direct action learning of a new environment; asymmetric adaptations in the opposite direction occur when subjects observe an actor, suggesting that mimicry or a similar mechanism is at work. In this study, the direction of the experienced forces relative to the actor that they observe was reversed to determine what causes this asymmetric offset. From these forthcoming results, it may become clear what sort of learning mechanism observational learning engages. Ultimately, these findings can translate to portable neurorehabilitation or sports-training programs based on observational learning of motor tasks.
We have physically annotated the genome of mycobacteriophage Misfit. Misfit was isolated in 2010 by Washington University in St. Louis students Hilary Brownstead, Eric Gustafson, and Aatif Sayeed from a backyard vegetable garden in Corona, California (GPS coordinates: 33°50’28.50” N, 117°32’56.60” W). The plaques range in size from 0.5mm to 2.0mm in diameter. Plaques are turbid with clear centers, indicating that Misfit is a lysogenic phage. The electron microscopy pictures show a phage with an isometric, spherical head approximately 60 nanometers (nm) in diameter and a tail about 260 nm long. Misfit is in the class siphoviridae. The genome is 76,159 base pairs long, with 144 total genes, including 2 tRNAs, with 10 estimated operons. While incorrect estimates of genome size (thought to be ninety-two kilobases from restriction digests) and plaque morphologies originally indicated Misfit was a Cluster J phage, Phamerator analysis indicated that Misfit is in Cluster E, with significant similarities to phages Cjw1 and Elph10. Misfit’s genome differs mostly by insertions compared to the other two phages, though there are a few deletions. We have also begun functional annotation of the genome, and have identified genes encoding for terminases, tail proteins, head proteins, and lysins. We anticipate further functional annotation results such as integrase genes, tapemeasure proteins, and chaperone proteins. With this knowledge we hope to contribute to the further understanding of the evolution of mycobacteriophages.

**ISOLATION, CHARACTERIZATION, AND GENOMIC ANALYSIS OF MYCOBACTERIOPHAGE MISFIT**

Claire Brownstone, Mitchell Hallman, and Jeffrey Lee  
Mentor: Sarah Elgin

In “Poetic Form and Iterative Practice in *The Dunciad* of Alexander Pope,” I argue that Pope’s poetics model his larger historical engagements in the era of literary industrialization. I place the repetition of the couplet’s rhyming words against the repetition of mass printing in eighteenth-century England. Beginning with a discussion of Pope’s rhyme, I argue that Pope manipulates the repetitive to make it mean differently with each return, producing a repetition generative of meaning. I also address generation in terms of lineage, and suggest that repetition is a link into literary inheritance; thus the repetition of literary tradition clashes with the repetition of modernity. In the context of the eighteenth-century literary industry, repetition also arises on a material level. *The Dunciad*, besides being issued in four separate editions, appears with an increasing amount of textual paraphernalia with each issue. In contrast to a poetic proliferation of meanings, the material text accumulates a proliferation of words and pages. Pope stages this interplay of meaning and materiality on the printed page, in the clash between notes and verse. The tension among textual units allows Pope to represent both text and context on his page, and suggest that repetition is a link into literary inheritance; thus the repetition of literary tradition clashes with the repetition of modernity. In his translations, literally The Iliad and figuratively *The Dunciad*, Pope combines the Ancient and Modern, ultimately claiming a material as well as literary right to both. As a concluding gesture, I discuss how these repetitions and claims to right culminate in Pope’s engagement with his rights to copy, that is, literally copyright.

**POETIC FORM AND ITERATIVE PRACTICE IN *THE DUNCIAD* OF ALEXANDER POPE**

Alexandra Bursak  
Mentor: Joseph Loewenstein

Spinal cord injury (SCI) is a traumatic event that can cause life-long impairment. Recent studies have demonstrated the role of spinal interneurons in regeneration and motor recovery following SCI. The V2a interneuron subtype, which is excitatory and spans several spinal cord segments, originates from the p2 progenitor domain in the ventral half of the developing spinal cord and may have therapeutic potential for spinal cord injury. This project focuses on developing an induction protocol to obtain high purity V2a interneurons from mouse Embryonic Stem (ES) cells that could potentially rebuild neural circuitry after SCI. Development of progenitor domains in the neural tube occurs in a ventral to dorsal manner and is dependent on the complex balance of concentration and duration of retinoic acid (RA) and sonic hedgehog (Shh) signaling. Experiments were conducted to find the optimum RA and Shh signaling conditions. Mouse ES cells were cultured for two days in suspended culture to form embryoid bodies (EBs). The EBs were then plated on gelatin with increasing concentrations of RA, a promoter of neural differentiation, for four days. The Shh agonist, purmorphamine (250 nM), was added at 0, 12, 24, and 36 hours following the addition of RA to promote differentiation into ventral spinal progenitors. Expression of the V2a-specific transcription factor, Chx10, was observed by quantitative real-time polymerase chain reaction (qPCR) and immunocytochemistry (ICC). Chx10 expression, as determined by qPCR, decreased with increasing concentrations of RA from 10nM to 50μM. Preliminary ICC results show that exposing EBs to just RA for at least 24 hours prior to adding purmorphamine produces nuclei with positive Chx10 staining. These results suggest that lower concentrations of RA may be advantageous for producing V2a interneurons, as well as exposure to RA prior to Shh signaling. Further experimentation will continue to optimize the protocol for V2a interneurons.

**INDUCTION OF V2A INTERNEURONS FROM MOUSE EMBRYONIC STEM CELLS**

Jessica Butts  
Mentor: Shelly Sakiyama Elbert

Mouse ES cells were cultured for two days in suspended culture to form embryoid bodies (EBs). The EBs were then plated on gelatin with increasing concentrations of RA, a promoter of neural differentiation, for four days. The Shh agonist, purmorphamine (250 nM), was added at 0, 12, 24, and 36 hours following the addition of RA to promote differentiation into ventral spinal progenitors. Expression of the V2a-specific transcription factor, Chx10, was observed by quantitative real-time polymerase chain reaction (qPCR) and immunocytochemistry (ICC). Chx10 expression, as determined by qPCR, decreased with increasing concentrations of RA from 10nM to 50μM. Preliminary ICC results show that exposing EBs to just RA for at least 24 hours prior to adding purmorphamine produces nuclei with positive Chx10 staining. These results suggest that lower concentrations of RA may be advantageous for producing V2a interneurons, as well as exposure to RA prior to Shh signaling. Further experimentation will continue to optimize the protocol for V2a interneurons.
AUDITORY INTENSITY EFFECTS ON AUDIOVESTIBULAR INTEGRATION IN NORMAL YOUNG ADULTS

Angela Chen
Mentor: Timothy Hullar

Falls are a major source of morbidity and mortality among the growing elderly population. Better understanding of the reasons for falls could help identify those likely to fall and design effective interventions to reduce their risk. Maintaining balance requires the integration of sensory inputs from the visual, vestibular, proprioceptive, and auditory systems, but they are complicated by different arrival times to the brain. This difference presents as a measurable “perceptual lag” on the order of ms and is called the point of subjective simultaneity. The brain compensates by allowing stimuli that arrive within a certain length of time, called the “temporal binding window”, to be perceived as occurring simultaneously. Previous literature has shown that older adults have wider temporal binding windows than younger people. Its duration for stimulus pairs involving visual and auditory stimuli has been shown to shorten with increasing stimulus intensity. Changing the characteristics of balance-related sensory signals could normalize the length of the temporal binding window and improve balance function. On the other hand, point of subjective simultaneity is known to be more variable across individuals. It is hypothesized that increasing the volume of the sound stimulus would decrease the duration of its temporal binding window and the length of the perceptual lag when combining with a vestibular stimulus.

ELUCIDATING THE HP1A CHROMOSHADOW DOMAIN BINDING SURFACE

Philip Chen, Degian Ghebermicael, Vincent Huang, Noliyanda James, Sung Yeop Jeong, Yamini Krishnamurthy, Sujay Kulsrestha, Jennifer Lapp, Benjamin Marks, Suzanne Mazhuvanchery, Sheri Mcclerklin, Chantel Miller, Akhila Narla, David Nathin, Neil Savalia, Nancy Shen, Mai Phuong Tran, Joy Wang, Vivian Wang, Yijun Yang
Mentor: Joseph Jez

Eukaryotic genomes are roughly partitioned into heterochromatin, gene-poor domains that remain highly packaged throughout the cell cycle, and euchromatin, gene-rich domains that are more accessible for transcription. Heterochromatic silencing is thought to be essential to maintain the integrity of the genome, minimizing transposition of endogenous DNA transposons and retroviruses found in eukaryotic genomes. Heterochromatin Protein 1a (HP1a) plays a key role in establishing and maintaining heterochromatin structure. HP1a binds to a wide array of protein partners among which are HP2, a non-histone chromosomal protein and PIWI, an RNA binding protein. We have found that PIWI binds 66 fold more weakly to HP1a compared to HP2 in a fluorescence polarization assay, consistent with their predicted roles. This differential affinity corresponds to a more extensive binding surface for HP2 compared to PIWI as shown by mapping the chemical shift perturbations of the HP1a residues in complex with HP2 or PIWI respectively. Finally deleting the C-terminal extension (amino acids 204 NED 206) of the chromoshadow domain also has the largest differential impact on binding HP2 and PIWI; since HP2 is more basic compared to PIWI, charge neutralization may be the critical function of these acidic residues. We used site-directed mutagenesis to explore this surface. Our results are consistent with a model where heterochromatin is initiated through a transient interaction between HP1a and PIWI. Once initiated heterochromatin may be maintained through a more stable interaction between HP1a and HP2. Thus HP1a has a number of built in mechanisms to discriminate between its binding partners as a means to coordinate its various functions.

Andong Cheng
See Ginika Agbim

THE SACCADE MAIN SEQUENCE IS BUILT BY THE INVERSE MODEL OF THE EYE MOVEMENT

Jeffrey Chiou
Mentor: Pablo M. Blazquez

Saccades are fast and accurate eye movements that show a fixed relationship between movement parameters called the main sequence. This results in stereotyped movements arguably reducing the computation load to the nervous system. We used a simple behavioral task and a model for motor control to investigate where in the central nervous system the main sequence is built. This model for motor control includes a forward model, which transforms motor commands into actual movement, and its inverse model, which transforms desired movement into motor command. Rhesus monkeys were instructed to make horizontal saccades at different gaze elevations. Saccades that do not pass through primary position have a torsional velocity present in the output of the forward model but not in the output of the inverse model. We used the amplitude and peak velocity of saccades that pass through primary position to calculate the main sequence, which was then used to predict the peak velocity of the remaining saccades. Results suggest that the torsional component of the eye movement is not represented in the main sequence, thus indicating that the structures holding the forward model do not form the main sequence. Results also support the current view that torsional eye movements are not represented in the motor output, but
mostly implemented by the mechanics of the orbit. Based on these results, we hypothesize that the main sequence is formed by structures responsible for constructing the inverse model.

**THE ROLE OF SHAME IN QING DYNASTY LAW**

Elaine Chow  
Mentor: Robert Hegel

The legal code of the Qing Dynasty is the last legal code of China’s imperial era. Known for its organized structure and complex intricacies, it contained over a thousand statutes developed over the course of more than three centuries. One significant area of the Qing legal code deals with rules that govern gender relations. In this research, I examine the role that shame plays in delineating the male and female identities in the Qing Dynasty. How shame manifests itself in the social and legal fabric of the time is investigated by looking at case records, official commentaries, and The Great Qing Code itself. Specifically, I argue that shame in Qing law is a three-fold concept: an internal notion relating to conscience, morality and guilt; an external notion relating to reputation and humiliation; and finally, as an instrument adopted by the penal system in order to reform and deter.

Internally, the concept of shame defines one’s moral standing. For women, the act of establishing one’s worth as an upright citizen often involved proving one’s proper sense of shame through the protection of her chastity. Thus, the concept of shame in the Qing courts occupied a highly internal realm, coinciding with one’s virtues. Externally, the notion of shame was a public one that correlated with one’s reputation. The defilement of one’s reputation was a publicly shaming issue, and I explore the way such concepts spurred the development of the “Cult of Chastity” and justified homicide in certain instances. Within the penal system, shame serves a dual purpose of both encouraging internal reform and acting as a public deterrent to crime. These three aspects of shame work together to define and shape the unique system of one of the most long-lived legal codes in the history of China.

**IDENTIFICATION OF miR-186 AS A NOVEL REGULATOR THAT REPRESSES BACE1 EXPRESSION**

Dah-eun Chung  
Mentor: Jungsu Kim

Alzheimer’s disease (AD) is the most common form of dementia. Although details of AD pathogenesis still remain unclear, abnormal accumulation of amyloid β (Aβ) peptide in the brain has been suggested to be the primary cause of AD. Given its critical role in Aβ generation, BACE1 has been intensively studied as a therapeutic target for AD. However, the regulation of BACE1 expression is poorly understood to date. Understanding regulation mechanisms of BACE1 is critical to develop a new therapeutic strategy for AD. Recently, microRNAs (miRNAs) are getting more attention as important regulators of disease-related genes in diverse disease settings. Therefore, we sought to identify a novel miRNA that regulates BACE1 expression.

In this study, we identified miR-186 as a novel regulator of BACE1 expression. miR-186 suppressed BACE1 expression dose-dependently through targeting the 3’-untranslated region (3’-UTR) of BACE1 mRNA in neuronal cells. In contrast, inhibition of miR-186 significantly increased BACE1 levels in neuronal cells. miR-186 is enriched in the brain among different mouse tissues with relatively high expression in the hippocampus compared to other brain regions. Furthermore, the expression level of miR-186 is much higher in neurons compared to astrocytes. Of note, miR-186 level in the cortex of the mouse brain is dramatically decreased in the aged mice compared to the young.

Taken together, we suggest that miR-186 represses BACE1 expression through targeting the 3’-UTR of BACE1 mRNA. The decrease of miR-186 level by ageing might be implicated in AD pathogenesis. Further studies are warranted to elucidate the pathological roles of miR-186 in AD.

**ANALYSIS OF NOVEL PHAGE ANNIHILATOR AND ITS PLACE IN CLUSTER G PHAGES**

Bryan Ciccarello, Laura Watkins, and Jeffery Wei  
Mentor: Sarah Elgin

A mycobacteriophage, Annihilator, was extracted from a soil sample collected from Forest Park in St. Louis, Missouri, purified, and characterized. The plaque morphology shows small, clear plaques, typical of a lytic phage. The phage particles, observed using electron microscopy, showed a hexagonal head with a diameter of about 64 nanometers and a tail length of 199 nm. The microscopy also indicated that Annihilator is a Siphoviridae phage with a long non-contractile tail and an isometric capsid. The isolated DNA was digested using 5 different endonuclease restriction enzymes and the fragments were observed by performing a gel electrophoresis. The genome size was estimated to be about 34,800 basepairs from the EcoRI digest. These results were then compared with other phages in the Mycobacteriophage DataBase and showed many similarities to bacteriophage categorized in Cluster G, based on restriction digests and electron microscopy pictures. The genome was then sequenced with 454 Pyrosequencing and confirmed a length of 41,882 base pairs. We then did positional annotation using the HHMI workflow and BLASTp as resources. Using the GeneMark, and Glimmer calls, we
called 61 genes, including a possible novel gene, and confirmed Annihilator’s placement in Cluster G. We then used HHpred to determine possible functions for our gene calls. There appears to be at least three operons, with only one gene on the reverse strand. This phage has remarkable similarity to several Cluster G phages, with many genes identical to phages BP6, Halo, and Angel. This new phage will increase the knowledge of known phages and expand the characterization of different clusters of mycobacteriophages.

Failing the Future: Discourses on Postwar Reconstruction and Society in Italian Neorealist Film
Sophia Cinel
Mentor: Jennifer Kapczynski

The post-war period in Italy was one marked by rapid political transformation, extreme economic hardship and a reworking of social structures which had been established during the Fascist regime. One artistic phenomenon that emerged during this era of drastic national change was the Italian neorealist movement in film. These films were characterized by their innovative formal techniques which lent them an air of gritty realism unprecedented in the international film industry. In this thesis, I explore the role of the child in neorealist films in relation to that of the adult, as well as the portrayal of adult characters in and of themselves. The films of directors Vittorio De Sica, Roberto Rossellini and Luchino Visconti were used as examples. I begin by exploring the ways in which the child character subverts the adult and then is ultimately corrupted by the adult character, leading to the child’s own—sometimes fatal—downfall. Further research focuses solely on the figure of the adult, and how the adult characters interact—or fail to interact—with one another in the films. I explore two types of adult characters—the unappealing and the passive—and how each can be read as representative of Italians during the postwar period. Through the study of these relationships, Two implications suggested by neorealist directors were discerned. Firstly, these directors were able to show that the way Italian society was executing its post-war recovery process was clearly not working. And secondly, they demonstrated to audience members the potentially grave consequences if post-war Italian society continued on this path.

Interactions between Emotion and Semantics in Linguistic Processing
Emily Cokorinos
Mentor: David Balota

This work aims to examine the ways in which emotion and mood state interact during linguistic processing, specifically, to tease apart some of the corresponding cognitive and neural processes. The research explores differences in the semantic processing of highly emotional stimuli when participants are in either positive or negative moods. Both emotional and sentence-level semantic contexts are known to affect the ease with which individuals are able to process language, but when considered together it is unknown which context will dominate: the congruency of the participant’s mood state with the valence of the sentence-final word or the congruency of the sentence’s local context with the sentence-final word. Before sentence presentation, participants were presented with either positively or negatively valenced International Affective Picture System images to induce global mood state. Participants were then presented with emotional sentences, which were either positively or negatively valenced and which ended with either semantically congruent or incongruent final words. Sentences were tested in an ERP paradigm focusing on the N400 component, and later in a speeded naming time task. Plausibility ratings for each sentence were collected to characterize the stimuli. Main effects of emotional congruence and sentence-level semantic congruence were found. However, overall, sentence context effects were much stronger than emotional context effects. Positive mood participants showed an effect of sentential congruency only for the mood incongruent items. Discussion focuses on the combined influence of global mood and local sentence context.

Religiosity and Politics
Rebecca Craig
Mentor: Heidi Kolk

Since the inception of the United States of America, religion has played an integral role in politics. Religion, traditionally Judeo-Christian faiths, have historically infiltrated the political institution a variety of ways, from dictating the very language of the Constitution to inspiring the political rhetoric government officials have invoked to garner support for binding legislation on countless controversial issues. Although traditionally overlooked, contemporary researchers have begun to recognize the importance religion has played in personal politics; directing and influencing individual voting habits in presidential elections. This work concludes that it is not one’s religious affiliation that instrumentally guides their own candidate selection and voting patterns, but the degree to which an individual embraces, interacts with and values the role of religion in their lives. The work critiques the simplified past hypothesis regarding the relationship between religiosity and voting behavior; as outdated studies have attempted to predict an individual’s voting behavior based
on the supposed voting “patterns” of an entire group (religious denomination) of people. Supported by evidence from present-day, expert academics in the field, various institutional data analysis and an in-depth look of the politics of religion in the 2012 Republican presidential primaries, this research proves the need for a restructuring and reexamination of the manner in which traditional assessment of religion and politics is conducted.

HUMACHINATION
Sarah Croop
Mentor: Heidi Kolk

The significance of the image is under duress. In our digital age of the Internet and subsequent spawned social networks like Facebook, communities across the globe have the power for instantaneous connections. The rapid circulation of information across the World Wide Web puts unnatural pressure on the meaning of the singular photographic image.

A digitized image's pixels are deconstructed and reassembled in every instance that the image appears on the Internet. In its circuitous deconstruction and reconstruction, the digital photograph is proliferated to a ghost of itself, disseminated across the entire globe.

The shared digital photograph no longer represents the moment recognized by the photographer’s eye. Instead it takes on a new life as an instrument for productive creative discourse in a larger social network.

This project repurposes photographs from an abandoned family photo album discovered in a St. Louis antiques store. The found images are revitalized in a sculptural piece. Using digital imaging techniques including steps of scanning, printing, photographing, and re-printing, I processed the original black-and-white photographs to represent my experiences with remembering the past. The resulting images express the fogginess of memory and the longing inherent to nostalgia.

Since family photographs are some of the most conventional photographs, with stereotypical poses and performed familial roles, family photo albums are accessible to a broad audience. My sculptural piece takes the standard family photographs out of their expected context and recycles the images in a public sphere. Display of these unconventional images in a playful interactive art piece invites audiences to explore alternative uses for a photographic image.

BECOMING SINGAPORE AND RICH: SINGAPORE AND MALAYSIA’S NATURAL EXPERIMENT WITH PROPERTY RIGHTS AND ECONOMIC GROWTH
Stuart Davis
Mentor: Andrew Sobel

The recent global economic downturn has reinvigorated the question of economic growth. This research aims to elucidate the causes for economic growth by examining the particularly revealing case of Singapore and Malaysia. Since the emergence of Malaysia and Singapore as two independent countries in 1965, and despite their structural and cultural similarities, the Singapore economy grew at a significantly faster pace than Malaysia. I posit that this puzzling divergence in growth trajectories is a function of Singapore’s relatively stronger commitment to property rights demonstrated by their more credible network of laws, regulatory institutions and commercial practices. Moreover, the natural experiment design, afforded by the exogenous relationship between Singapore and Malaysia’s separation and their respective property rights regime, offers a novel insight into how the specific institution of property rights affect countries’ development.

CHARACTERIZATIONS AND FUTURE PROJECTIONS FOR MYCOBACTERIOPHAGE JERM
Alana Deutsch, Mikala Evans and Rohit Jaswaney
Mentor: Sarah Elgin

Mycobacteriophage Jerm was isolated outside the south side of the Knight Center in Washington University in St. Louis and purified using Mycobacteria smegmatis. The plaque morphology showed small, turbid plaques, signifying a temperate phage. A 10-plate infection was performed, and the high titer lysate was used in the extraction and collection of pure phage DNA. The DNA was digested with restriction endonucleases and run through an agarose gel with a molecular weight standard. This generated an approximate genome length of 38,000 base pairs. Electron microscopy was then used to take images of the phage for measurement and comparison purposes.

The head was spherical with an average width of 54.0 nm and an average length of 53.0 nm. The tail was estimated to be 119 nm long. These images are conclusive that Jerm is a siphoviridae morphotype. Restriction enzyme digest results led to the prediction that Jerm was a Cluster A phage. After the DNA was sequenced, a protein BLAST analysis was used, and helped confirm the prediction that Jerm belonged to Cluster A, while further providing evidence that Jerm belongs in the A2 subcluster. Other programs, including Apollo, GBrowse, NCBI protein blast, and HHpred, were used to examine and annotate Jerm’s genome. This revealed a total genome length of 52.69 kbp and 93 ORFs. Jerm’s sequence was also found to contain one tRNA gene, many structurally coding genes on the left arm, and
process related genes, like the integrase gene, on the right arm. Functions were compared to other phages via a genome map. This study effectively continues the ongoing research of the Howard Hughes Medical Institute’s initiative to analyze and classify mycobacteriophage. The research can help further classify other strains of phage, and can also be used to relate phages already classified by the institute.

**ISOLATION AND COMPARATIVE GENOMIC ANALYSIS OF THE MOSAIC ARCHITECTURE OF MYCOBACTERIOPHAGE RUFUS BETWEEN OTHER CLUSTER A PHAGE**

**Britt Devore, Jordan Grainger, and Alec Zimmer**

Mentors: Sarah Elgin and Kathy Hafer

Rufus is a mycobacteriophage isolated from a soil sample obtained from Mudd Field on the Washington University in Saint Louis campus. When cultured with *Mycobacterium smegmatis*, non-turbid plaques ranging in diameter from 0.20cm to 0.50cm appeared, suggesting a lytic phage had been isolated. Electron Microscopy imagery analysis indicated Rufus belongs to the class Siphoviridae based on its isometric, 53nm diameter head and flexible, 120nm tail. Following Roche 454 pyro-sequencing, it was determined that Rufus had a genome length of 52,350 bp, coding for 93 proteins. Comparison with other mycobacteriophages with similar plaque morphologies, head and tail characteristics, restriction digests, and gene and protein calls all suggested grouping Rufus in cluster A1. While the genome architectures of the A1 phages, such as U2 and Bethlehem, are similar, Rufus's genome possesses mosaic architecture. This is particularly evident in the right arm of the genome. Comparisons with A1 bacteriophage Dreamboat suggest that Rufus has an insertion of approximately 21,000 bp between positions 44,000bp and 47,000bp. This insertion includes a gene with similarities to transposases found in *Mycobacterium avium*. Interestingly, despite its determined lytic characteristic, Rufus encodes a serine integrase gene typically characteristic of lysogenic phage. This gene can also be found in many A1 phages, and similar genes can be found in some A5 and A10 phages.

**THE LIFE OF THE (TEA) PARTY: THE TEA PARTY AND THE EFFICACY OF SOCIAL MOVEMENTS**

**Ariel Dobkin**

Mentor: William Lowry

In this research I examine the efficacy of the Tea Party based on its ability to attract support and pursue a specific legislative agenda. In order to accomplish its goals and be a lasting force in politics, a political movement needs to achieve three factors of success: a Substantial Constituency, Policy Specificity, and tangible Legislative Influence. A computational model is utilized to determine that the Tea Party has reached the critical mass of followers necessary to effectively pursue goals. Survey data from 2010 and 2011 is used to determine that the unifying issue of the Tea Party is fiscal responsibility and the role of government. Because Tea Partiers share this narrow interest, I argue that they can accomplish their goal if they focus and function as an interest group. The Anti-Saloon League’s push for Prohibition is used as a comparative case study to demonstrate the increase in efficacy that comes with consolidation of a disparate movement. This work makes a larger point about social movements in general; with a Substantial Constituency, Policy Specificity, and the organization that leads to Legislative Influence, any movement can be successful.

**A TOUGH BALANCING ACT: INSTITUTIONAL AND POLITICAL FACTORS IN THE BUDGET PROCESS**

**Corey Donahue**

Mentor: John Patty

This research examines both the effectiveness of congressional budgeting rules that have been put in place over the last two decades as well as the impact of public opinion regarding the size of the deficit. The issue is important both to settle past debates regarding the value of budgetary procedure and also in order to understand how best to restrict the growth of future deficits. This study attempts to differentiate itself by combining an examination of the legislative history of important budgeting laws with a quantitative analysis. In the work, I argue that while public anger over the deficit is important for congressmen to reach agreement on how to eventually balance the budget, the implementation of lasting institutional restraints on discretionary spending is an effective method to reduce the deficit.

**MORALES’ BOLIVIA: A NEW PARADIGM IN EGALITARIAN GOVERNANCE?**

**Alieza Durana**

Mentor: Bret Gustafson

This research seeks to understand how issues of income inequality can be addressed through public policy and how these policies relate to models of political authority and the state. Over the last decade, many Latin American states have developed new strategies of governance to address the issue of socioeconomic stratification. I am interested in Bolivia as a case study, given the policy changes that have occurred during the Morales administration. Since taking office in 2006, President Morales has enacted both universal and targeted
social policies to address socioeconomic disparities in Bolivia, mainly through the nationalization of hydrocarbons, and the allocation of the subsequent resource revenue to various social policies. This research examined the Juancito Pinto and Renta Dignidad cash transfer programs passed under the MAS-IPSP administration to evaluate whether Morales’ policies are indicative of a larger paradigm shift in Latin American governance – a shift in how authority is claimed politically, how political authority legitimizes itself thereafter, and what poverty-reduction measures are both materially and politically feasible in the Bolivian institutional context.

Eventually, I determined that while the general material aspects of these two programs are insignificant, the nationalization of gas and oil has paved the way for public hydrocarbon taxes to fund social policy expansion. Furthermore, a significant shift in rhetoric of the role of the state and the notion of human rights has resulted from the funding shifts. In essence, President Morales has set an important precedent in terms of how pro-poor policies are articulated in Bolivia, and more largely in Latin America. Rather than continuing with the technocratic styling of his predecessors, Morales has assumed a hybrid form of moral and legal authority. Under his rights-based approach to governance, Bolivian citizens (or rights holders) are empowered to demand social and economic policy measures to ensure their own wellbeing.

**HEALTH, HEALING AND RELIGIOSITY IN THE RITUAL PRACTICE OF BIKRAM YOGA**

*Elan Elyachar-Stahl*  
Mentor: Rebecca Lester

This work uses a both and approach in order to deconstruct health, healing and religiosity in the ritual practice of Bikram Yoga. Just as Weber distinguishes between *gemeinschaft* (community) and *gesellschaft* (society), I consider Bikram Yoga in the contexts of both community and society. By recognizing that community and society, though interrelated, are separate entities, this research analyzes Bikram Yoga as both a religious practice for many individuals (community), and as a temporal and historical product of Yoga in the United States of America (society). I develop a thick description of how Bikram Yoga is adapted as a religion, employing Foucault’s notion of *technologies of self* as the mechanism through which Bikram yoginis lead a supremely moral life. I then prove that Bikram Yoga is a product of the modern capitalist ethos, which culminates in a discussion that links Yoga, immortality and capitalism.

**RECOMBINEERING IN *STAPHYLOCOCCUS AUREUS***

*Ezinwanne Emelue*  
Mentor: Petra Levin

*Staphylococcus aureus* is a gram-positive bacterium and significant pathogen. Due to its inherent ability to divide in three perpendicular planes, *S. aureus* grows in grape-like clusters. How *S. aureus* orchestrates this complicated division pattern is not well understood, a problem compounded by *S. aureus*’ resistance to genetic manipulation. To make genetic manipulation easier, a new strain is being developed that ideally will allow use of “recombineering” for generating mutations in *S. aureus*’ genome. Recombineering or recombination-mediated genetic engineering is a fast process that permits insertion of DNA or oligonucleotides encoding the desired mutation directly into an organism’s genome utilizing recombination proteins. This work seeks to adapt recombineering to *S.aureus* to create rifampin resistant mutations in *rpoB* at a high frequency. Resistance to rifampin results in an observable phenotype, growth on rifampin, *rpoB* serves as a model gene to test whether recombineering can be achieved in *S. aureus*.

To select for mutants in *S. aureus* that confer rif resistance, the recombinase *recT* was cloned from *S.aureus* into a plasmid that permits expression of *recT*. Then the plasmid was electroporated into a restriction minus strain of *S.aureus* to generate methylated *recT* plasmid, which was then electroporated into wild type *S.aureus*. I am currently cloning *recT* from *L. reuteri* into a plasmid as well to compare the efficiency of recombineering with each RecT. To select for rif-resistant rpoB-mutants, wild type *S.aureus* were plated on TSA-rifampin. These mutants were then sequenced and analyzed for a consensus point mutation that yields a rif-resistant phenotype. I then generated oligos homologous to the region of *rpoB* encoding this mutation. Ideally, if recombineering works, electroporation of these oligos into *S.aureus* in the presence of RecT will increase levels of rif-resistant recombinants.

**GENOMIC ANALYSIS OF MYCOBACTERIOPHAGE BROSEIDON**

*Brody Frink, Satchel Siegel, and William Strober*  
Mentor: Sarah Elgin

Mycobacteriophage Broseidon was isolated from soil found in St. Louis, Missouri at coordinates 38.643055 N, 90.301944 W. It was purified, analyzed, and then DNA was extracted and sequenced. It infected *Mycobacterium Smegmatis* and formed turbid plaques. The
phage has a hexagonal head with a length of 46.3 nm and a flexible tail with a length of 136.0 nm, putting it in the family Siphoviridae. The genome was sequenced, and determined to be 51,361 base pairs in length, with 87 open reading frames. It was originally determined to be part of Cluster K, but it shows an extremely similar nucleotide sequence to other Cluster A4 phage, especially with MeeZee. It is organized into two arms, the left arm containing genes that are transcribed in the forward direction, most of which have structural functions, consistent with MeeZee. The right arm contains genes that are mostly transcribed in the reverse direction, which have a variety of other functions, including an integrase gene and other related genes. There is a notable difference between Broseidon and other Cluster A4 phages at the transition point between the left and the right arm. Abdiel, another A4 phage had a different gene call for its integrase, having a shorter sequence for this particular gene. An attP location is being searched for and assumed to exist based on plaque morphology.

VOLUMETRIC CHANGES IN SUBCORTICAL REGIONS IN CHILDREN WITH TOURETTE SYNDROME

Olivia Frosch
Mentor: Bradley Schlaggar

Tourette syndrome (TS) is a developmental neuropsychiatric disorder characterized by chronic motor and vocal tics. Disturbances in cortico-striato-thalamo-cortical (CSTC) circuitry have been implicated in the pathogenesis of TS. Subcortical structures involved in this circuitry have been examined for TS-related volumetric abnormalities in adults and children with TS, with and without comorbid diagnoses and on and off of medications used to treat the disorder. Prior results do not appear to converge on a set of structural abnormalities characteristic of TS, though reductions in the volume of the caudate nucleus have been identified in multiple studies. In the present study, subcortical volumes were obtained from high resolution MRI scans from 29 participants with TS and 29 age-matched control participants. Comparisons between these two participant groups revealed a significant decrease in the volume of the left hippocampus, and marginally significant reductions in the volume of the left putamen and left nucleus accumbens. Within the TS group, individuals with more severe symptoms had smaller bilateral hippocampus volumes, and the participants with comorbid psychiatric diagnoses had a reduction in the volume of the right globus pallidus. Caudate volumes did not differ between groups, however the participants with TS who were taking medications had smaller left caudate volumes. In addition, increased tic severity was associated with an increase in the volume of the caudate nucleus. The caudate findings indicate that medication could be mitigating tic severity via the caudate nucleus. The findings in the hippocampus indicate that the limbic portions of the CSTC circuitry are likely involved in TS.

LATERALITY FOR SIMPLE BEHAVIORS AND TOOL USE TASKS IN CAPTIVE AND WILD APES

Christopher Fuertges
Mentor: Crickette Sanz

Humans exhibit a strong species-wide preference for right-handedness that may be related to hemispheric specialization of the brain. This specialization allows for language and other advanced cognitive abilities thought to be unique to the human species. How such handedness developed is a topic of debate and many studies on ancient humans have aimed to determine how such a shared preference fits into our evolution. Aside from the hominin lineage, our closest living relatives, the great apes, are often a focus of research on handedness. Researchers have studied behaviors ranging from simple reaching to complex tool-use in order to determine if hand preferences exist in hominoids as they do in humans. This study uses data from three species of captive apes and one population of wild chimpanzees. I recorded hand use during instances of feed-forage and object manipulation behaviors performed by chimpanzees, gorillas, and orangutans housed at the Saint Louis Zoo, St. Louis, MO. Additionally, hand and foot use was recorded from video footage of seven different tool-use tasks performed by chimpanzees in the Goualougo Triangle, Republic of Congo. A relatively weak individual-level lateralization was displayed for the simple tasks performed by the zoo apes, while a strong individual-level lateralization was displayed for the complex tasks performed by the Goualougo chimpanzees. Results support suggestions that lateralization increases with task complexity and that population-level hand preferences exist among the great apes. However, these preferences do not approach the species-level right-hand preference documented in humans. Lateralization in hand use is present throughout a wide range of primates, but how it became so prevalent in modern-day humans is a question that can only be answered with further research.

DEFICIENCY IN HEPATIC MTTP REVERSES GALLSTONE SUSCEPTIBILITY IN L-FABP KNOCKOUT MICE BY REDUCING CANALICULAR CHOLESTEROL SECRETION

Ho Yee Joyce Fung
Mentor: Nicholas Davidson

Cholesterol gallstone disease (GS) is a common affliction that is linked to the imbalance of biliary lipid content, including cholesterol (CH), phospholipids (PL) and bile acids (BA), which results in the precipitation of cholesterol crystals. This study is aimed at examining
the role of liver fatty acid binding protein (L-Fabp) and hepatic microsomal triglyceride transport protein (Mttp) as genetic modifiers of the gallstone susceptibility trait.

L-Fabp is a cytosolic cholesterol sensor that regulates hepatic lipid metabolism; Mttp regulates lipoprotein assembly and secretion from hepatocytes into plasma, but its role in biliary canalicular lipid secretion remains unknown. Our earlier studies showed that L-Fabp -/- mice exhibited increased susceptibility to diet induced GS through increased biliary CH secretion. Other studies demonstrated that liver specific Mttp deletion (Mttp-LKO) prevent diet-induced GS by increasing biliary PL secretion. My studies explored the hypothesis that hepatic Mttp deletion in the L-Fabp null background would abrogate diet induced GS formation. Accordingly, we used two strategies to generate mice with deficient hepatic Mttp in the L-Fabp -/- background, through conditional genetic Mttp deletion (L-MttpLKO) and antisense mediated Mttp knockdown (L-MttpASO). We fed all groups of mice a lithogenic diet for two weeks and evaluated GS formation, serum and hepatic lipid content, biliary lipid secretions and gene expression of hepatic lipid transporters and lipogenic genes.

After LD feeding for two weeks, L-MttpLKO and L-MttpASO mice were both protected against GS formation when compared to their control mice respectively. There was decreased biliary H secretion in L-MttpLKO mice. L-MttpASO mice exhibited the same trend with a significant decrease in the expression of the cholesterol transporters. These data suggest that ablation of hepatic Mttp protects L-Fabp -/- mice from diet-induced GS formation by reducing canalicular CH secretion and implies that Mttp plays a dominant role in pathways regulating canalicular CH secretion.

**CHARACTERIZATION AND ANALYSIS OF MYCOBACTERIOPHAGE ABDIEL**

Jamal Gaddis, Justin Muste, and Lukas Rees  
Mentor: Sarah Elgin

A temperate phage, Abdiel, able to infect *Mycobacteria smegmatis* was isolated after five rounds of purification from an enriched soil sample taken from a drainage ditch on the Washington University in St. Louis Danforth campus. Initial characterization by Electron Microscopy indicated Abdiel has a head of 45.2 nm x 46.6 nm and standard restriction digest indicated Abdiel shared some features with cluster C phages in the National Genomics Research Initiative Mycobacteriophage database. In Electron Microscopy imaging we failed to observe a tail, a feature inconsistent with previously observed phages. 454 sequencing was used to establish the complete phage genome sequence of 51 kbp, with eighty-seven ORFs organized into two clusters. Functions were assigned to the products of ORFs based on comparison of the predicted amino acid sequence to previously observed amino acid sequences. A protease, methylase, helicase, peroxidase and integrase are several interesting features of the genome. The presence of an integrase and cloudy phage plaques suggest Abdiel is a temperate phage. Moreover, functional analysis revealed Abdiel is an A4 phage closely related to phages Peaches and Eagle. Examination of the tape measure region is underway to assess the possibility of an unstable tail.

**REDEFINING AMERICAN FASHION:**

**HOW MODERN CULTURAL TRENDS LAUNCHED A NEW FASHION PHENOMENON**

Christopher George  
Mentor: Heidi Kolk

Fascinated by the widespread permeation of fashion in popular culture, media, and daily life, I have created this exhibit to highlight many of the complex attributes of the late 1980s and early 1990s environment that shaped modern fashion. Each board of this exhibit illustrates one of the broad, key concepts, with several points exploring different events and elements of the key concepts. There is no order for exploring this exhibit, as I encourage viewers to experience the concepts in the intertwined, organic manner in which they took place, rather than an artificially chronological or thematic order. Over the relatively short period of time, there were a great number of changes in popular culture, media, and fashion. Some of the changes occurred as consequences of others, while some changes occurred in parallel.

American fashion existed as an important entity before the period of the exhibit. Ralph Lauren, Bill Blass, and James Galanos are a few of the greatest designers of the twentieth century, but I believe they operated in an entirely different environment and that their products were available for only a very small portion of the American population. Additionally, the designers that I have mentioned are only a few of the influential designers of the time and were chosen for their relevance and contribution to the conceptual boards they are referenced on. The exhibit is by no means comprehensive, but rather is meant to offer a snapshot of some of the more significant trends and events that have helped to shape current fashion.

Degian Ghebermicael  
See Philip Chen
ACTING OUT THE RABBINIC SCRIPT: THE LEGAL POSITION OF THE ANDROGYNOS IN RABBINIC LITERATURE

Philip Gibbs
Mentor: Pamela Barmash

Despite the gendered nature of the Jewish tradition, the ancient rabbis create a highly nuanced understanding of diverse sexualities. They lay out a number of categories that defy the binary distinction between males and females. One of these categories, the androgynos, describes a figure that is intersex, meaning that the genitalia are not clearly either male or female. Though the texts of rabbinic literature do not give a physical description of the androgynos, the ancient rabbis use ritual obligation to define the gender role of the figure thereby defining the androgynos as a figure with both male and female genitalia. To understand the gender role created by the rabbis, I read the ancient legal literature using the perspective of post-modern gender theory to see how the rabbis construct both gender and sexuality. Though the rabbis understand sexual difference as clearly biological, their discussion of problematic categories reveals what sort of priorities they maintain when constructing the sex and defining the gender role of the androgynos. The rabbis balance their desire for exploring the theoretical ambiguity of difficult categories with their desire to maintain strict gender roles. The rabbis rule that the androgynos must act like a male in many situations, but they acknowledge the ambiguity of the figure through a number of ways. I observe how the different genres of rabbinic literature are able to face the ambiguity inherent in the ambiguous body of the androgynos and compare their treatment to other possible responses to intersexuality. I found that the rabbis rule that the androgynos performs as a male, demanding that the figure takes part in a number of significant rituals while not allowing the androgynos to enjoy the privileges and power associated with the male role in Jewish ritual law.

“MY DAUGHTER WILL CHOOSE”: THE SEXUAL NARRATIVES OF TWENTY MAASAI WOMEN

Alannah Glickman
Mentor: Shanti Parikh

The Maasai of East Africa are idealized in the West as an example of a “traditional” African ethnic group. In addition to their decorative dress and pastoralist production methods, the sexual practices of the Maasai are often viewed as “promiscuous,” “primitive,” and distinctly non-Western. The purpose of this study is to de-mystify Maasai sexual practices through the use of twenty sexual narratives of Maasai women. This study was conducted between April 8 and April 30, 2011 in Mto wa Mbu, Tanzania and surrounding villages. Twenty females belonging to three different generations interviewed about their “lived” sexual experiences as well as the future of Maasai sexual traditions. Four main sexual practices were discussed: esoto, female circumcision, marriage, and sexual intercourse itself. I analyze the data using descriptive analysis. The women’s personal experiences and opinions about change demonstrate that sexual practices are indeed undergoing major changes. Esoto, a night ritual during which ndito (girls) and ilmurran (warriors) flirt, dance, and have sex, is going out of practice in the area. While female circumcision is still practiced, it is done so in private. In terms of marriage, the number of wives per man is decreasing and educated women now have the option of choosing their own husbands. Women are also becoming more active participants in sexual intercourse. The interviewees highlighted the following as causes for these changes: government influence, education, contact with outsiders, and religion. The majority of the women expressed positive feelings about the changes. Furthermore, the variation present among the narratives highlight the dichotomy between the historical “ideal” and lived experience. These gaps underscore the complexities of Maasai sexuality, challenging the Western notion of an “African sexuality.”

ON-CHIP SCREENING OF EXPERIMENTAL CONDITIONS FOR THE SYNTHESIS OF NOBLE-METAL NANOSTRUCTURES WITH DIFFERENT MORPHOLOGIES

Jennifer Grant
Mentor: Younan Xia

The applications of nanostructures critically depend on their morphologies. Although significant progress has been made in the chemical synthesis of nanostructures with a variety of different morphologies, it is still highly desired to develop an approach that allows one to quickly identify the best set of parameters for nanostructure syntheses. Herein, an on-chip approach to the rapid screening of experimental conditions pivotal to the production of nanostructures with different morphologies is reported. The key component of this approach is an array of reactors containing solutions with a one- or two-dimensional gradient in reagent concentration, pH value, or reaction temperature. In the proof-of-concept experiments, the parameters needed for the production of Au and Pd nanostructures with various morphologies are quickly identified. In principle, this approach can be extended to other systems for rapid screening and optimization of experimental conditions involved in the syntheses of different types of nanostructures.
INVESTIGATION OF POTENTIAL NUCLEIC ACID-ASSOCIATED PROTEINS IN *Tetrahymena thermophila*

Emily Gray, Betty Zhang  
Mentor: Douglas Chalker

TTERM_00760380 ("Smr-containing protein") is a 2442 base pair gene in *Tetrahymena thermophila* that encodes a 673 amino acid protein containing one small MutS-related (Smr) domain and two CUE domains. Smr domains exhibit nicking endonuclease activity and have been suggested to interact with MutS proteins. CUE domains have been shown to bind ubiquitin. TTERM_00218980 ("G-patch protein") is a 1799 base pair gene that encodes a 599 amino acid protein containing one G-patch domain. G-patch domains are associated with RNA-binding proteins. Both proteins of interest were hypothesized to show nuclear localization. The Smr-containing protein was hypothesized to be involved in either DNA repair or recombination during meiosis in the micronucleus and the G-patch protein was hypothesized to be involved in telomere addition in the macronucleus. To gain information on protein localization within the cell, a pICY expression vector containing the genes of interest fused to a fluorescent tag (YFP) was constructed and transformed into *Tetrahymena* cells and visualized under UV light. In both vegetative and conjugative cells, the Smr-containing protein was evenly distributed throughout the cytoplasm. In both vegetative and conjugative cells, the G-patch protein showed punctate structures within the macronucleus. To investigate expression variation throughout the cell life cycle, reverse-transcriptase PCR was performed on growing, starved and conjugative cells at 3, 6, 9 and 12 hour time points. The Smr-containing protein was shown to be constitutively expressed throughout the cell life cycle. The G-patch protein was upregulated in late conjugation. Further studies with the Smr-containing protein will include localization of the protein immediately following DNA damage by UV irradiation to investigate its potential function in DNA repair. Further studies with the G-patch protein will include a co-localization with a known nucleolar protein and a known telomerase holoenzyme protein to differentiate whether the protein is nucleolus or telomere-associated.

PERSONALITY, CLOSE RELATIONSHIPS, AND DEPRESSION: THE IMPACT OF DEPRESSION ON PERSONALITY PERCEPTION OF FAMILY MEMBERS

Sarah Griffin  
Mentor: Thomas Oltmanns

Although self-report measures are the most obvious method of assessing personality and, consequently, are the most frequently used assessment technique, research has shown that informant reports provide unique information not otherwise provided by self-reports. Spouses are the most common sources of informant reports on personality, as they historically have had the highest levels of agreement with self-reports, but recent research exploring other sources of informant information have shown that family sources (e.g., siblings) can reach similar levels of agreement as spousal informants. Reported inconsistencies in depression's impact on long-term personality, and reports of changed or strained close relationships due to depression led the present study to address the question of whether depression impacts self-other agreement on personality, between the self and a family member. It was expected that spouses would have the highest levels of self-other agreement, and that a lifetime depression diagnosis would be associated with lower self-other agreement for all informants. Data was collected from a regionally representative, community-based sample of 1,630 adults, from which individuals with a spouse, sibling, or child informant were selected. Both participants and informants completed the NEO-PI-R on the participant's personality, and participants were screened for a lifetime diagnosis of depression. Results show that child and sibling informants showed levels of agreement not significantly different from spouses. Also, depression did not impact self-informant agreement of personality; except, self-other agreement on neuroticism was significantly higher for children whose parent qualified for a lifetime MDD diagnosis than children whose parent did not qualify.

Mitchell Hallman  
See Claire Brownstone

PRIMARY CAUSES OF THE EASING OF RESTRICTIONS ON THE CUBAN CATHOLIC CHURCH IN THE 1990S

Maxwell Hamilton  
Mentor: Joseph Schraibman

The relationship between the Roman Catholic Church in Cuba and the Castro-led Cuban government experienced a dramatic transformation in the 1990s. For the first time since the Cuban revolution, the government allowed the Catholic Church more freedom within the public sphere, and the Church in turn used its institutional abilities to achieve a greater degree of collaboration with the communist government than was previously thought possible. In the wake of these and far reaching changes in church-state relations, it is important to determine how these developments came about. In this work, I argue that the worldwide rise of liberation theology and the progressive church, the fall of the Soviet Union, and the perpetuation of an aggressive U.S. policy towards Cuba were all primary
influential factors in allowing for the reforms and improved relationship of the 1990s between Church and State in Cuba.

This analysis of the causes of reform in 1990s Cuba uses primary sources from the Castro government, the Cuban clergy, and the international Catholic community to map the changing ideological dynamics between the Church and government from the 1960s to the 1990s. I argue that liberation theology and the development of the progressive church served as a clear means of ideological reconciliation between the Cuban Catholic Church and communist government. I turn to a historical analysis of the fall of the Soviet Union, arguing that it was a catalyst for societal change within Cuba. Finally, I explore the evolution of U.S. policy toward Cuba, investigating how the Catholic Church maintained its relevance within Cuba through its opposition to the embargo. This research allows for an analysis of the factors that led to the transformation in church-state dynamics within Cuba, as well as a better understanding of the current position of the Catholic Church within Cuban society.

**SHARING RESEARCH, SHARING METHODS:**
**CREATING A DIGITAL COMMUNITY FOR AMCS STUDENTS**

Genevieve Hay  
Mentor: Heidi Kolk

Over the past few years, higher education has seen growing interest in digital humanities scholarship and undergraduate research, and academics in sociology and cultural studies increasingly stress the importance of making research public. On a pedagogical level, most cultural studies programs encourage undergraduate students to engage in interdisciplinary research and explore multiple modes of inquiry in classes, with faculty, and with their peers.

In an attempt to unite these goals, I studied digital presentations of academic work and examined how these approaches could be cultivated to serve a broad audience of undergraduate scholars. I interrogated presentations of public work in American culture ranging from academic e-journals, blogs and wikis, to news websites like NPR. The research was applied by building a website for students to submit conversational, yet academically informed work in American culture. By creating a website that borrows its style and objectives from both scholarly sites and public news sources, it is hoped that students can transform their academic work into reflections that are accessible to students from many disciplines and discuss research methods with their peers.

**THE IMPLICATIONS OF KINSHIP, RELIGION, AND ECONOMY FOR NAVAJO REPRODUCTIVE HEALTH**

Emily Heller  
Mentor: Carolyn Sargent

Unfortunately, Navajo women continue to possess poorer maternal health indicators than women in the United States population overall. Navajo births usually occur in a hospital setting under biomedical supervision. Thus, a lack of biomedical care during birth cannot explain the maternal health disparity between the Navajo and the United States population as a whole. Other factors, such as inadequate prenatal care or nutrition, stress, and poverty are all possible causes of Navajo women's relatively poor maternal health outcomes. In this project, archival research was conducted using past ethnographies of the Navajo and statistical data, in order to examine various aspects of Navajo culture and life, including kinship, religion, and economy. I analyzed the data to determine these variables’ influences on maternal health status. While traditional reproductive, kinship, religious and economic beliefs and practices grant women status and resources, the Navajo’s location as a marginalized group within the larger national economy leads to poverty and the associated health consequences. Future efforts to improve the maternal health status of Navajo women should focus on removing economic barriers to optimal health and reproductive outcomes.

**SEPARATE PEOPLE, ONE PEOPLE: CREATING JEWISH ST. LOUIS, 1880-1940**

Marc Hendel  
Mentor: Margaret Garb

St. Louis Jews and Jewish institutions were far from unified. In the 1880s, the already established German Jewish population was faced with a mass immigration of Yiddish-speaking Eastern Europeans. Language was one of the many fragmenting forces. Differences in geography, religious beliefs, and economic status resulted in the formation of separate synagogues, charitable institutions, and newspapers. By the 1920s, the Jews of St. Louis, whether from Eastern Europe, Germany, or the United States, came to see themselves as having common interests and formed shared institutions. Organizations initially founded and supported only by German Reform Jews began to unify the diverse Jewish population by providing venues for social interaction. Zionism spurred separate groups to unite both politically and economically. With the onset of the Great Depression, Jewish institutions were financially centralized in order to save administration costs, further uniting previously separate groups. This study, through the lens of immigrant history, traces the ways that St. Louis immigrants fashioned a new collective Jewish identity in an American city.
CEREBRAL BLOOD FLOW RESPONSES TO DEEP BRAIN STIMULATION OF THE DORSAL AND VENTRAL SUBTHALAMIC NUCLEUS CORRELATE WITH GAIT AND BALANCE RESPONSES IN PARKINSON DISEASE

Kelly Hill
Mentors: Gammon Earhart and Joel Perlmutter

Deep brain stimulation (DBS) of the subthalamic nucleus (STN) is a common therapy for Parkinson disease yet its effects on gait and balance are variable and the underlying mechanisms remain unclear. Anatomical evidence suggests heterogeneity within the STN region but the degree to which stimulation location within the region influences outcomes is not well established. The purpose of this study was to (1) compare effects of stimulation of dorsal versus ventral STN region on gait, balance and regional cerebral blood flow (rCBF) and (2) examine relationships between changes in rCBF and changes in gait and balance induced by stimulation of dorsal versus ventral STN region. We employed a validated atlas registration process to locate and selectively stimulate electrode contacts in the dorsal and ventral STN regions of 37 individuals with Parkinson disease with bilateral DBS. In a within subjects, double blind and counterbalanced design, controlled for stimulation parameters, we evaluated resting state rCBF in a priori regions of interest (PET imaging with $^{15}$O labeled water), gait velocity, cadence, stride length, and balance during each of three stimulation conditions: DBS Off, unilateral D STN DBS, and unilateral V STN DBS. Stimulation of either site increased stride length without producing significant group level changes in gait velocity, cadence, or balance. Stimulation of either region increased rCBF in subcortical regions near the stimulation site and produced variable changes in cortical and cerebellar regions. Stimulation induced changes in gait velocity related to rCBF changes in the premotor cortex during V STN DBS ($r = -0.40, p = 0.03$) and to rCBF changes in the cerebellum anterior lobe during D STN DBS ($r = 0.43, p = 0.02$). Blood flow decreases in these regions were associated with gait velocity improvements. These relationships were dependent on location of stimulation, suggesting that DBS may produce similar motor outcomes by distinct mechanisms that vary with stimulation location.

ACCESS DENIED: POTENTIAL AND REALIZED ACCESS IN URBAN AMERICAN FOOD DESERTS

Kieran Holzhauer
Mentor: Peter Benson

Food deserts, areas where barriers prevent residents from accessing fresh, affordable, and nutritious food, have become popular political and academic explanations for the high levels of obesity among individuals living in low-income neighborhoods. Most definitions of food deserts revolve around physical barriers to access, namely a lack of food retailers. However, many residents of food deserts exhibit other characteristics that influence their purchasing and consumption habits. A neighborhood’s physical infrastructure determines potential access, what foods individuals can buy, but other factors shape realized access, what foods individuals actually buy. In this project, I argue that focusing on physical access is necessary but not sufficient for facilitating the consumption of a healthful diet, because such a limited scope ignores the intertwining social and economic factors at play within food deserts.

This research on urban American food deserts began with a review of scholarly articles and texts to determine the sociohistorical roots of food desertification. Next, an examination of national and local anti-food desert initiatives gave insight into the range of solutions directed at food deserts. Finally, a food basket analysis of the Old North Saint Louis food environment, and consumer and staff interviews at the Old North Grocery Co-op provided a detailed investigation into the results of a specific attempt to ameliorate food desert conditions. An analysis suggests that, despite their important role in determining diet and health, barriers to realized access are under-stressed because of difficulties garnering funding and support.

Understanding and targeting the sociocultural determinants of realized access holds promise to pose new questions and solutions about diet, nutrition, and obesity in and beyond urban America. Potential access receives more resources because of its relative simplicity, yet focusing on the determinants of realized access will draw attention to many fundamental inequalities and injustices.

POLY(ETHYLENE GLYCOL) MICROSPHERES FOR THE DELIVERY OF NEUROPROTECTIVE AGENTS AFTER SPINAL CORD INJURY

Tyger Howell
Mentor: Shelly Sakiyama-Elbert

Initial injuries to the spinal cord are often followed by a secondary injury that causes axonal degeneration and formation of an inhibitory glial scar. This progression is mediated by reactive astrocytes, which gather at the site of injury and secrete a host of inhibitory signals including chondroitin sulfate proteoglycans (CSPGs). In vitro experiments have shown potent inhibition of axonal extension on substrates containing CSPGs. Other research indicates that degradation of CSPGs by an enzyme, chondroitinase ABC (chABC), increases axonal extension onto CSPG-containing substrates and may allow for enhanced recovery after spinal cord injury. chABC is rapidly
denatured under physiological conditions, creating a need for a delivery vehicle that preserves the activity of the enzyme while also providing sustained release. This study seeks to characterize the properties of poly(ethylene glycol) (PEG) microspheres for delivering active chABC to spinal cord injury sites.

Introduction of the kosmotropic salt sodium sulfate to PEG diacrylate (PEG-DA) solutions causes formation of microspheres with diameters of about 3 microns. The model protein bovine serum albumin (BSA) was added to the solution to form protein loaded microspheres. The microspheres were crosslinked using 0.05% w/v Irgacure 2959 photoinitiator and 365nm ultraviolet light. The microspheres were then washed and a release study conducted in water over two weeks.

Release of BSA was dependent on the final sodium sulfate concentration present during microsphere formation. Total BSA release from microspheres formed in 600mM sodium sulfate was greater and lasted longer than microspheres formed in 725 or 800mM sodium sulfate. Continued optimization of the formation protocol will generate microspheres that are better able to provide sustained release of active chABC to improve axon regeneration in the damaged spinal cord.

FUNCTIONAL DISSOCIATION IN HUMAN MEDIAL AND LATERAL ORBITOFRONTAL CORTEX
Tina Yi-Ting Huang
Mentor: Dr. Deanna Barch

To date, most neuroimaging and behavioral studies have reached consensus on the functional role of the orbitofrontal cortex (OFC) in emotional processing and sensory integration. However the distinction, or lack thereof, between the functions of medial versus lateral regions of the OFC remains a controversy. Some studies report a functional dissociation such that medial OFC shows increased activation during receipt of rewarding stimuli whereas lateral regions respond to punishment. Other studies, however, failed to report such dissociation. This may be the result of difference in experiment complexity and the type of reward used. While some studies suggest that primary and secondary rewards may result in different activation patterns in the OFC, few have made within subject comparisons. Those that do make such comparisons are limited in their interpretation by the fundamental difference between how primary and secondary rewards are delivered. To address this problem, we measured brain activity using fMRI while 21 young adults completed a modified version of a card guessing game task.

We observed dissociation between activity patterns in medial and lateral regions of the OFC, however this dissociation was not the medial/reward-responsive and lateral/punishment-responsive pattern reported in the literature. We found activation in lateral OFC only in response to high quantity rewards. Medial OFC did not show significant activation to punishments. We also found a positive correlation between subjects’ lateral OFC activation patterns and their reward sensitivity as measured by the BIS/BAS scale. Our modified reward paradigm allowed for comparison with previous secondary reward studies free of many of the confounds associated with primary reward paradigms. Our result provides insight to the reward circuitry in human OFC, and the distinctive roles medial and lateral OFC played in reward processing.

CHARACTERIZATION OF SPONTANEOUS [RNQ+] PRION VARIANTS AND THEIR EFFECT ON THE [PSI+] PRION IN SACCHAROMYCES CEREVISIAE
Vincent Huang
Mentor: Heather True-Krob

Prions are infectious, self-propagating proteins that have misfolded from their native conformation and aggregated to form a β-sheet rich structure called amyloid. In mammals, formation of the prion PrPSc causes a set of neurodegenerative diseases termed transmissible spongiform encephalopathies. Interestingly, PrPSc can assume multiple different infectious conformations called prions strains or variants. These distinct structures ultimately confer differences in pathology and disease onset.

Saccharomyces cerevisiae has proven to be a useful model organism in investigating the structural basis of prion strains. Sup35p is a yeast translation termination factor that can misfold and aggregate into the [PSI+] prion, thereby causing readthrough of stop codons. Moreover, spontaneous formation of [PSI+] depends on the presence of a second prion, [RNQ+]. In fact, different [RNQ+] variants display variation in their ability to induce [PSI+]. The general model in the field, derived largely from [PSI+] studies, proposes that the stability of prion aggregates and kinetics of amyloid formation are the major determining factors of prion strains and their resulting biological phenotypes. Yet, it remains unclear if these same principles explain the differences between naturally occurring [RNQ+] variants.

In this study, we isolated a set of spontaneous [RNQ+] variants and showed that they are novel, having distinct physical properties from the set of [RNQ+] variants originally described. Furthermore, these properties did not correlate with the ability of each [RNQ+] variant to induce [PSI+]. This suggests that the previous model is too simplistic and our current understanding of the molecular basis of prion variants is incomplete. In turn, our data indicates that other factors, such as differences in chaperone interactions, may play a major role in influencing the prion strain that propagates in vivo. Obtaining further insight is crucial to understanding how these prion strains can dictate pathological differences in mammalian disease.
Disneyland opened in Anaheim, California in 1955, a few years into the burgeoning Cold War, when fear of nuclear annihilation was both prominent and logical. The theme park was a popular tourist destination, but what about Disneyland made it so popular? This research seeks to answer this question by looking at both the internal properties of Disneyland and the historical moment happening inside the park. Disneyland presented a safe reality that visitors could not experience outside of the theme park due to Cold War paranoia, but I argue that Disneyland presents a hyperreality rather than reality, using Baudrillard’s theories on simulations and simulacra as a starting point. Points of analysis include the layout and architecture of Disneyland, the ABC television show Disneyland that promoted the theme park, bomb shelters, and Cold War literature, both fictional and instructional, that deals with the topic of handling the apocalypse. The work presents a primarily historical analysis, but uses frameworks from theories of mass media, tourism and semiotics to further make sense of what Cold War-era tourists used Disneyland for. Disneyland presented a vision of both past and future that was better than what the real world offered, and tourists got sucked in to the narrative the theme park presented.

Mohit Iyyer
See Rahul Bhansali

Noliyanda James
See Philip Chen

Rohit Jaswaney
See Alana Deutsch

This project is a historical investigation examining the involvement of slave soldiers in Argentina and Uruguay during the wars for independence and civil wars (1810-1876). The research explores how black slave soldiers have been silenced in the independence and national narratives of the Río de La Plata region, and their participation and engagement with the independence project and civil wars. Furthermore, the implementation and implications of the policy of manumission through military service for Afro-Argentines and Afro-Uruguayans is examined. The implementation of manumission through military service involved the manipulation of this policy by both criollos, who attempted to force slaves to serve more than their term and keep them in militaristic bondage, and by the slaves as they used this policy to escape cruel masters, sell out royalist owners, and secure freedom. In addition, though scholars have cited many reasons for which slaves have willingly taken up arms in defense of their owners—including pay, freedom, and social mobility—this project explores the implications of arming and manumitting a mass amount of enslaved people for their post-war inclusion and social mobility in the newly independent states.

Sung Yeop Jeong
See Philip Chen
FOREIGN MARRIAGE:
A HISTORY OF THE UK RESPONSE TO SOUTH ASIAN MUSLIM IMMIGRATION
Taylor Johnson
Mentor: John Bowen

Over the last 60 years, the number of Muslims living in the United Kingdom has increased nearly 300-fold. The majority of these Muslims come from the former Commonwealth countries of India, Pakistan and Bangladesh. Driven by widespread economic opportunity, immigration to the UK from the region surged in the aftermath of the Second World War. Family reunification, chain migration, and transnational marriage have continued this elevated level of immigration through the second-half of the twentieth century. As the number of South Asians living in the UK continued to increase, domestic concerns about identity, religion, and employment led the UK government to establish policies restricting further immigration. Through an examination of the language and content of immigration policy, court decisions, and statements made by government officials, this project explores the ways in which the UK used marriage-related immigration policy to specifically limit continued South Asian immigration. Throughout this period, the UK Home Office implemented policies targeting the Islamic practices of polygamous, telephonic, and proxy marriage, as well as the South Asian practice of arranged marriage. Because of marriage’s close relationship with culture, using marriage within immigration policy targets entire cultural groups, demonstrating the discriminatory nature of British immigration control. While previous scholars have addressed these policies in isolation, this project combines these policies into a single narrative of marriage-related immigration control during this period.

NEGOTIATING AUTHENTICITY:
DIASPORIC TRADITIONS OF RAAS
Shweta Joshi
Mentor: Joan Brockmann

This work discusses Raas as a Gujarati diasporic tradition in the United States. The Gujarati diaspora defines Raas as a Hindu, Gujarati dance that involves short sticks termed “dandia.” Raas evolved from a communal tradition performed at celebrations and festivals by the Gujarati diaspora into a proscenium-viewed competition. Today there are more than 10 national competitions and 40 university-associated Raas teams in the United States, and the phenomenon is only growing. Collegiate Raas competitions have become a space for second-generation Gujarati-American students to display their unique interpretation of their hybrid culture, one that isn’t wholly Gujarati or American. However, the competitions have some tensions that are problematic for the dancers. The first-generation judges and the scoring guidelines ask for both tradition and innovation, two seemingly contradicting terms, in each dance. Through the use of videos, forums and official documents, this thesis argues that the Gujarati second-generation diaspora uses hybridity to their advantage in order to satisfy and reduce the conflict caused by the generational differences and scoring guidelines. The second-generation attempts to successfully balance tradition and innovation through their choreography, theme and music selection. Therefore, competitive collegiate Raas performances explicitly demand both first-generation customs and second-generation stylizations. The second-generation Gujarati choreographers use their own hybrid identity and knowledge they gained from the first-generation to produce performances that attempt an award-winning balance of tradition and innovation.

IDENTITY, NETWORKS, AND DIASPORIC SUBJECTIVITY
IN THE ST. LOUIS HAITIAN COMMUNITY
Joelle Julien
Mentors: Joachim Faust and Bret Gustafson

Research on diasporic subjectivity by Lily Cho and Paul Brodwin, among other theorists, suggests that Diasporas are locally produced, subjective conditions. That is, diasporic communities are not simply groups of people. Rather, we should think about diasporic subjectivities as states of existence, collective experiences and conditions of life that are shaped by internal and external power relations in both the homeland and the receiving community.

In this research I use the idea of diasporic subjectivity to explore the experience of Haitians in St. Louis. Studies of the Haitian Diaspora have explored how formal and informal social and economic networks relate to questions such as remittances, dual citizenship, and circular migration. Research on the Haitian Diaspora has also studied identity construction in Haitians living outside of Haiti. Through in-depth interviews and participant observation, the project combines these two approaches – one about social, economic, and political networks, and the other about identity – to produce an ethnography of Haitian diasporic subjectivity in St Louis. I suggest that differences in language, religion, racial/ethnic consciousness, and class-specific identities shape the social networks, which in turn contribute to the multi-layered Haitian community in St Louis. The research will thus add to our knowledge of Haitian diasporic subjectivities, and to our understanding of how social networks and identity construction interact to inform diasporic communities.
MEN, MOTHERHOOD AND MONEY:
CHANGES IN THE FEMALE TELEVISION ATTORNEY FROM THE 1990s TO THE 2000s
Aaron Kacel
Mentor: Heidi Kolk

Since the 1970s, American television has struggled with its portrayal of female attorneys. Originally, female attorneys were portrayed as beautiful and stylish, but unreliable and unskilled. Then, as they gained more prominence and screen time, they appeared less superficial and more intelligent. While such positive strides were achieved, remnants of the traditional vision remained. This research focuses on the most recent stage in the evolution of the female television attorney, specifically changes from the 1990s to the 2000s. Two shows, The Practice and Ally McBeal, represent the 1990s. Damages and The Good Wife represent the 2000s. The central question of the work is to what extent, if at all, the portrayal of female attorneys changed from the 1990s to the 2000s. The work argues that, in portraying female lawyers as independent, highly competent and self-sufficient leaders who maintain their prowess in light of personal difficulties, the most recent shows mark a crucial positive improvement in the portrayal of female lawyers on television. Such improvement raises a new set of questions about the costs of success that future legal shows featuring female attorneys will be forced to confront.

Aaron Kacel
Mentor: David Thomas Konig

On March 24, 1989, Joel Steinberg, a New York City criminal defense attorney, was convicted of first-degree manslaughter. He was found guilty of killing a six-year-old girl named Lisa whom he had taken in as his daughter. His conviction came after an exhausting trial of nearly two years. After Steinberg was sentenced to twenty-five years in prison, many began to ask whether an innocent man was punished for a crime he did not commit. Their inquiry was primarily focused on the court’s decision to allow television cameras in the courtroom in which Steinberg was tried. Such had been done before in the U.S., but People v. Steinberg marked a shift in the evolution of the American television trial in that it broadcast large portions of the trial gavel-to-gavel, or without interruption, rather than simply airing segments. The central question of this research is whether this inclusion and broadcasting is unfair to defendants. To answer this question, the work first considers theoretical arguments for and against inclusion. It establishes a framework for analyzing fairness in light of potential impact on key court participants. Then the narrative of the Steinberg trial is outlined. Finally, it argues that, while the inclusion of the cameras and broadcasting inspired changes in the behavior of key court participants, such behavior did not wholly render the trial unfair as fundamental legal processes whose preservation is necessary for due process, such as witness examination or closing arguments, remained intact.

OPTIMAL SPATIAL FILTERING FOR BRAIN-COMPUTER INTERFACES USING AN EMOТИV EPOC EEG HEADSET
Kurtus Kahle
Mentor: Arye Nehorai

This research project seeks to improve the signal quality of Brain-Computer Interfaces (BCIs) using existing and novel methods of spatial filtering. In this context, a spatial filter is any specified linear combination of signals from an electroencephalogram (EEG), and a BCI is any external device controlled by brain signals. Improved spatial filtering methods would result in better control of medical devices used to drive hand motion for stroke and traumatic brain injury patients, and may also aid such patients who require other forms of BCI, such as wheelchairs or communication devices. This project focuses on signals obtained from a specific model of EEG headset, the Emotiv Epoc, and on BCIs used to control an orthotic, robotic hand; however, these methods are applicable to other headset models and other types of BCI. Existing spatial filtering methods include referencing one electrode to one other electrode (Bipolar), referencing to an average of all electrodes (Common Average Reference, or CAR), and an approximate spatial second derivative (Laplacian) reference. The novel method investigated here uses an optimization routine to deduce spatial filters that outperform the standard methods on the r-squared metric for a given signal — although the method could be used with other metrics, such as Receiver Operating Characteristic (ROC). The deduced filter is then applied to other data sets, and the new r-squared value is computed and compared to the r-squared values achieved using Bipolar, CAR, and Laplacian spatial filters, as well as the r-squared value obtained without a filter. Initial data indicate that optimized filters can outperform existing spatial filtering methods for sufficiently similar data sets. These results may show promise in the future for stroke or traumatic brain injury patients who have difficulty with hand movement or several other basic tasks.
AN IMPERIAL ACTOR IN THE LATE OTTOMAN EMPIRE: PERFORMATIVITY AND STATUS IN THE TRAVELOGUES OF CENAP ŞEHABETTIN
Ali Aydin Karamustafa
Mentor: Nancy Reynolds

This research is a primary source analysis of the travel accounts written by Cenap Şehabettin, a Turkish Ottoman health official who travelled in the Arab lands of the Ottoman Empire at the turn of the twentieth century. Are these imperial texts representing colonial ambitions? How might historians today view the relationship between Ottoman officials and the imperial lands in which they traveled? Given that by the eve of World War I the empire was not an expansionist military power driven by capital interests like many European states, I argue that we must look differently at texts produced in the Ottoman context. The writings of Şehabettin demonstrate how foci of power in the empire had shifted from the person of the Sultan to a state- bureaucracy system in which prestige and power were derived from the possession of cultural capital and status in the public sphere. These texts suggest how this shift was precipitated by technological advances in transportation and communication that allowed Şehabettin to publish his travel writings in serial form in the Ottoman press. A literary analysis further reveals how he employed several specific “gazes” during his travel in Arab lands that would have won him favor among his elite Ottoman readership. I describe this as the performativity of status and exploitation of cultural capital, through which Şehabettin derived elite status and social power in the expanding Ottoman public sphere. His travel accounts also reveal how the range of Ottoman cultural capital was diverse and contradictory. Technologies of travel and communication created new power networks and a new stage for performing and creating status. A biographic view of one of the many actors on stage, Cenap Şehabettin, suggests the reorganization and increased public nature of imperial status during the emergence of the Ottoman nation-state.

rRNA TRANSCRIPTION REGULATION IN MYCOBACTERIUM SMEGMA TIS
Surabhi Kasera
Mentor: Christina Stallings

In any cell, a very high percentage of transcription is that of ribosomal RNA (rRNA) and therefore understanding the regulation of rRNA is essential. Numerous proteins that regulate rRNA transcription levels have been identified that are critical for survival. Mycobacterium smegmatis has two rRNA operons, rrnA and rrnB. Previous experiments revealed that for the rrnB operon, β-galactosidase activity was greatly increased in a promoter fusion construct containing the promoter and an upstream region when compared to the activity from a construct with just the promoter region. We believe that this upstream region has a transcription factor binding site that is causing the activation of transcription. A DNA immunoprecipitation assay revealed the presence of two proteins that bind sequences in rrnB but not in rrnA. These proteins were identified as transcriptional regulators MSMEG_3081 and MSMEG_4847. We are now testing the hypothesis that these transcription factors are binding to rrnB specifically and activating transcription by making deletions in these genes to eventually observe if changes in rRNA transcription levels occur.

CHINA’S NEW GENERATION OF MIGRANT WORKERS
Lauren Katz
Mentor: Letty Chen

There are nearly 230 million rural migrants living and working in China’s urban centers. Among them are the manual laborers at construction sites who build China’s emerging skylines and the assembly-line workers at factories that produce electronics used by the rest of the world. However, instead of being compensated fairly for their hard work, they are oppressed by employers and marginalized by their urban counterparts. Recently the media has brought attention to this population through the lens of major corporations exploiting their human rights in their factories. However, little research has been done on the personal lives of these individuals – including their consumption patterns, personal goals and desires, and moral composition. This work focuses in particular on college-age members of the migrant worker population. Through personal interaction and first-hand observations, I was able to discover how these individuals interact with various aspects of China’s dynamic cultural landscape and the implications their actions have on their personal desires, value systems and beliefs.

The main character in this analysis, a young migrant worker working as a low-level salesmen in a district located on the outskirts of Shanghai, is introduced and his life contextualized within historical and personal background. I use primary research to analyze various aspects of his life, and those of his coworkers, and place them in the broader context of modern Chinese society, incorporating themes such as family life, marriage and relationships, consumption and leisure, and other relevant topics. I conclude with the idea that China’s
young migrant workers are as individualistic and willing to consume a modern Chinese lifestyle as their wealthier urban counterparts, although with unique characteristics. As a field of study that has yet to be deeply researched, this work will provide new perspective and basic understanding of an often overlooked area of modern Chinese society.

**Economic Empowerment Through Savings and Seed Funding for Disadvantaged Youth in Peri-Urban and Rural Uganda**
Preethi Kembaiyan and Akhila Narla
Mentor: Peter Benson

In the district of Iganga, Eastern Uganda, issues related to extreme poverty prohibit access to basic needs and essential markets as avenues to secure income. As a result, local adult unemployment rates exist at 57% and rates of unemployment are even higher for youth unemployment. Formative anthropology research conducted in the peri-urban community of Iganga Town, indicates that providing income for young women may serve as a preventive health intervention to address uniquely high rates of HIV/AIDS prevalent among adolescents in the town. In an attempt to empower youth to take control over their health and development, leaders of the local non-governmental organization Uganda Development and Health Associates (UDHA), WUSTL students, and Ugandan youth between the ages of 18 and 22 jointly created an income-generating activity based on the creation of jewelry made from recycled paper beads sold in an U.S.-based market. American student groups and volunteers developed a market for the environmentally-friendly products made by those in Uganda to earn the young Ugandan artisans empowerment wages (three times the Fair Trade Standard). In monitoring the use of funds by six youth who were incorporated into a two-year pilot program, individual case study evaluations were conducted to analyze how funds were used. These evaluations indicated that a mixed group of six participating peri-urban and rural youth favored increased production and gains for male participants and that the international market created average total earnings of $400 USD per Ugandan youth participant, with $100 USD also available per youth for business plan implementation to sustain access to income for health and development purposes. Given the intervention goals, findings suggest greater positive health impacts can be catalyzed through earned income from international sales that benefit young rural women’s collectives while peri-urban youth can be connected to local markets.

**Analysis of Brain Signal Generation for EEG 2D Control**
DoHyun Kim
Mentor: Arye Nehorai

The overall goal of this project is to have a brain-controlled interface (BCI) by means of a non-invasive electroencephalogram (EEG). The interface would then be used to control a hand exoskeleton for aiding in the rehabilitation of hand motor skills in people who suffer from severe motor impairment. However, the scope of BCIs is not limited to controlling the hand exoskeleton. It can be applied to just about any system that a person could otherwise control—personal computers, cars, and cell phones, just to scratch the surface. The purpose of this sub-project is to determine reliable methods of generating clear, consistent brain signals through voluntary muscle movement and motor imagery. I generated a collection of empirical data to lay down the foundation for a targeted survey that will better test the results from smaller scale experiments. The EEG data were acquired from Emotive® EEG headset with BCI2000® EEG data acquisition software. The StimPresentation test and the 1D CusorTask were performed to acquire EEG signals of 14 channels and 30 frequency bins. After acquiring EEG signals, data – each channel and each frequency – were processed through MEM (Maximum Entropic Method), and were tested by Statistical test of R², F-test, ROC and Cross Validation. By the statistical tests, specific channels and frequencies were chosen for the motor control. These EEG signals were applied into 2D control test. By achieving 2D control and 3D control, our team will have more degrees of freedom to control the artificial hand.

**The Challenges in Chilean Intercultural Health:**
International Development and Mapuche Demands
Abigail Korn
Mentor: Ignacio Sánchez-Prado

Indigenous peoples’ understanding of health and wellness often differs fundamentally from the western biomedical model. This project examines the Chilean intercultural health program, initiated in 2001. The program, known as Origins, marks an attempt to foster cooperation between indigenous peoples and the state as well as to support the development of rural communities. I examine the relations of Mapuche healers and traditions with the national healthcare apparatus and biomedical professionals in order to assess Origins’ efficacy and satisfaction, from Mapuche patient as well as Chilean state perspectives. Intercultural health must be understood within the complexity of the opposing currents that shape it including market-driven policy history, the Mapuche struggle for autonomy, and formal rights like patent law or informed consent. Rather than solely addressing health disparities, health serves as a proxy for other
Mapuche-state conflicts. As Chile and other countries move forward with intercultural projects, dialogue as well as interdisciplinary work will facilitate and strengthen initiatives.

THE LIFE AND DEATH OF AN AMERICAN TOWN: THE HAMBURG MASSACRE OF JULY 1876 AND THE RISE AND FALL OF AFRICAN-AMERICAN POLITICAL CULTURE IN RECONSTRUCTION SOUTH CAROLINA

Jonathan Kovacs
Mentor: Iver Bernstein

This work represents the first full study of the Hamburg Massacre of 1876, an event little known among historians but one that had major significance for African-American political culture in South Carolina as well as for race and public memory in the post-Reconstruction era. After the Civil War free African-Americans had begun to play a creative role in Southern society as free citizens and voters. They formed towns, gained wealth, and even got elected to the state legislature. Their newfound citizenship offered them the chance to build their own future and establish a political culture that would be the foundation for their future success in America. However, the former planter elite, a group of whites who had been slave owners before the war, would not let this endure. They despised any form of African-American advancement that threatened the tenets of the antebellum society of old. Left with few other options, these whites resorted to violence in order to return freed people into a state of subjection. These dynamics represented the root of the Hamburg Massacre, which happened on July 8, 1876, and resulted in the death of six African-Americans. Not only did the perpetrators of the massacre begin a campaign of violence that would culminate in the end of Reconstruction in South Carolina, but they also ensured that history vindicated their actions by distorting the narrative of the massacre, establishing the white men as the victims rather than Hamburg’s black citizens. This distortion was critical to why Hamburg’s story was lost for decades and why the town would eventually disappear from maps in the years after the massacre. In the end, the flowering and destruction of Hamburg represented a key to the deepest stakes of the Reconstruction struggle, which included not simply political power, but political culture in its broadest parameters involving the self-rule, the public life, and the existence of the town its political, physical, and aspirational dimensions.

APPLICATIONS OF LINEAR MIXED EFFECT MODELS: AN ANALYSIS OF MISSOURI SCHOOL DATA

Daniel Kowal
Mentor: Jimin Ding

In this research, we analyze standardized mathematics exam scores from a Missouri school district. Using linear mixed effect modeling, we model student exam scores as repeated measurements in order to investigate the influencing factors on student performance. After considering several mixed effect models and comparing them using information criteria (AIC and BIC) and likelihood ratio tests, we settle on two models for the data: (i) a random intercept model that assumes constant variance across exams and equal correlation between exams, and (ii) an extension of this model that allows the variance of exam scores for low-income students to vary across exams. By analyzing fixed effect parameter estimates and random intercept predictions, we find significant stratification within ethnicity and economic status. We further investigate the presence of monotone trends of exam scores in order to identify groups of students whose performance significantly improved or declined relative to the national student population. By combining these results, we can identify student features that predict either strong or weak performance on the standardized mathematics exams.

Amy Krause
See Sonya Anderson

PROCTOR OR DOCTOR?:
AN ANALYSIS OF SURVEY DATA FROM PATIENTS WITH ALZHEIMER’S DISEASE

Artem Kreimer
Mentor: Jimin Ding

In this work, we look at cognitive data collected over thirteen years from patients at risk for Alzheimer’s Disease (AD). The goal is to evaluate the power of the questionnaire to predict the onset of AD. Answers to a set of 268 survey questions, such as “Who is the president right now?” and “Here is a string of numbers; can you tell them to me backwards?” are collected at each clinic visit. These answers are combined algorithmically to produce a score assessment of global cognitive ability. We first propose a functional Pearson correlation coefficient, taking into account longitudinal dependence within a patient. We then look at the correlations between the question responses at a time, t, and the global cognitive scores at a future time, t+n, for various values of n. Selecting a subset of the 268 questions by inspecting these correlations, we examine the subject, question, and demographic effects estimated by a logistic item
response model on the subjects answers. We also look at how those effects can model global cognitive ability. Finally, we propose a multi-state survival model that we can fit when survival data from the study becomes available.

**COMPACT RECONNAISSANCE IMAGING SPECTROMETER FOR MARS (CRISM) ALONG TRACK OVERSAMPLED (ATO) OBSERVATIONS**

Christina D. Kreisch  
Mentor: Raymond E. Arvidson

The Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) on the Mars Reconnaissance Orbiter (MRO) has been imaging the surface of Mars since 2006 in order to obtain more information about Mars’s mineralogy. By studying the mineralogy of Mars, CRISM can help reveal more information about the presence of water on the red planet. The images taken are normally Full Resolution Targeted (FRT) images, where the distance between each pixel corresponds to about 15-19m on Mars. However, CRISM has recently begun to take Along Track Oversampled (ATO) images, where the distance between each pixel is less than 18m, in order to obtain even more information about the planet’s mineralogy from the images. This study aims to characterize and determine the amount of oversampling in the ATO images. The distances between pixels in an ATO image and a regular FRT image of Botany Bay and Cape York are analyzed and compared with plots and map projections. There is significant overlap in the ATO compared to the FRT, and most of the overlap is in the along track direction, although there is a small amount in the cross track direction, as well. The clarity of the virtual mosaics confirms that the overlap in the ATOS allows for more information to be obtained from the ATO images.

**GENE DUPLICATION EVENTS IN THE EARLY EVOLUTION OF PHOTOSYNTHETIC REACTION CENTER COMPLEXES**

Yamini Krishnamurthy  
Mentor: Robert Blankenship

Photosynthesis arose on Earth more than 3 billion years ago, and evidence suggests that the earliest forms of photosynthetic life were anoxygenic (non-oxygen evolving). Oxygen evolving photosynthesis is a more recent development that has revolutionized the energetic and enzymatic fundamentals of life. The origin and evolution of the photosynthetic reaction center complexes, which are the center of the energy storage process, has been perplexing from a phylogenetic perspective. Reaction center proteins clearly evolved from a homodimeric core structure to a heterodimeric structure, and evidence strongly suggests that at least two independent duplications took place to give rise to the Type I and Type II groups of reaction centers. However, it is uncertain whether there were multiple or a single duplication within the Type II group. Reaction center proteins of known peptide sequences have been compared using ClustalW alignments and two different phylogenetic tree algorithms. The proteins include photosynthetic reaction centers from the anoxygenic proteobacteria and filamentous anoxygenic phototrophs and the oxygenic cyanobacterial Photosystem II. The phylogenetic analysis strongly suggests that the independent duplication model better explains the evolution of the anoxygenic Type II reaction centers and the cyanobacterial Type II reaction centers than does divergence followed by a single gene duplication event. This in turn implies that the asymmetry in electron transfer pathways and quinone function in the anoxygenic and oxygenic Type II reaction centers has arisen via convergent evolution. The selection pressures that may have given rise to this remarkable convergence is discussed.

**IDENTIFYING THE MECHANISM OF SKIN BARRIER FORMATION**

Grace Kroner  
Mentor: Cristina Strong

The skin is an important tissue because it acts as a first line of defense. The human Epidermal Differentiation Complex (EDC) in the genome encodes genes required for the skin barrier; however, the mechanism to coordinate EDC gene expression is unknown. The research focuses on identifying the function of a conserved noncoding element (CNE), 923, in the human EDC. We hypothesize a function for 923 as a locus control region or potential genetic master switch for EDC gene expression during skin cell development and differentiation. The lab’s previous studies showed that 923 has key properties of an enhancer including DnaseI hypersensitivity. Also, in transgenic reporter mice, 923 showed epidermal specificity. Within 923, 4 PhastCons blocks (areas of conserved sequence between multiple species) were uncovered and it was hypothesized that each has a role in 923 enhancer activity. To test this, individual deletions of each PhastCons block were cloned into a vector with a firefly luciferase reporter gene. Each construct was subsequently cotransfected with Renilla luciferase into mouse epidermal cells (SP-1) under proliferating and differentiating conditions. Firefly luciferase assays were performed on transfected SP-1 cells harvested at 48 and 72 hours and normalized to Renilla luciferase reporter assays to assess enhancer activity. In both the forward and reverse orientation, deletion of Block 4 demonstrated a decrease in enhancer activity. I investigated transcription factor binding sites and hypothesized that AP-1 was a critical transcription factor. Site-directed mutagenesis was employed
to alter the AP-1 binding site and test for enhancer activity. The direction-independent enhancer properties of Block 4 are perhaps critical for regulation of skin cell development. A better understanding of the genetic regulation of the EDC could allow progress in treating skin barrier diseases with known genetic mutations.

Sujay Kulshrestha
See Philip Chen

INVISIBILITY AND RESPONSIBILITY: ACCESS TO HEALTHY FOOD IN ST. LOUIS, MISSOURI
Michaela Kupfer
Mentor: Carolyn Sargent

This research explores the economic, political, and social roots to the disparities in rates of obesity and diet-related health conditions between privileged and disadvantaged populations in the United States. Rates of obesity and its associated chronic illnesses such as diabetes, heart disease, and high blood pressure have increased dramatically over the past thirty years. The popular rhetoric surrounding the obesity epidemic frames the recent increases as a failure of personal responsibility, an argument that has deep roots in American traditions of individualism. I seek to problematize this understanding by revealing the ways in which unjust and oftentimes invisible systems of power structure the nutritional choices that disadvantaged individuals have available to them. In particular, I focus on how the food industry’s accumulation of economic and political power has led to the superabundance of obesity-promoting foods. This then interacts with systems of social power to determine which populations have access to nutritional well-being. The examples of St. Louis, Missouri and of O’Fallon Park neighborhood in North St. Louis City are used, in particular, to elucidate how these forces have shaped the contemporary landscape of accessibility to food and health.

“EDUCATION IS A WEAPON:” PORTRAYALS OF STALIN IN SOVIET AND POST-SOVIET TEXTBOOKS
Natalie Kutat
Mentor: Max Okenfuss

In this research, I examine portrayals of Stalin in various Russian-language textbooks for university students of history, beginning with the late 1940s and continuing up to the present day, and how these portrayals have shifted depending on the political climate in which textbooks were written, as well as the authors’ desire to ingratiate themselves with the leadership. After World War II, when he was still in power, textbook authors enthusiastically praised Stalin. During the Khrushchev thaw, authors were free to criticize Stalin, and they did so enthusiastically, condemning Stalin’s crimes and the cult of personality that sprang up around him. When Brezhnev was in power, the government did not pursue such an anti-Stalinist line and Stalin’s role in history was often ignored or glossed over. Textbook authors were freer to examine Stalin during Gorbachev’s perestroika, though there was still some restraint, and they became even more openly critical in the 1990s when Boris Yeltsin was president of the Russian Federation. Textbooks from this decade openly discussed the costs of collectivization, reasons for the Great Terror, and other subjects that were previously controversial. However, since Vladimir Putin’s rise to power in 2000, the government has resumed its ambivalent stance towards Stalin, evident in textbook authors’ treatment of Stalin during the last decade. Some textbooks published in recent years have received condemnation for being too favorable, even praiseworthy, towards the dictator. These shifting portrayals of Stalin show how the Soviet (and later Russian) government’s view and treatment of its own history has changed and sheds light on the troubling trend in modern Russia to use historical accomplishments for propaganda purposes.

EFFECTS OF SIGNALING FROM FIBROBLASTS ON SCHWANN CELL DIFFERENTIATION
Jasmine Kwasa
Mentor: Shelly Sakiyama Elbert

The peripheral nervous system (PNS) has limited regeneration capabilities in response to injury. This research focuses on the use of Schwann cells (SCs), glia of the PNS, in regeneration therapies. Previous studies have shown that fibroblasts, another cell present at the injury site, promote SC clustering due to ephrin-B2/EphB2 signaling between the two cell types. The focus of this study is to observe these same clustering effects and determine if other forms of fibroblast signaling play a role in SC differentiation into the mature SC phenotype. First, SCs and fibroblasts were harvested from the rat femoral nerve (both motor and sensory branches) and expanded in vitro. The cells were separated using Dynabeads® technology, which recognizes a p75NTR (SC receptor) antibody to separate pure cells into pure cultures of fibroblasts and SCs. Cells were then passaged twice and co-cultured under two conditions: (1) both cell types cultured in the same well and (2) both cell types cultured using a Transwell® system whereby fibroblasts and SCs are separated by a semi-permeable membrane. To observe the SC clustering in response to fibroblast signaling, immunocytochemistry was performed using S100β (SC marker) and thy1.1 (fibroblast marker). SC differentiation was evaluated using quantitative real time polymerase chain
reaction (qRT-PCR) to determine the expression levels of S100 (mature SC marker) and nestin (de-differentiated SC marker) compared to SCs cultured alone. From these experiments, we expect to show that the clustering of SCs in response to signaling from fibroblasts has an effect on the differentiation of SCs into their mature phenotype.

**THE MEN FROM FRANCIA: THE NORMAN INFLUENCE IN PRE-CONQUEST ENGLAND**

Maia Lamdany  
Mentor: Mark Pegg

The Norman influence in pre-Conquest England increased considerably over the course of the eleventh century, culminating in the Norman Conquest of 1066. This research reassesses the political contours of Anglo-Norman relations in the form of a series of mini biographies. The biographies are of Emma of Normandy, Edward the Confessor, and William the Conqueror, with Godwin and Harold also receiving extensive treatment. We can learn through the political history of Anglo-Norman relations of the eleventh century that although there was a significant change when William the Conqueror took control, that change was less substantial than commonly thought.

During this time England shifted from an orientation towards Scandinavia to that of Normandy. Edward the Confessor, the son of Emma of Normandy and the Danish Canute, ruled England from 1042 until 1066, and spent around twenty-five years living in exile in France, particularly Normandy. Upon unexpectedly becoming king he brought Norman advisers with him, a move that upset the existing nobles. Edward’s reign became something of a battle between the Normans and supporters of the Anglo-Saxon Godwin, who was Edward’s father-in-law and whose son Harold briefly succeeded Edward in 1066.

Edward’s long exile shaped his later reign as his policies of bringing in Normans while diplomatically attempting to continue the policies of his predecessors created a tinderbox. He died without an apparent and uncontested heir, leading to a clash between these two influences as Harold Godwinson and William of Normandy each fought for one side of Edward’s policies, and the Norman won out in the end. Edward had paved the way for this conflict while never obviously aligning himself with the Norman side, preferring to keep England as it was during his reign. There was a gradual alignment with Normandy, but no genuine unification until 1066.

**SOCIAL NETWORKING AND PEER SUPPORT (SNAPS) IN ADOLESCENTS WITH TYPE 1 DIABETES MELLITUS (T1D): A PILOT STUDY**

Jennifer D. Lapp  
Mentor: Neil H. White

Social support from peers has been shown to improve outcomes in adolescents with T1D. However, on-site support groups are difficult, time consuming and costly. With the rapid growth of social media, we asked whether on-line social networking and peer support (SNAPS) would benefit adolescents with T1D. We performed a pilot study to determine if SNAPS would improve outcomes in adolescents with T1D. 46 subjects with T1D were enrolled and randomized to a SNAPS (N=22; age 14.6 ±1.8) and a control (CONT; N=24; age 15.4 ±1.8) group. The SNAPS group was assigned an age- and gender-matched “buddy”, offered anonymous E-mail access to their buddy, and could communicate whenever they wished. Communications were not monitored, but data was obtained about frequency of communications. The CONT group was not assigned a buddy. HbA1c was determined at baseline (BL) and 3-months. HbA1c was similar in both groups and did not statistically change between BL and 3-months (9.6±1.5% at BL vs. 9.8±1.5% at 3-months in SNAPS group and 10.1±1.8% at BL vs. 9.9±2.0% at 3-months in CONT group). Both child and parent completed the PedsQL Diabetes Module (PedsQL-DM) and Diabetes Family Conflict Scale (DFCS) at BL and 3-months. There was a trend (p=0.06) for subjects in the SNAPS group to report reduction in conflict on the DFCS between BL and 3-months. On the PedsQL-DM, parents from the CONT group reported that the child had fewer symptoms of diabetes (p=0.04) and parents from the SNAPS group reported that the child had fewer treatment barriers (p=0.015) and better treatment adherence (p=0.012). There were no differences on the composite or worry scales between BL and 3-months for both groups. These pilot data suggest that unmonitored peer support via social media in adolescents with T1D provides little benefit. However, additional research would be required to determine if other approaches to social networking, such as including diabetes information or access to healthcare professionals, would be beneficial.

**BARREL CORTEX, PRINCIPAL TRIGEMINAL NUCLEUS, AND SPINAL TRIGEMINAL NUCLEUS INTERPOLARIS NEURONAL DATA CODING**

Hannah J. Lee  
Mentor: Mark Jacquin

The barrel cortices of mice and rats are common models for studying central nervous system information processing and developmental mechanisms. For this study, the acute effects of reversible allatostatin-induced silencing of trigeminal brainstem and cortical neurons were observed by whisker-mediated discrimination behaviors in male rats in order to better understand neuronal data coding. We test
the hypothesis that the Spinal Trigeminal Nucleus Interpolaris codes coarse neuronal data due to responses to externally generated whisker deflection with head orientation and that the Principal Trigeminal Nucleus codes more precise neuronal data due to smaller receptive fields.

Transduced neural cells in the adenovirus vector injection sites should incorporate and express the payload genes AlstR and EGFP. Therefore, only the transduced cells are silenced when allatostatin is infused into the brain. Positive control rats had vector injection sites in the barrel cortex; experimental rats had vector injection sites in the Spinal Trigeminal Nucleus Interpolaris or Principal Trigeminal Nucleus. All control and experimental animals were trained to discriminate between rough and smooth surfaces with high accuracy. Unfortunately, no behavioral changes in whisker-mediated discrimination and other relevant behaviors were seen in positive control animals due to reversible silencing. One experimental rat, with an injection site in the Spinal Trigeminal Nucleus Interpolaris, showed a significant difference in discrimination in only one trial out of five different allatostatin infusion trials; for this rat, EGFP immunohistochemistry did not reveal fluorescently tagged cells in the Spinal Trigeminal Nucleus Interpolaris or in nearby regions. Unfortunately, the results do not give much insight into the functional properties of inputs to the barrel cortex. However, it is clear that future work would require improvements on the selection of control injection sites and on targeting the entire desired region.

Jeffrey Lee
See Claire Brownstone


David Levine
Mentor: Sonia Lee

Although past historians of the early relationship between the United States and Pakistan have advanced narratives of American false assumptions, wishful thinking, and misguided polices, their arguments have been based on a mistaken notion of American goals for the relationship and a use of sources which is far too narrow to accurately assess it. This study, which utilizes a broadened primary source base incorporating both South Asian and Middle Eastern sources, analyzed against recent scholarly breakthroughs on Eisenhower’s foreign policy, argues that American policymakers wanted Pakistan to facilitate the creation of the Baghdad Pact, a collective security organization in the Middle East. For Eisenhower, the pact would serve as a tangible manifestation of the benefits of a pro-Western orientation and counter growing anti-colonial nationalist movements in the Middle East which the administration considered susceptible to communism. The leaders of Pakistan, the Eisenhower administration believed, could act as catalysts for the agreement, as their strong Islamic faith could persuade other Muslim leaders in the Arab Middle East to join. For reasons both historical and political, Pakistani leaders supported these American notions of Islam’s role in the world.

While Pakistan did its part in promoting the burgeoning pact, the pact did not turn out the way policymakers had hoped. Soon after its creation, it became a tool of inter-Arab politics, rather than a base of pro-Western unity. Since American policymakers planned on substantially aiding Pakistan only after the pact’s creation—this timeline the result, among other reasons, of inter-departmental bickering within the Eisenhower administration—the State Department was largely able to back out of their oral commitments to Pakistan once the pact had failed. By late 1956, not only did Eisenhower regret the relationship, but so did the Pakistanis.

IDENTIFICATION OF CELLULAR DETERMINANTS OF HUMAN T-CELL LEUKEMIA VIRUS ENTRY

Kevin Levine
Mentor: Lee Ratner

Human T-Cell Leukemia Virus Type 1 (HTLV-1) infection is the cause of adult T-cell leukemia and a demyelinating disease known as HTLV-1 associated myelopathy/tropical spastic paraparesis. Because of the uncertainty surrounding the mechanism of HTLV-1 binding and fusion to host cells, the current project sought to identify cellular factors that can function as receptor or co-receptor for the virus. Identification of the HTLV-1 receptor would likely lead to a better understanding of the mechanisms that lead to the progression of disease and could lead to direct clinical interventions targeting the receptor-envelope interaction. Previous studies used a retroviral cDNA screen, introducing a cDNA library from HeLa S3 cells that are highly permissive to the HTLV-1 virus, into NIH 3T3 cells that are poorly permissive to the virus. This was followed by infection with viral particles expressing the HTLV-1 envelope, and growth in selective media to identify candidates important for infection. Of the roughly 441 potential factors identified from the screen, there are 210 unique protein coding sequences. The twenty most plausible candidates were selected on the basis of localization of protein products to the cell membrane, number of times identified in the screen, and correlation with gene products important for HIV infection. The
current study examines these twenty candidates using a luciferase assay to measure viral entry in stable and transiently transfected NIH 3T3 cell lines. Further analysis of these cell lines, each expressing one of the candidate receptors, is needed to validate the role of these candidates in HTLV-1 infection.

**LUNG S100A8 EXPRESSION INDUCED IN BRONCHOPULMONARY DYSPLASIA IN BABOON MODEL**

Ruth Lewit  
Mentor: Richard Pierce

Previous studies have identified differentially expressed genes in the baboon model of Bronchopulmonary Dysplasia (BPD); they have not, however, identified genes that are differentially expressed with increased severity of BPD. This study set out to identify biomarkers that track with BPD severity and can predict clinical outcomes. Baboons were delivered prematurely at 125 days of gestation (65% of gestation) and placed on a ventilator for fourteen days, during which time physiological parameters were monitored. The gene expression profiles from baboon lungs with BPD were analyzed according to two physiological indices, ventilatory efficiency index (VEI) and oxygenation index (OI) using Partek Analysis Software. These indices are measures of BPD severity and may thus provide a means to track changes in gene expression with increased severity. Thirty-seven genes were found that correlated significantly with OI using a p-value less than .005 and a fold change greater than ±1.5 as criteria. One gene, Calgranulin A (S100A8) was found to have increased expression with increasing OI values with a fold change of -41.2. To further investigate this gene, S100A8 expression was analyzed by Realtime RT-PCR in RNA from 47 baboon samples and validated using immunohistochemistry. Expression of S100A8 mRNA was found to be increased 3.4 fold in ventilated, premature baboon lung when compared to gestational controls. S100A8 was also found to be increased 3.76-fold by immunohistochemistry in ventilated lungs compared to gestational controls. Increased S100A8 was localized to clusters of inflammatory cells in BPD lungs, but not gestational controls. Additional studies expanding the data set to other BPD models including sheep and human models are currently underway.

**MDX MICE HAVE A DEFECT IN AUTOPHAGY THAT IS RESTORED BY RAPAMYCIN-LOADED NANOPARTICLE TREATMENT**

Allison J. Li  
Mentor: Samuel A. Wickline

Duchenne Muscular Dystrophy (DMD) is a genetic disorder caused by mutations in dystrophin, a cytoskeletal protein in muscles, leading to progressive muscle wasting and ultimately death in the second or third decade of life. The current standard of care for DMD patients is corticosteroid therapy which slows down the natural progression of the disease but is also associated with several unwanted side-effects such as excessive weight gain, behavioral abnormalities, and osteoporosis. Our lab's previous studies of therapeutics in the mdx mouse, an in vivo DMD model, has demonstrated that mdx mice treated with rapamycin-loaded nanoparticles showed an increase in grip strength, an improvement in a clinically relevant measurement of disease progression. No strength increase was observed with rapamycin administered orally without nanoparticles. Because rapamycin is known to induce autophagy, we assayed for autophagy in mdx mice treated with rapamycin-loaded nanoparticles. Western blot analysis of LC3B-II, the processed form of a protein used in autophagy, suggests that there is a previously unknown defect in autophagy in mdx mice, as shown by a lack of LC3B-II accumulation after blockade of autophagic flux by colchicine. Rapamycin nanoparticle treatment rescues autophagy to levels comparable to the control, suggesting that defective autophagy may contribute to the physical manifestations of muscular dystrophy in mdx mice and that restoration to normal levels may contribute to the observed strength increase.

**ALTERNATIVE FARMING: A STUDY IN POWER AND VALUE**

Brendan Lind  
Mentor: Peter Benson

This research involves a study of alternative farming, primarily in Washington State. The farms studied varied in size, philosophy, practice, produce, and phenomenological approach to farming. The primary research method was participant observation. At each farm, I gathered information - stories, personal perspectives, and data - by interacting, working, and eating with the farm workers and owners. Looking at the relation of power and values, the work weaves stories of the farmers with a perspectival history of food. Within this study I see the alternative food movement as a values-based movement that encourages different relations to the production and/or consumption of food. I see alternative farming practices of varying kinds as practiced or supported by people within this movement. The main argument is the true paradox of alternative farming – the movement is built on values, but alternative farming practices only become mainstream over the long run if they encourage greater production (power) and not as a result of the values held by those in the movement that originally supported the practices. This makes the practice of alternative farming a struggle for those in the movement, for the values that motivate them at the outset prove to be fundamentally opposed to the workings of the modern world. This research
is really about two things: The beauty of people “following a dream and trying to see it through,” and the conflict, hopelessness, and frequent futility of the movement and its associated lifestyles given these farmers relationship to power.

**BINDING THERMODYNAMICS OF THE *E. coli* MULTI-DRUG TRANSPORTER EMRE**

Yongjia Liu  
Mentor: Katie Henzler-Wildman

Bacteria have evolved a variety of ways to expel toxic substances, such as antibiotics. One adaptation is the multidrug transporter, a membrane protein that recognizes and removes multiple drug-like substances. EmrE, a multidrug transporter native to *Escherichia coli*, also serves as a good model for other ion-coupled multidrug transporters due to the protein’s small size and existing biochemical data. EmrE imports protons down a concentration gradient to power the export of polyaromatic cation drugs, with a 1 substrate: 2 proton stoichiometry. The structure of EmrE is an asymmetric homodimer, with a single charged residue, Glu-14, in the membrane region of each monomer that interacts alternately with stabilizing the protons or 1 substrate during the transport cycle. Precise knowledge of the pKa of Glu-14 pKa is needed to characterize the coupling between proton and drug transport. The thermodynamics of EmrE binding to the substrate TPP+ was measured was measured over a pH range, from pH 6 to 8.5 using isothermal titration calorimetry (ITC). The binding constant increases with pH, which indicates competition between the substrate and protons. Additionally, the number of protons released, calculated from the enthalpy data, was approximately 2, as predicted by the single-site alternating access model. Unexpectedly, the ITC binding curves deviate from single-site binding at high protein concentrations. These high concentrations are necessary to study binding around pH 6, because of the low effective binding constant. This hampered further quantitative analysis of the data. Future work will use NMR to accurately measure the pKa of Glu-14.

**“I AM BOTH JEWISH AND BUDDHIST”: AN EXPLORATION OF THE JUBU PHENOMENON**

Jennifer Locke  
Mentor: Beata Grant

This work explores some of the motivations and manifestations of the so-called “Jubu” (or JewBu) phenomenon in the United States, that is, people of Jewish background who are drawn to Buddhist thought and practice but seek to find creative ways to reconcile both in their lives. I have chosen to focus on a close reading of three recent books: *The Jew in the Lotus: A Poet’s Re-Discovery of Jewish Identity in Buddhist India* by Roger Kamenetz (1995), *That’s Funny, You Don’t Look Buddhist: On Being a Faithful Jew and a Passionate Buddhist* by Sylvia Bornstein (1998), and *One God Clapping: The Spiritual Path of a Zen Rabbi* (2001) by the late Rabbi Alan Lew. While the details of these three people’s lives differ, I argue that they all seem to be marked by three stages of development. First, all three come from largely secular Jewish backgrounds which left them feeling spiritually discontented. This dissatisfaction leads to a time of considerable emotional and intellectual turmoil during which they discover Buddhist teachings. The final stage is marked with a return to their roots and a renewed appreciation for what the Jewish tradition has to offer. All three find various ways to incorporate both Jewish and Buddhist elements into their lives. While these three stages do not necessarily apply to all Jubus, they help to shed light on what I argue is the primary reason for the rise of the Jubu phenomenon, which was the need for increased spirituality in American Judaism.

**THE ROLES OF FEN1 AND TRF1 IN MAMMALIAN TELOMERE REPLICATION**

Ying Jie Lock  
Mentor: Sheila Stewart

Telomeres are protein-DNA complexes at the ends of linear chromosomes that promote genomic stability by preventing chromosome fusions and degradation. Many mechanisms have evolved to ensure the faithful replication of the telomere. Central to these mechanisms is Shelterin, a multi-protein complex of six proteins (TRF1, TRF2, RAP1, TIN2, TPP1, and POT1) that binds to telomeres and coordinates DNA replication and repair activities at the telomere. Previous work demonstrated that flap endonuclease 1 (FEN1), a DNA replication and repair protein, localizes to the telomere during the S and G2 phases of the cell cycle. Further studies showed that while FEN1 depletion does not abrogate replication across the genome, it does induce telomere instability as characterized by sister telomere fusions and degradation. Many mechanisms have evolved to ensure the faithful replication of the telomere. Central to these mechanisms is Shelterin, a multi-protein complex of six proteins (TRF1, TRF2, RAP1, TIN2, TPP1, and POT1) that binds to telomeres and coordinates DNA replication and repair activities at the telomere. Previous work demonstrated that flap endonuclease 1 (FEN1), a DNA replication and repair protein, localizes to the telomere during the S and G2 phases of the cell cycle. Further studies showed that while FEN1 depletion does not abrogate replication across the genome, it does induce telomere instability as characterized by sister telomere loss (STL). FEN1-dependent STL is restricted entirely to lagging strand-replicated telomeres and dependent on FEN1’s DNA repair and gap endonuclease activities. In addition, FEN1 depletion leads to telomere fragility, in which telomere FISH signals appear as doublets or smears on the termini of chromatids. Intriguingly, FEN1 depletion-induced telomere fragility is restricted to leading strand-replicated telomeres, suggesting that FEN1 participates in leading strand DNA replication at the telomere. Because fragile telomeres are also induced upon deletion of TRF1, and preliminary work has shown that FEN1 and TRF1 co-immunoprecipitate from cellular lysates, we propose a model in which FEN1 is recruited by TRF1 to the telomere during leading strand DNA replication to prevent telomere fragility. However, because FEN1 interacts directly with TRF2, FEN1’s interaction with TRF1 could be mediated by TRF2. Here we use *in vitro* binding assays to show that FEN1 directly interacts with TRF1. This data implicates a previously unknown and distinct role for FEN1 at
the leading strand during DNA replication. Future work will focus on identifying the domain(s) of FEN1 that are important for the FEN1-TRF1 interaction, and determining whether the interaction is important for preventing telomere fragility in vivo.

**MUTANT CYCLE ANALYSIS OF GLUK2 KAINATE RECEPTOR MODULATION BY CIS-UNSATURATED FATTY ACIDS**

M. N. Lopez  
Mentor: J. E. Huettner

Kainate receptors (KAR) are tetrameric ligand-gated ion channels activated by the endogenous transmitter L-glutamate. As for other ionotropic glutamate receptors, KAR subunits (GluK1-5) are members of the pore-loop superfamily but with inverted orientation relative to voltage-gated or cyclic nucleotide-gated channels. Three of the KAR subunits are able to form homomeric channels (GluK1-3) and two of these (GluK1 & 2) can undergo RNA editing from glutamine (Q) to arginine (R) at a position near the apex of the pore loop (Q590R in GluK2). Q to R editing reduces calcium permeability and channel block by cytoplasmic polyamines, but increases permeability to chloride and susceptibility to inhibition by cis-unsaturated fatty acids, such as arachidonic (AA) and docosahexaenoic acids (DHA).

We have used site-directed mutagenesis to analyze the structural basis for channel modulation by fatty acids as well as ion permeation and polyamine block. Previous work demonstrated increased susceptibility of homomeric GluK2(Q) to DHA inhibition with R substitutions at numerous locations along the interface where the pore loop and transmembrane helices contact each other. R substitutions at several locations in the M3 helix at the level of the GluK2(Q) central cavity reduced polyamine block and increased chloride permeability. DHA exposure reduced chloride permeation through these mutants and increased unitary conductance to monovalent cations suggesting a change in the degree of M3 helix rotation when channels open. To extend these findings we have used double mutant cycle analysis to evaluate amino acid substitutions along the M3 helix of edited (R) and unedited (Q) homomeric GluK2 receptors. We find that the changes in fatty acid modulation and polyamine block observed with Q/R site editing can be compensated by introducing oppositely charged glutamate (E) or aspartate (D) residues at specific nearby M3 helix locations. Results identify positions that can mediate interaction between the M3 helix and the pore loop Q/R site.

Chengchao Luo  
*See Megan J. Yu*

**“VAMO’ A PORTARNOS MAL:”**

**IMAGINING THE PUERTO RICAN NATION (AND BEYOND) FROM THE CALLE 13**

Gabriel Magraner  
Mentor: Joseph Schraibman

Calle 13, a controversial musical group from Puerto Rico that mixes rap with everything from bossa nova to cumbia, represents a useful subject for investigating how identity is negotiated within three overlapping and intersecting spaces: 1) the Puerto Rican island itself, 2) the colonial relationship between Puerto Rico and the United States, and 3) a larger Latin American cultural discourse. While the group became popular during the reggaeton genre’s transition from *el underground* to the mainstream in the mid 2000s, Calle 13 also belongs to a broader, nascent genre of *música urbana* characterized by its generative hybridity. Through lyric analysis of the their discography from 2005 and 2010, this research highlights various strategies employed by Calle 13 in their social critique, such as how the group utilizes the language of performance to criticize class structures on the island and how the group culturally integrates the island into Latin America by invoking the space of the barrio, or slum, and ignoring the Puerto Rican diaspora in the continental United States. Despite professing a “subversive” message, the group’s music circulates within the market and supports dominant structures of power. This problematizes Calle 13’s attempts to destabilize notions of center and periphery by declaring that the spirit and value of Latin America resides in its marginalized subjects.

**MICRORNA IN ENTERIC NERVOUS SYSTEM DEVELOPMENT**

Shahriyar P. Majidi  
Mentor: Robert O. Heuckeroth

MicroRNA (miRNA) are critical regulators of many aspects of development, but their role in the enteric nervous system (ENS) is not well understood. Recent data suggest that miRNA are essential for normal ENS function. For example, conditional Dicer deletion within the ENS leads to enteric neurodegenerative disease. However, although Dicer is critical for the function of all miRNA, only a subset of miRNA are likely to be needed in the ENS and miRNA may have other roles in ENS development. For this reason, we think it is important
to identify miRNA expressed in the developing and mature ENS. We also became interested in this question because we demonstrated that retinoic acid (RA) signaling reduces Pten protein levels in migrating ENCC at the leading edge of the migration wavefront, but have been unable to demonstrate an effect of RA on Pten mRNA. One possibility is that Pten undergoes posttranscriptional regulation by miRNA in response to RA. To test this hypothesis, we used a microarray to identify specific miRNAs differentially expressed in undifferentiated ENCC as compared to differentiated ENCC-derivatives. Immunoselected ENCCs were subjected to conditions promoting either differentiation or maintenance of progenitor state in culture. Total RNA was isolated from these cultures for analysis and compared to samples from whole embryos. Preliminary results show differentially expressed miRNAs between these groups. These are currently being validated by qRT-PCR and in-situ hybridization. This will be followed by functional studies of Pten regulation by validated miRNAs. The existence of such mechanisms is promising for our future studies of Pten regulation and importantly, may reveal miRNAs that could be targets for the treatment of ENS disorders, like intestinal pseudo-obstruction syndrome or diabetic gastroparesis.

\[\alpha-\text{Decay of Excited States in } ^{12}\text{C}\]
Juan Manfredi  
Mentor: Lee Sobotka

High-resolution triple-alpha coincidence data were used to reconstruct the decay of the excited states in \[^{12}\text{C}\] at 7.65 MeV (\(^{1}\pi = 0^{+}\)) and 9.64 MeV (\(^{1}\pi = 3^{-}\)). These data are consistent with the \(\alpha\)-particle decay of both levels proceeding exclusively through \(^{8}\text{Be}_{\text{g.s.}}\). In the first of these cases, the Hoyle state, upper limits of 0.45% and 3.9% (at the 99.75% confidence level) are set for an equal-energy alpha particle decay process and a process uniformly spanning three-body phase space (respectively).

\textbf{Serotonin Precursors As Intervention for Colitis-Associated Mood Disturbance}
Jeffrey Marinshaw  
Mentor: Matthew A. Ciorba

The human inflammatory bowel diseases (IBD), Crohn's and ulcerative colitis, affect millions of individuals worldwide and can cause severe diarrhea, rectal bleeding, abdominal pain, and weight loss. Heightened states of depression and anxiety are also commonly observed in humans with active IBD and have been reported in mouse models of colitis. In humans and animal models, acute tryptophan depletion induces depressive symptoms. The Ciorba lab recently reported that during active Crohn's disease, serum tryptophan levels are depressed relative to healthy controls or patients in remission. We used a murine colitis model to evaluate whether supplement based intervention along the serotonin synthesis pathway could attenuate colitis-associated anxiety and depression. The impact of these supplements on colitis severity was also assessed.

Colitis was induced in age-matched wild-type mice by 7-day cycles of dextran sodium sulfate (DSS) in drinking water. Colitis severity was examined by clinical parameters and histology. Following each course of DSS, experimental groups received amino acid treatments (5-HTP, tryptophan, or alanine) ad libitum or via oral gavage. Depressive behavior was assessed using the forced swim test and tail suspension test. Anxiety behavior was assessed using the step-down test and light-dark box test. A locomotor activity test was performed to verify that differences in behavior were not due to physical impediment.

Our results suggest orally administered tryptophan and 5-HTP do not worsen disease severity or alter locomotor activity in DSS colitis. Colitis mice receiving 5-HTP by gavage more closely resemble healthy controls than colitis controls in behavioral tests of anxiety. No differences between groups were observed in tests assessing depressive behavior. These results suggest that 5-HTP supplementation lessens anxiety associated with chronic colitis and has an acceptable safety profile. These experiments will be extended to determine if the observations hold true across different mouse strains and models of colitis.

Benjamin Marks  
See Philip Chen

\textbf{Play Ball!: The Role of Baseball in the Evolution of California}
Jack Marshall  
Mentor: David Konig

Although baseball was the most popular sport in the United States throughout the first half of the twentieth century, Major League Baseball did not arrive to California until the 1958 season. In addition to describing the circumstances leading up to – and resulting from – the Brooklyn Dodgers’ and New York Giants’ moves to Los Angeles and San Francisco, this work investigates the history of California throughout the first half of the twentieth century to show how the growth of both California and baseball within the state were nearly directly correlated. Whereas Los Angeles and San Francisco were regional powers in the late nineteenth and early twentieth centuries (at
which point baseball was confined to youth fields and unstable minor leagues), their rapid growths throughout the first half of the twentieth century, especially that of Los Angeles, resulted in a demand for major league-caliber baseball. The study documents the changes that came as a result of California’s entry to major league status. There are few historical sources that describe the effects that baseball had on California, as well as a dearth of information about the rise and fall of the Pacific Coast League and organized baseball in California. While this work touches upon effects on New York City’s baseball supporters, the wider focus is on California and their new teams, focusing both on the cities’ past overtures to major league teams as well as what happened in the years immediately following 1958. Los Angeles Mayor Norris Poulson claimed that by the 1950s, Los Angeles was a major league city in everything except for baseball; this work describes the events that led to Los Angeles’ and San Francisco’s “major league” statuses, using baseball as a concrete example to show how far the two cities came from their original roles in the United States in becoming the major international cities that they are now.

**CHARACTERIZING THE ROLE OF FIVE PUTATIVE CAPSULE REGULATING GENES IN CRYPTOCOCCUS NEOFORMANS**

Alyssa L Marulli

Mentor: Tamara L Doering

*Cryptococcus neoformans* is a pathogenic fungus that poses a serious threat to the health of immunocompromised individuals. The large protective polysaccharide capsule of *C. neoformans* is induced by the environmental conditions these cells encounter when they enter the human body and is required for their virulence. Five genes from the KN99 serotype A strain were selected to study their roles in the stress-response pathways leading to capsule induction: *BCY1, HOG1, CNAG_00797*, *CNAG_07924*, and *CNAG_00883*. Each of these genes was deleted using the homologous recombination split-marker approach. The capsule of each mutant strain was induced, measured, and compared to wild type. The growth of these mutant strains under differing stress conditions was also tested and compared to wild type as was their melanin production. The results show that the *bcy1Δ* and *hog1Δ* mutant strains showed increased capsule radius while the other three genes showed no change in capsule size when compared to wild type. *Bcy1Δ* had inhibited growth under the stress conditions of disturbing the cell wall, osmotic, and high temperature. *Hog1Δ* had increased growth under basic pH and inhibited growth with osmotic and disturbing the cell wall stresses. *CNAG_07924Δ* and *CNAG_00883Δ* had increased growth under osmotic stress while *CNAG_07797Δ* showed no difference in growth under any of the stress conditions tested. The *bcy1Δ*, *hog1Δ*, and *CNAG_07924Δ* strains all showed decreases in melanin production as well. All of the effects seen were heightened as the temperature and concentration increased. These results indicate that *BCY1, HOG1, CNAG_07924*, and *CNAG_00883* are all involved in at least one of the stress-response pathways that eventually lead to capsule formation upon entering the body. Further studies are needed to determine each gene’s exact role in these pathways.

**APT102 PREVENTS REOCCCLUSION AND SUBSTANTIALLY DECREASES INFARCT SIZE WITHOUT BLEEDING TIME PROLONGATION AFTER CORONARY FIBRINOLYSIS IN DOGS**

Suzanne Mazhuvanchery

Mentor: Dana Abendschein

Patients presenting with myocardial infarction (MI) are given reperfusion therapy commonly in the form of recombinant tissue-type plasminogen activator (rt-PA), in addition to aspirin, heparin, and clopidogrel (Plavix®); however, aspirin and heparin do not prevent thrombotic reocclusions effectively and Plavix increases bleeding.

APT102 is a human recombinant apyrase that degrades circulating ATP and ADP, inhibiting platelet activation while generating cardio-protective adenosine. This study tests whether APT102 will decrease the rate of reocclusion of the affected vessel and decrease infarcted myocardium without increasing bleeding when compared to Plavix.

One week after instrumentation of an electromagnetic flow probe and a distal transluminal electrode on the anterior descending branch of the left coronary artery, thrombosis was induced in conscious but sedated dogs by applying current via the electrode to create a platelet-rich thrombus and simulate an MI. One hour after occlusion (arterial flow rate of 0), IV rt-PA (1 mg/kg), IV heparin (100 U/kg bolus and 50 U/kg/h for 125 min), and oral aspirin (5 mg/kg) were given to each dog. The dogs were randomly assigned to receive either oral Plavix (4 mg/kg) or IV APT102 (1.0 mg/kg). Coronary flow and bleeding times were monitored for 24 hours, and then transverse sections of the dog hearts were stained with a vital stain to determine the area of infarction.

The reperfused coronary artery in dogs treated with Plavix (n=6) all reoccluded, whereas none of the arteries in dogs given 1.0 mg/kg APT102 reoccluded (n=6, p<0.001). The infarct area as a percentage of area at risk was 16.7±8.3 % for the Plavix group compared to 3.1±2.5 % for 1.0 mg/kg APT102 (p=0.0081). Bleeding time was increased significantly by Plavix at 24 hours post occlusion (137±36 s) compared to baseline (78±12 s, p=0.0045), but not for 1.0 mg/kg APT102 at 24 hours (103±23, p=0.047).

APT102 inhibits reocclusion, decreases infarct size, and does not increase bleeding in contrast to Plavix. APT102 requires further study as a conjunctive agent to optimize fibrinolytic therapy.
SOCIAL ANXIETY ON FACEBOOK
Bethany McCord
Mentor: Thomas L. Rodebaugh

Previous studies of socially anxious individuals’ Facebook use indicate that people with high social anxiety have much to gain and lose from Facebook use. However, little is known about how people with high social anxiety actually use Facebook. Two hypotheses were tested in this study. The poor get poorer hypothesis predicts that users with high social anxiety will interact on Facebook less than other users, presumably because social interaction is anxiety-provoking. The second hypothesis predicts that Facebook users with high social anxiety will report feeling symptoms of social anxiety while interacting with others on the site.

Participants (n = 216) completed an online survey consisting of the shortened versions of the Social Interaction Anxiety Scale (SIAS-6) and Social Phobia Scale (SPS-6), a questionnaire assessing how frequently individuals use the interactive features of Facebook, and a measure of social anxiety experienced while using those features, the Facebook-SIAS.

No significant correlation between the SIAS-6 and SPS-6 and the FBQ was supported ($r = 0.05, p = 0.23$). A correlation was found between the SIAS-6 and SPS-6 and the F-SIAS ($r = 0.66, p < .001$). These findings indicate that even though socially anxious individuals do experience anxiety while interacting with others on Facebook, they still interact on the site just as much as other users. This may simply reflect the difference in degree of symptoms experienced in each situation. A second possibility is that the extra time and space involved in Facebook interactions allow socially anxious users to employ coping strategies that they are not used in face-to-face interactions.

IS YOUR WORKFORCE LEGAL? E-VERIFY LAWS IN THE U.S. STATES
Sarah McDonald
Mentor: Gary Miller

Frustration over the absence of federal immigration reform has led states to pass their own laws that raise barriers to undocumented immigrant employment. One type of law requires that public and/or private employers use E-Verify, an internet based work authorization verification system run by the Department of Homeland Security, to verify that their employees are eligible to work in the United States. Fifteen states passed mandatory E-Verify laws between 2006 and 2011. Political Science scholars have studied factors that influence federal immigration policy but they have yet to explore the factors that drive state-level E-Verify laws. This study asks: What factors influence a state’s decision to pass mandatory E-Verify legislation? Answering this question will help the political science and the immigration policymaking communities understand why certain states passed mandatory E-Verify laws and predict whether certain states are likely to pass similar laws in the future. I use ordered logistical regression and linear regression to determine the effect that economic conditions, interest group representation, public opinion, and political ideology have on a state’s likelihood of passing E-Verify laws. I find that economic conditions, specifically measured by unemployment rates, and interest group representation, specifically measured by labor union representation, have the largest influence on the type of E-Verify policy a state passes. There is a positive relationship between the unemployment rate and the odds a state will pass E-Verify legislation. There is a negative relationship between the percentage of workers represented by labor unions and the odds a state will pass E-Verify legislation. Therefore, states with high unemployment and low labor union representation should be the most likely to pass mandatory E-Verify laws in the near future.

STEVEN BARNES THE MYTHMAKER: THE REPRESENTATION OF THE BLACK HERO IN THE SPECULATIVE FICTION NOVELS LION’S BLOOD AND ZULU HEART
Marcia McIntosh
Mentor: William J. Maxwell

Writer Steven Barnes observed early in life the need for African American mythic heroes in American popular culture. To craft myths, Barnes uses what he considers “the mythology of the 19th, 20th, and 21st centuries”: speculative fiction, an inclusive term for the literary genres of science fiction, fantasy, horror, erotica, utopian, dystopian, futuristic, and alternate history. Using an outline for myth called the Hero’s Journey, Barnes accomplishes the task of creating myths of triumph for African Americans that communicate universal truths for all audiences. In his alternate history novels Lion’s Blood (2002) and Zulu Heart (2003), Barnes develops a black hero with the potential to change perceptions of the black male in society. I argue that (1) Barnes reveals his idea of a black mythic hero by identifying differences between his protagonists and other dominant male characters and that (2) this presentation is made possible only by Barnes’ clever use of a speculative setting to neutralize stereotypical perceptions.
MY PRESIDENT IS BLACK: HIP-HOP CONSTRUCTS A POLITICAL ROLE IN 2008
Christopher Carter McLamb
Mentors: Heidi Kolk, Peter Kastor, Patrick Burke

Joining millions of other first-time voters in 2008, hip-hop musicians Youg Jeezy, Nas, Soulja Boy, Ludacris, and T.I. went to the polls on November 4, 2008, to help elect Barack Obama President of the United States of America. Their participation came as part of a broader shift in hip-hop culture. After decades of opposition to politicians and government, many of hip-hop's most popular musicians rallied behind Barack Obama's campaign in 2008. This work explores the ways hip-hop culture operated as a political social movement in 2008 by examining hip-hop music, blogs, magazines, and performances over the course of the campaign. Furthermore, this study places the events of 2008 within a broader history of hip-hop's role in national politics. Beginning in the early 2000s, several hip-hop musicians and moguls sought to turn hip-hop's cultural influence into a political force representing the beliefs of post-civil rights black Americans. At the same time, hip-hop's aesthetic culture transitioned away from the gangsta image that dominated the 1990s, reducing the controversy surrounding the genre's musicians. In response to these developments, the Obama campaign organized an unprecedented outreach effort that established mutual respect with hip-hop culture, and appealed specifically to hip-hop's social criticisms. Dozens of hip-hop musicians responded by promoting Obama through their music, appearances, and performances as both informal and formal Obama surrogates. In arguing for hip-hop's political influence during the 2008 election, this thesis not only shows how hip-hop culture became a part of the coalition that led to Obama's victory, but also offers a new way to understand how hip-hop's aesthetic culture is intimately tied to its ability to influence electoral politics.

EVERY BLOW FROM THE RUFFIAN BROOKS GIVES TEN THOUSAND TO LIBERTY: EXPLAINING THE POPULAR MOBILIZATION IN THE NORTH FOLLOWING THE CANING OF CHARLES SUMNER
David Messenger
Mentor: Iver Bernstein

On May 22, 1856, South Carolina Representative Preston Brooks assaulted Massachusetts Senator Charles Sumner in response to a speech that Sumner delivered that not only insulted the South and slavery, but also slighted Brooks' uncle, Senator Andrew Butler of South Carolina. Although the caning took place in Washington, far away from the conflicts of “Bleeding Kansas,” Northerners saw the two events as connected. In the aftermath of the caning, Southerners applauded Brooks for his actions to defend their honor against the defamation of an abolitionist. The caning provoked a response in the North that was unparalleled by any antebellum event up until that point. Northerners were angered by what they perceived as an attack upon their region. Anti-Southern rhetoric was widespread and abolitionist sentiment filled the air. The Sumner caning indeed was not any ordinary event because it inspired an “awakening” of democracy that had religious undertones that yielded to secular democratic nationalism. To explain this awakening, this study uses newspapers, letters written to Sumner, and the correspondence of notable abolitionists. Explaining the popular mobilization in the North in the aftermath of the caning is central to understanding assumptions about slavery, violence, sexuality, and ideas of republicanism that are not well understood. These themes are crucial to grasping the processes that led to the Civil War. This thesis argues that the first sectional tensions arose from the caning as a result of northern popular mobilization. The mobilization resulted from Sumner's oration, which reached out to democratic ideals and transformed them into a new public communication that was accessible. Northerners were also transfixed on the violent nature of the attack, which made Sumner a martyr and a religious figure. The North's democratic mobilization was the sign of war in practice, if not actually declared. It seemed that there was no turning back.

LOOK LIKE ME, ACT LIKE ME: THE EFFECT OF RESERVED SEATS ON SUBSTANTIVE REPRESENTATION OF THE MAORI IN NEW ZEALAND
Courtney Millian
Mentor: Brian Crisp

Reserved seat systems are a unique method for ensuring a baseline level of minority representation. They require that certain seats be occupied by members of a particular minority group. This study seeks to advance the debate on reserved seats by addressing their potential to influence minority substantive representation. I extend existing theories of ethnicity and electoral systems to the context of substantive representation of Maori, a minority group for which seats are reserved in New Zealand. Most notably, I hypothesize that the incentives generated by reserved seats will prompt the Maori legislators in those seats to pursue a greater degree of substantive representation than those Maori legislators who hold non-reserved seats. Using original data sets of written parliamentary questions and member's bills, I construct two models to test the effects of ethnicity and tier on a legislator's pursuit of substantive representation. Results indicate that reserved seats matter for substantive representation, above and beyond simply increasing the number of minorities in the legislature.
CHARACTERIZATION OF MYCOBACTERIOPHAGE LITTLEGUY

Jay Mohan, Yeamie Smartt-Nalli, and Judy (Jingxuan)Wang
Mentor: Sarah Elgin

Mycobacteriophage LittleGuy was isolated from a sample taken at Washington University in St. Louis on September 4th, 2011. The phage produced small, turbid plaques with a radius of about 4 mm when plated with Mycobacterium smegmatis. Its plaque morphology suggested that LittleGuy was lysogenic. LittleGuy was also studied with electron microscopy (EM): the size of the viral head was determined to be approximately 51 nm x 50 nm, and the size of the tail was approximately 211 nm. Based on the EM evidence, LittleGuy appeared to be Siphoviridae. The phage DNA was then isolated from the phage structure and explored with restriction enzymes BamHI, Clal, EcoRI, HaeIII, and HindIII. No clear bands were observed, revealing a restriction enzyme map similar to that of many Cluster K phages in the mycobacteriophage database. Therefore, LittleGuy was preliminarily assigned to Cluster K. In 2012, genome annotation began on LittleGuy. After sequencing, the size of the genome was determined to be 51,168 base pairs. Eighty-eight genes, separated into at least 4 operons, had been annotated for position. Based on the results of many BLAST searches, it was found that LittleGuy was closely related to mycobacteriophages Peaches, Backyardigan, TiroTheta9, LHTSCC, MeeZee, and Eagle—all Cluster A4 phages. Therefore, LittleGuy was replaced into Cluster A4. The functional annotation of LittleGuy’s genome would lead to important insights about how the phage operates and infects bacteria and should also reveal a great deal about LittleGuy’s evolutionary history. The study of mycobacteriophage LittleGuy is certain to add valuable information to the growing database of mycobacteriophage knowledge.

ART ACTIONS AND AIRMAIL PAINTINGS: ART FURING THE PINOCHET REGIME IN CHILE, 1973-1989

Molly Moog
Mentor: Angela Miller

The repressive military dictatorship of Augusto Pinochet in Chile, from 1973 to 1989, is not remembered for its artistic sponsorship, but rather for its egregious violation of human rights. However, artistic production did exist during the seventies and eighties in Chile, exemplified by artists Eugenio Dittborn and the members of CADA (The Art Actions Collective), who employed conceptual and performance art in a critical deconstruction of the Pinochet regime’s official discourse. This research examines the dictatorial period through an analysis of the collaborative art actions that CADA executed throughout Santiago and the collage-like compositions of Eugenio Dittborn, which were displayed within Chile and sent to museums abroad through airmail. The work examines the official discourse of the military regime; its efforts to erase the history of the previous government, headed by Socialist president Salvador Allende; and the dictatorship’s effect on the Chilean artistic, cultural, and intellectual scene. The research further focuses on CADA’s “art actions”: participatory urban interventions that deconstructed the regime’s use of rhetoric and censorship and opened a counter-dictatorial discourse. The work examines the prints and Airmail Paintings of Eugenio Dittborn, which incorporated photographs of marginalized Chileans in a commentary on the mediation of photographic images and the power of photography to capture disappearance. The study addresses post-dictatorial debates on how to remember the Pinochet regime and the manner in which critical discourses on the artistic production of the dictatorial period have entered into these debates. It also challenges the notion of an extant, coherent artistic avant-garde in Chile during the dictatorial period. This analysis of art, politics, and memory during and after the Pinochet dictatorship engages with current debates over the lasting legacy of the dictatorial period in Chile.

LYAUTEY’S DIVIDED CITY: A DEFENSE OF THE DUAL CITY THEORY IN ITS UNIQUE APPLICABILITY TOWARD SETTLER-COLONIAL SUBJUGATION

Timothy Morgan
Mentor: Eren Tasar

In our recent endeavor to fill the cavernous dearth of historical and anthropological scholarship pertaining to states subjugated by European imperialistic power, historians have given rise to a theoretical conception that seeks to both illustrate and elucidate the unique urban metamorphoses that accompanied colonial rule. Guided by the ostensible schisms that have historically divided both the colonial city and those dwelling within it, many have posited the theory of a “dual city,” one intensely stratified and, thus, transformed by the considerable divisive forces inherent to colonialism. While this model convincingly accommodates a number of colonial instances, some social historians and anthropologists have decried its failure to adequately explain the often-convoluted relationships and dynamics that can develop between the colonizer and the colonized. In order to consummate this discrepancy, this work defends the colonial dual city model in its unique and specific applicability toward “settler colonial” rule, that which presides over a significant metropolitan settler
population in addition to a preexisting indigenous society. To this end, this work comparatively analyzes the evolution of colonial administration in Algeria, a definitively settler-colonial realm, and Egypt, which never incurred a significant metropolitan settler population. As this analysis illustrates, the distinctive nature of colonial polity that resulted from the settler-colonial social dynamic played a definitive role in the formation of intense social and spatial stratifications upon the urban framework, substantiating the selective use of the duel city theory and, thereby, strengthening our understanding of the relationship between administrative polity and colonial urban and social development.

**THE POWER OF REPRESENTATIONS: THE HARKIS OF FRENCH ALGERIA**

_Erica Muñoz-Fitch_

Mentor: John Bowen

_Harkis_ is a term given to ethnic Algerians who fought on the French side of the Algerian war for Independence between 1955-1962 and they were the group most often caught in the middle of a war that was both physical and ideological. After the war’s end the _harkis_ were in forced into an even tougher situation when all sides abandoned them. French policies significantly impeded their immigration, even as the new Algerian government condoned or ignored massacres of _harkis_ and their families. For the thousands of _harkis_ who eventually made it to French soil, the tribulations of integration had only just begun. This work examines the story of harkis and how they were portrayed on either side of the Mediterranean. This work considers the suffering of the question and asks why such a group was so maligned. The power of images and their affect on a community is examined through the images furthered of the _harkis_. Analysis of the representations used for _harkis_ focuses on the idea of “perfect victimhood” and how in failing to be blameless, harkis lost their rights as victims. To strengthen this study of the power of characterizations, a comparison of ethnic Europeans known as _pied-noirs_, who were also forced to flee Algeria after independence, is used to further the analysis of these representations by presenting a case that is similar in many respects except the images portrayed of them. _Harkis_ are only one facet in the long and complicated history of Algeria and France, but their story is often untold. In lifting this sad and sometimes incomprehensible chapter of French history out of the shadows, the complex relationship between France and its dearest colony becomes clearer. Ultimately this work strives to examine and explain in depth the wounds the _harkis_ have endured in silence.

Justin Muste

*See Jamal Gaddis*

**ULTRASONIC SENSOMETER**

_Ruth Nan, Sydney Saito, and Kaichen Zhang_

Mentor: Robert Morley

Parking meters can be a source of inconvenience for police officers in that oftentimes, the LCD display is foggy or difficult to read. Parking meters often have a default setting that display a red background even when cars are not present. This project, the Ultrasonic Sensometer, seeks to address these issues by detecting when a car is present at the parking meter and displaying an LED that visible from 10 meters away when lit.

The Ultrasonic Sensometer implements an alert system that detects the presence of a parked automobile within 1 meter. The parking meter sensor is able to determine whether the car is legally parked, overdue, or soon to expire. The Ultrasonic Sensometer receives two input signals from the parking meter: if the parking meter has been paid and if five minutes or less are remaining on the meter. In a demonstration, these signals are simulated by two external switches. The device will signal the state of the parking meter, overdue or within five minutes, with a light-emitting diode (LED). The project integrates a Parallax PING))) sensor; an Arduino Uno with an ATmega328 processor; and circuit elements including an LED, resistors, and switches.

To conserve energy, the device has a sleep mode which wakes itself up approximately every fifteen minutes. The Ultrasonic Sensometer will run on the parking meter’s battery. Future directions involve making a wireless module to alert the parker as well as the police as to the state of the parking event.

**VECTOR-BORNE DISEASES IN ST. LOUIS, MO: CASE STUDY OF HUMAN EHRlichiosis DISEASE RISK THROUGH GEOGRAPHIC INFORMATION SYSTEMS SPATIAL ANALYSIS**

_Akhila Narla_

Mentor: Memory Elvin-Lewis

Vector-borne diseases serve as a major threat when humans interact differently with their environment due to changing global processes
and relationships with natural landscapes. Because previous trends in ecologic behavior are altered, infectious disease trends are affected since the majority of infectious diseases are zoonotic in origin (i.e. transmitted from animals to humans). In the United States and in the Midwest, vectors like mosquitoes and ticks have contributed to disease risk. While research in Missouri has been conducted resulting in integrative mosquito vector control measures to combat Yellow Fever, Dengue, West Nile Virus, and St. Louis Encephalitis, tick-transmitted diseases are highly important in the U.S. as they are the most prevalent vector-borne infectious diseases afflicting human health. Different ticks inhabit different areas in the U.S., uniquely transmitting diseases like Lyme Disease and Rocky Mountain Spotted Fever. In Missouri, the high abundance vector in the St. Louis region is the lone-star tick (*Amblyomma americanum*), which transmits the bacterial infections *Ehrlichia chaffeensis* and *E. ewingii*, causative agents of Human Ehrlichiosis, for which Missouri has the highest human incidence in the country. To better understand the disease ecology, a novel technique for this disease in the region was used to visually depict through Geographic Information Systems the separate and combined contributions over a three year period of density of nymphs, nymph infection prevalence and density of infected nymphs to disease risk around the forest-covered regions of the 32 parks sampled in the St. Louis region. Using interpolation maps and calculated landscape variables, gradients of disease risk and landscape-linked correlations were determined. Enhancing understanding of the cascade of human-mediated environmental changes allows public health experts to target regional prevention efforts.

David Nathin
See Philip Chen

**MT-A70 SUBUNIT OF mRNA METHYLTRANSFERASE IN *Tetrahymena Thermophila***

Nickolas Nauman and Monirath Siv

Mentor: Douglas Chalker

MT-A70 is the S-adenosylmethionine-binding subunit of mRNA methyltransferase (MTase) in humans, found to catalyze the methylation of internal adenosines in eukaryotic mRNA. However, the exact function this plays in cellular processes remains unclear. Here, using bioinformatics analysis we identified two proteins encoded by *MTA1* and *MTA2* genes in *Tetrahymena thermophila* that each contain an MT-A70-like domain. MTA1-YFP and MTA2-YFP fusion proteins exhibited macronuclear localization during both vegetative growth and conjugation which supports the hypothesis that they function in macronuclei, which may be related to mRNA methylation. During conjugation, MTA1-YFP and MTA2-YFP localized to both parental and new developing macronuclei. MTA1-YFP and MTA2-YFP expression patterns and DNA microarray analyses suggested that they may play important roles in the development of the new macronuclei. In order to further elucidate the function of these proteins in *Tetrahymena*, RNA Immunoprecipitation will be performed to identify possible RNA targets that these genes may bind and methylate.

**The Spenser Project**

Amanda Netburn
Mentor: Joseph Loewenstein

Edmund Spenser was the eminent English poet of the 16th century. The Spenser Archive is the digital component of Oxford University Press’s forthcoming *Collected Works of Edmund Spenser*. A multi-institutional undertaking, the Spenser Archive collaborates with Early English Books Online to add in-depth markup, editorial commentary, text of variants, and flexible display to their transcriptions of Edmund Spenser’s works.

**Identifying Proteins that Interact with Drosophila melanogaster Heterochromatin Protein 2 (HP2) and Characterizing Their Contribution to Heterochromatin Formation**

Patrick Ng
Mentor: Sarah Elgin

Heterochromatin Protein 2 (HP2) interacts and co-localizes with Heterochromatin Protein 1 (HP1) within *D. melanogaster* chromatin and is itself involved in heterochromatin formation. Several mutations in the HP2 gene cause suppression of position effect variegation (PEV), a loss of reporter gene silencing. Of the 17 HP2 mutations recovered, three missense mutations, 288, P2763L, and 230, have been identified, one each in exons 6, 8, and 9 of HP2; the latter two have been selected for further study. We postulate that interactions between HP2 and its binding partners at the sites of these mutations impact heterochromatin formation. A Yeast-2-Hybrid (Y2H) mating screen was utilized to find proteins potentially interacting with HP2 exon 9, and identified 37 protein-coding clones from the *D. melanogaster* library. None of these clones displayed a loss of protein interaction with the mutant form of HP2 exon 9 relative to its wild type...
counterpart. Future explorations could quantify differences in association between these proteins and wild type or mutant exon 9. Prior Y2H work identified genes coding for proteins that distinguish between the wild type and missense mutation in HP2 exon 8. We examined one of these proteins, cheerio, for possible Su(var) effects by comparing expression of lacZ in D. melanogaster stocks with wild type or mutant cheerio. In these experiments the lacZ gene has been juxtaposed with a region of heterochromatin; this arrangement is similar to the juxtaposition of the white gene with heterochromatin in the classical assay for suppression of PEV. Differences in the β-galactosidase activity are observed qualitatively in tissue staining and quantitatively in whole fly assays. Differences in wild type and mutant suppression of PEV for white activity are observed in another exon 8 interacting protein, sinuous. The results indicate that cheerio and sinuous are associated with gene silencing due to heterochromatin formation.

**READING THE REAL BIBLIOTECA DEL ESCORIAL: DANGEROUS BOOKS, READERS, AND POPULATIONS**

**Sophia Nuñez**  
**Mentor: Stephanie L. Kirk**

Amid an atmosphere of increasing censorship and intolerance in sixteenth- and seventeenth-century Spain, the apparent anomaly of a royal, religious library accepting Hebrew, Arabic, and forbidden books presents a unique window onto aspects of early modern Spain’s political, cultural, and intellectual life. While treating the Real Biblioteca del Escorial, which King Philip II decided to found in 1559, as such a microcosm of Spain’s larger issues, I explore the significance of its surprisingly inclusive collections and contrasts between the treatment of books and that of people. Reading the library entails an examination of early modern attitudes towards libraries, books, and readers, along with attendant views on censorship, intolerance, and destruction. Additionally, I consider the political-historica context of Spain’s powerful empire and ambivalent attitudes towards Protestants, Jews, Muslims, and their converted but stigmatized descendants. Given these contexts, I examine published histories, constitutions, catalogues, and letters regarding the Escorial library in the sixteenth and seventeenth centuries for an understanding of its policies, readers, and book acquisition – paying particular attention to the treatment of suspect books and their readers. From the historical context and documentary evidence, I suggest that keeping ‘dangerous’ books in this library expressed power over the conquered, showed royal pride and prestige through a universal and valuable library, and minimized the risks that the books present by isolating them from all but trustworthy readers in the Escorial. Indeed, although the library was ostensibly open to “all men of letters who wished to come and read in it,” in the words of Philip II, it appears that only those most trusted readers enjoyed an unusual, potentially dangerous freedom of reading at the Escorial. Further efforts for this project will include archival work in the Escorial and the Archivo Histórico Nacional in Spain this summer.

**FRACHTALS, FORM, AND MOVEMENT: HOW AND WHY INFINITE JEST MAKES US ADDICTS**

**Aine O’Connor**  
**Mentor: Amy Baily**

David Foster Wallace’s novel *Infinite Jest* spans a truly intimidating 1,097 pages; I examine only five of them through the lens of Danilo Guimarães’s argument that the creation of any work of art is only significant if its form can successfully interest and engage an audience. I argue that the structure of *Infinite Jest* is that of a body—more specifically, an addicted body—and that this form recurs, like a fractal, throughout the text. The addicted body is present in both the content of the novel and in how its physical form determines the reader’s interaction with it: while Wallace describes chemical bodies of drugs, the bodies of students who use them, and the body-like structure of the school they attend—the campus is shaped like a heart, full of vein-like tunnels, and contains a lung of sorts—an irritatingly large number of endnotes make the reader constantly flip hundreds of pages back and forth. Thus the book’s form creates a chaotic and fatiguining experience that by physically stressing the reader reflects the stress of the addicted bodies Wallace describes. In the same vein as Guimarães’ claim that the form of a work is deliberately constructed to channel an idea, I believe that Wallace formatted *Infinite Jest* so that we depend on its bizarre structure—its body—to follow the plot in much the same way an addict depends on chemical substances, and in the same way we all depend on certain routines and structures of action. In this way, Wallace’s fractal use of the symbol of the body in both what and how he writes these pages of *Infinite Jest* showcases addiction in the hopes of making us conscious of our own.

**CHINESE MIGRATION TO LATIN AMERICA: A HISTORY OF THE COOLIE TRADE IN CUBA, PERU AND PANAMA, AND IT’S IMPACT ON SOCIETY**

**Lauren Olens**  
**Mentor: Joseph Schraibman**

This study synthesizes the history of the Chinese Coolie trade –also known as the shipment of indentured laborers - to Cuba, Peru and Panama in the nineteenth century. Scholarly articles and books are brought together, yielding a thorough analysis of this wave of Chinese immigration to Latin America. This essay first introduces the study of Chinese immigration in order to gain a basic understanding of
this phenomenon. Then, the work expands on the Coolie trades and the impacts they had in each country. The study extensively compares the Coolie trades to the three host societies, which was not found in previous research. It finds that the Coolie trade to Cuba and Peru were very different from the trade to Panama due to the amount of Coolies, the labor they provided and the reasons they were needed. On the other hand, the Coolies’ voyage to the Americas, horrible conditions and treatment in the three host societies were similar in all of the cases studied.

TO BUY OR NOT TO BUY? MUTUAL ASSISTANCE HOUSING COOPERATIVES IN URUGUAY AND THE CHALLENGES OF SHIFTING IDEOLOGIES

Mariana Oliver
Mentor: Peter Benson

With the onset of modernization processes in Latin America, capitalism has become the hegemonic system within most of the region’s urban cities. This trend has been accompanied by a significant shift in urban cultures as societies adopt ideologies that stress individual gain above communal bonds or welfare. Within this changing urban context, we have the mutual assistance housing cooperatives, where membership within these communities entails a collaborative effort. This housing model is an intriguing example of a system that provides alternatives to Western notions of homeownership for working-class people, turning the tables on capitalist-inspired ideals of privatization and individualism in favor of solidarity and collective action instead. Though the cooperative system has survived and thrived for the past forty years, today it faces challenges associated with the cultural changes that have accompanied the modernization of urban cities in Latin America. The ideologies of political resistance, solidarity, and cooperation that resonated so strongly with Uruguayans during the labor union movements of the ’60s and ’70s, and then later during the military dictatorship in the ’80s, have shifted and changed. Today’s urban cultures increasingly adhere to capitalist consumerism, which poses a serious challenge to the sustainability of the more traditional ideological narrative of Uruguay’s mutual assistance housing cooperatives. Nevertheless, as the ethnographic research in this work shows, the problem of housing continues to exist for many working and lower-middle class people who do not have the economic resources to enter into the private housing market. Given this reality, people continue to acknowledge, accept, and appreciate the alternative the cooperative system provides for them.

CANCER: A GLOBAL ANTHROPOLOGICAL PROFILE

Priya Parikh
Mentor: Peter Benson

As the burden of illness in developing countries becomes more chronic in nature, cancer incidence and mortality are increasing dramatically. To better understand the trajectories of cancer globally, it is vital to explore scholarship that addresses various aspects of cancer anthropology: risk factors and prevention, metaphor and conceptions, stigma and coping, gender related issues, complementary therapies, and epidemiology and distribution. By doing this, I aim to create a profile of where cancer is in the world and the cultural issues that are involved in its current burden. With this approach, we can add an anthropological view to the current medical perspectives on cancer, so that we can be better informed on how to make a positive applied impact on cancer control.

ISLAM ON THE GROUND: FEMINIST ACTION AND NARRATIVES IN MOROCCO

Deanna Parrish
Mentor: Carolyn Sargent

This work attempts to identify the foundations of the roles religion plays in informing and legitimizing activism, concentrating on women’s rights movements in Morocco. Specific focus is given to how Islam and feminism have shaped one another, and the forms humanitarian organizations have taken in view of those streams of doctrine. In doing so, I seek to clarify the genesis of the divergent narratives and justifications currently in use for women’s rights agendas across political and sector divides. This work contextualizes two prominent movements within Morocco’s “women’s rights landscape” that work to enable increased legal rights and services. Through them I question and reject the traditional/progressive, secular/leftist v. conservative/Islamist paradigm, and hypothesize the existence of a historical foundation for current activist movements that push forward an international human rights agenda through utilizing Qur’anic principles. More broadly, I question how gender equality can be articulated and reached within a legal system whose jurisprudential point of reference is fundamentally based on religion.

Ruchik Patel
See Sonya Anderson
SUBLIMINAL MOTIVATION: IMPACTS ON COGNITIVE CONTROL
Lauren Patrick
Mentor: Todd Braver

Previous research has found that both conscious and unconscious rewards effectively motivate goal pursuit. It has also been demonstrated that subliminal and supraliminal goal priming activates different pathways in the brain, producing variations in performance depending on the length of time that the prime is presented. Specifically, supraliminal priming of motivation inspires greater attention to detail as compared to subliminal priming. This study examined the effects of not only supraliminal (100ms) and subliminal (22ms) incentive priming cues, but also barely perceptible (50ms) cues. It was hypothesized that the 50 millisecond condition would produce moderate activation of both pathways, resulting in behavioral data demonstrating aspects of both conscious and subliminal motivation. Priming was achieved through the presentation of blue and grey flashes within a checkerboard, with blue signifying the possibility of additional monetary reward, and thus motivating goal pursuit, and grey signifying a non-incentive trial. The flashes were presented while participants were performing a gender discrimination task, a lexical decision task, and a more cognitively demanding switch task that combined the gender discrimination task and lexical decision task in a single block. A significant difference in accuracy for the levels of subliminality between incentive and non-incentive trials was found, demonstrating that incentive primes motivate people to achieve greater accuracy than is achieved without goal priming. An interaction between trial type and subliminality was also found for the reaction time of participants in incentive versus non-incentive trials, suggesting that each presented level of subliminality uniquely impacts performance on tasks with varying cognitive demand. These findings are evaluated in context of other recent findings and potential future research directions are explored.

UNDERSTANDING WOMEN’S CHOICE OF DELIVERY LOCATION:
A STUDY FROM AN URBAN SLUM IN SOUTHERN INDIA
Kranti Peddada
Mentor: Shanta Pandey

One of the focal points of the UN Millennium Development Goals for 2015 is improving maternal health around the world, specifically by reducing the Maternal Mortality Ratio (MMR) by three-quarters. India, a developing country with a population of over 1 billion, contributes a substantial 20% to the global MMR burden, and has hence become an important target for maternal health improvement. Among other factors, institutional delivery rate is a critical measure of maternal health because home deliveries, as they are generally practiced in India, place women at high risk for suffering from pregnancy-related complications. Because the level of institutional delivery in India has already been quite extensively studied in urban and rural areas, this study focused on investigating the institutional delivery practices of women living in an urban slum. Furthermore, of those women who delivered in medical institutions, the choice of delivery in either a public or private facility was analyzed. The results of this study were based on primary data collected over the course of four days (August 2-5, 2011) in the city of Visakhapatnam, located in the Southern state of Andhra Pradesh, India. A total of 200 women with children aged 0-5 years were interviewed by going door-to-door to each residence in the slum. The results of the study provided quite unexpected results, with institutional delivery being practiced by all but three of the women. Of those of who delivered in medical institutions, it was noted that increased utilization of private facilities was associated with having just one child, being a migrant to the slum, and having exposure to electronic media after controlling for other variables. These results provide insight into the current level of maternal health in India as well as factors that influence women to avail different healthcare options for delivery.

BLOWING AWAY THE COMPETITION:
WHO’S LEADING THE PACK IN WIND POWER USE AND WHY
Amy Plovnick
Mentor: Itai Sened

Wind power use in the United States has increased considerably over the last decade. However, there is a great deal of variation across states in the amount of wind power generated and the percentage of electricity obtained from wind power. In addition, the states that use the most wind power are not necessarily the states with the greatest wind resources. In this study, I investigate what accounts for this variation in wind power use across states. I argue that the institutions - the rules and government structures - that govern the wind power industry determine its growth within states. I find that the types of renewable energy policies that a state adopts and the state’s economy and resource availability have a significant effect on its wind power use, while the political environment within the state does not. As renewable energy policies diffuse between states and to the federal government, it is important to recognize that some policies are more effective than others in promoting renewable energy development.
AN EPIDEMIC NEVER SLEEPS:
THE POLITICIZATION OF HIV/AIDS IN POST-APARTEID SOUTH AFRICA

Gabriela Plump
Mentor: Shanti Parikh

This research project examines the political and economic pressures that weighed upon the post-Apartheid government in South Africa at the onset of desegregation. To ensure a peaceful democratic transition, the ANC’s public dealing with the HIV epidemic was to virtually ignore the crisis. Looking at the period from the beginning of ANC rule in 1994 to the present, I explore the political, social, and economic factors that produced this social disease (AIDS).

I collected data from books, published reports, medical journals and though interviews with African University students to try to understand how the culture around AIDS in South Africa is a consequence of a very turbulent political and economic shift. Such instability within a racially divided society influenced and disabled the ANC from tackling, containing or treating the epidemic.

AIDS is a consequence of intricate social networks and cultural factors. I examine the reasons why the government attributed AIDS to stemming from a set of issues different than HIV and why they denied the prevailing bio-medical science of the disease. This unique virus/syndrome can only be prevented or slowed by behavioral changes and subsequent transformations in the wider social context where risky behaviors exist. The attitude of the government and public towards AIDS has morphed far beyond its biological significance and has become a disease linked to meaning—stigma, denial, knowledge, one’s “status,” AIDS representations in popular culture, wealth and race. Fear of antiretroviral drugs has constrained and stalled South African’s access to care. By uncovering the changing situation in South African life and governance during the mid-1990s, it becomes clear how HIV turned into a pandemic and the cause of almost 50 percent of deaths in South Africa, yet has not yet fulfilled Mandela’s efforts to appear like a normal illness.

ANALYSIS OF BRAIN SIGNAL GENERATION FOR EEG

Thomas Powers
Mentor: Arye Nehorai

The overall goal of the WUSTL-BCI project is to have a brain-controlled interface (BCI) by means of a non-invasive electroencephalogram (EEG). The interface would then be used to control a hand exoskeleton for aiding in the rehabilitation of hand motor skills in people who suffer from severe motor impairment. However, the scope of BCIs is not limited to controlling the hand exoskeleton. It can be applied to just about any system that a person could otherwise control—personal computers, cars, and cell phones, just to scratch the surface. The purpose of this project is to determine reliable methods of generating clear, consistent brain signals through voluntary muscle movement and motor imagery. We hope to generate enough empirical data to lay down the foundation for a targeted survey that will better test the results from our smaller scale experiments.

EXPERIMENTAL REACTIVATION OF PSEUDOTACHYLITE-BEARING FAULTED ROCKS

Hannah Rabinowitz
Mentor: Philip Skemer

We have conducted deformation experiments to test the relative strength of pseudotachylite fault veins to their host rock in two types of natural samples: a tonalite from the Gole Larghe Fault in Italy and a foliated mylonite from the Alpine Fault in New Zealand. The purpose of these experiments is to investigate strain localization in brittle-to-ductile shear zones. Deformation experiments are conducted using a Griggs apparatus at a confining pressure of 1 GPa and temperatures of 450°C to 800°C. The sub planar pseudotachylites in the core samples are oriented 45° to the loading direction. Experiments are run at convergence rates of 0.5 m/sec, corresponding to strain rates of about 2x10 5 s 1. The deformed samples exhibit discrete fracture surfaces sub parallel to and often cross cutting the pseudotachylite veins in the high temperature experiments. Low temperature experiments exhibit deformation unassociated with the pseudotachylite vein. In the lowest temperature experiments, we see evidence for cataclasis within the pseudotachylite. In the highest temperature experiments we see reduced contribution of brittle fracture type deformation. In the absence of other relatively weak surfaces in the wall rock (e.g. favorably oriented fractures), future deformation may localize along pre-existing, pseudotachylite bearing faults at lower crustal conditions.

GLP-4 ENCODES THE VALYL AMINO-ACYL tRNA SYNTHETASE VARS-2

Suchita Rastogi
Mentor: Tim Schedl

\textit{glp-4} is defined by the mutation \textit{bn2}, which at a restrictive temperature (25°C) results in adult hermaphrodites that appear somatically normal but that are germline depleted. \textit{glp-4(bn2)} has been widely used to generate germline-deficient animals for studies of aging,
pathogenesis, and stress resistance, and to assess germline versus somatic gene expression. To identify its gene product, *glp-4(bn2)* was sequenced to >30x coverage using the Illumina platform. Within the ~2Mb mapped region containing *bn2*, coding changes appeared in 5 genes. RNAi of only one of these genes, Y87G2A.5 *vars-2*, gave a sterile phenotype. *glp-4(bn2)* failed to complement the *vars-2* deletion tm3947 for fertility at 25°C. Tightly linked suppressors were isolated, and sequencing identified *bn2*tm3947, *bn2*tm40, and *bn2*oz283 as intragenic revertants.

*vars-2* encodes a cytoplasmic class I valyl amino-acyl tRNA synthetase that catalyzes attachment of valine to its cognate tRNA. *bn2* Gly296Asp and the intragenic revertants occur in the CP1 domain. Homology modeling of VARS-2 with the crystal structure of valRS from *T. Thermophilus* suggests that the sterile phenotype of *glp-4(bn2)* at 25C likely results from a reduced pool of charged valyl-tRNA, leading to reduced protein synthesis. *vars-2*-likely also functions in the soma: 1) *vars-2*(tm3947) is larval lethal; 2) *in situ* hybridization shows somatic expression; and 3) structural analysis suggests that *vars-2* has unique functions that cannot be compensated by paralog *vars-1* (VARS-2 is predicted to charge tRNAs with all four Val anti-codons, while VARS-1 is predicted to bind only anti-codons with third position pyrimidines. Thus *glp-4(bn2)* may also result in reduced protein synthesis in somatic tissues even though there is no obvious somatic phenotype. As it is known that reduced translation can lead to alterations in lifespan and stress resistance, this property, rather than germline depletion, may be the cause of the *glp-4(bn2)* organismal aging and stress resistance phenotypes.

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**CARDIAC REMODELING UNDER THE STRESS OF HEART FAILURE**

_Vinod K. Ravikumar_

Mentor: Igor R. Efimov

Heart failure (HF) is a widely occurring condition in older populations that impairs cardiac structure and function. HF results in electrophysiological (EP) remodeling, consisting of changes in ion channel protein expression and functional substrate for arrhythmogenesis. Currently, there is no defined treatment for HF due to the difficulty of interpreting symptoms, which lead to an appropriate diagnosis. Therefore, a large number of treatments are diet-based because of our limited knowledge of arrhythmia at the molecular level. In order to investigate mechanisms of electrophysiological substrate for arrhythmia in human end-stage non-ischemic cardiomyopathy, we performed extensive molecular and optical tests in both human and animal models.

Optical mapping of coronary-perfused left ventricle tissue in wedge and free wall preparations was performed with end-stage non ischemic cardiomyopathy (HF, n=10) and non failing hearts (NF, n=10). In order to visualize the optical data, immunostaining, western blotting, and histology were used as analysis techniques.

We found that conduction abnormalities were a result of Cx43 anisotropic downregulation, Cx43 phosphorylation, as well as a rise in fibrosis. These causes lead to a substrate for the propagation of deadly ventricular arrhythmias and are the likely cause of sudden cardiac death in patients with non-ischemic cardiomyopathy.

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**TALKING TORTURE: A DEMOCRACY’S GUIDE TO INTERROGATION ETHICS**

_Daniel Rebnord_

Mentor: Andrew Rehfeld

The practice of torture, as a method of interrogation, has attracted a noted increase in public scrutiny and academic research since September 11, 2001. But despite its contemporary pertinence and moral significance, no consensus exists as to whether the use of government-sanctioned torture may ever be justified in order to prevent future, mass-casualty terrorist attacks. This study therefore serves to provide a comprehensive analysis of various deontological and utilitarian arguments that are frequently cited in order to either affirm or deny the moral permissibility of resorting to the use of torture as an interrogation technique. However, unlike the majority of previous academic scholarship that has generally fixed its attention on the justice of the act of torture itself, this study aims to advance a second-order argument by outlining a set of normatively justifiable procedures through which democratic societies can resolve for themselves the first-order moral question of whether the use of torture can ever be justified. In doing so, this study concludes that in those circumstances for which it is ultimately unclear how intelligence officials ought to act when confronted with the possibility of employing torture during an interrogation against an uncooperative detainee, it is normatively desirable to leave such determinations in the hands of deliberative citizens who, through the processes of political reflexivity and collective responsibility, can place epistemic safeguards upon the moral justifiability of their nation’s interrogation policies.

_Lukas Rees_

_See Jamal Gaddis_
**BIOLOGICALLY INSPIRED CHEMICAL SENSING**

Joshua Remba  
Mentor: Arye Nehorai

According to recent biology literature, Mustelus canis sharks localize odors based on the time delay between olfactory signals detected by each of their nares. This project replicates this process by implementing a LabVIEW GUI to collect voltage data from an array of eight sensors, arranged in a 4X2 configuration. Each sensor acts as an individual electronic nare, which can be paired with any other “nare” in the array to create a specific “electronic nose.” This project examined the efficacy of ten such “noses” in locating the chemical source. Experimenters exposed isopropyl alcohol to the sensor array and implemented a Dynamic-Time-Warp processing algorithm on the resulting data to compute the overall delay between signals in each sensor pair. The delays from the most accurate noses will be used in a voting system to localize the source relative to the sensor array. While additional work is required to improve the system’s consistency, preliminary results are promising. This sensor system will eventually interface to a mobile robotic platform that will actively seek out a chemical source.

**GAS DETECTOR DESIGN WITH BRASCH MANUFACTURING**

Marc Remmert  
Mentor: Ed Richter

We are working to design a refrigerant gas detector with Brasch Manufacturing. The detector utilizes the photo-acoustic effect. The prototype had previously utilized the effect to detect refrigerant gases but was subject to temperature drift and outside noise issues. We decided to use the resonant qualities of different cell to boost our signal from the refrigerant gasses. Our focus then came in designing an analog circuit. This circuit has the ability to detect the pressure pulse from the signal, cut down the noise and increase the gain to a usable level. This is done by using four microphones, two input microphones to pick up the signal, as well as another two microphones to pick up noise. We then band pass filter the signal through a pair of chopping amplifiers. This being complete we sum our signals together to get rid of the ambient noise and give us a more usable signal. Finally we run the signal through one more operational amplifier to add gain and output the signal. Once we have our final circuit we then will take the output signal and digitally process. This process will include integrating the circuit and then matching this signal to the known refrigerant gas outputs. This circuit and process allows us to detect the refrigerant gasses we are looking for with high accuracy.

**BUILDING A CONCEPTUAL ANTHROPOLOGICAL FRAMEWORK OF RURAL AMERICAN MEDICINE: UNDERSTANDING THE CULTURE OF RURAL PHYSICIANS AND FACTORS INFLUENCING RETENTION**

Scott Rempel  
Mentor: Bradley Stoner

Rural Americans face unique barriers to accessing adequate health care and constitute one of the most medically-underserved groups in the United States. Increasing the number of primary care physicians in rural areas is a key method to decreasing rural health care disparities. In effort to increase this workforce, government and private organizations offer substantial financial incentives, including loan-forgiveness programs, to physicians in exchange for a rural service commitment. However, physician recruitment and retention remain enduring challenges. Factors influencing retention remain poorly understood and are of intense interest for lessening rural health care access disparities. The majority of literature on retention-related factors focuses on negative dynamics that cause physicians to leave underserved, rural communities.

This project explores factors reinforcing the retention of established rural physicians through a dual approach: 1) An etic literature-based analysis examines and contrasts the themes of the larger culture of American medicine and the values held by its physician members with the values and themes unique to rural American medical culture; 2) Emic perspectives of rural medicine are presented and discussed from a series of qualitative interviews with longtime rural Kansas physicians.

Results indicate that several factors based in anthropology encourage rural physician retention. These factors are intrinsically linked to the cultures of both rural medicine and rural communities, and strongly resonate with many of the cultural ideals of American physicians. This project dispels common negative myths and associations of rural medicine and includes two key highlights: 1) a new understanding of the relationship between rural medical realities and the ideals of professional medical culture, 2) the value of developing an emic understanding of rural medical culture. Together, these ideas can be valuable in the future development of policies and interventions aimed decreasing rural health disparities by increasing rural physician retention.
"ENGLISH UNDEFILED": TEXTUAL AUTHORITY AND POLITICAL SOVEREIGNTY IN BOOK IV OF THE FAERIE QUEENE

Matthew Rickard
Mentor: Joseph Loewenstein

The work began as an attempt to grapple with the textual relations among Chaucer’s Knight’s Tale and Squire’s Tale and Ariosto’s Orlando furioso in book IV of Edmund Spenser’s The Faerie Queene—how the source texts interact with one another in the context of book IV and how Spenser’s reading of his literary antecedents models how we should be reading The Faerie Queene. In examining the sites of contact, I began to see that Spenser’s source texts compete with one another antagonistically. The presence of other poems in book IV broadens rather than narrows the semantic range of the allusive poem. At the heart of such an instability seems to be an anxiety about authority itself. Operating under the assumption that literary and political dimensions of authority are mutually reflective, and furthermore, that each type of authority proffers access points from which to analyze the other, I first consider the treatment of literary authorities as manifest in the technique of allusion and then progress towards an understanding of the poem’s representations of sovereignty and the import of these representations for Spenser’s assessment of and posture towards Elizabethan politics.

PERFECTIONISM IN THE LIFE DOMAINS: THE RELATIONSHIP BETWEEN DOMAIN-SPECIFIC PERFECTIONISM AND EATING DISORDER SYMPTOMATOLOGY IN A NON-CLINICAL SAMPLE

Elizabeth N. Riley
Mentor: Rebecca Lester

Eating disorders are psychiatric disorders characterized by a drive for thinness, bulimic behavior, and body dissatisfaction. Multidimensional perfectionism is currently conceptualized as a stable construct that is pervasive across all domains of an individual’s life. Previous research has demonstrated a unique and robust relationship between eating disorder symptomatology and general multidimensional perfectionism. The present study seeks to examine the relationship between perfectionism in different life domains and levels of eating disorder symptomatology. 49 undergraduate participants completed self-report measures of general multidimensional perfectionism, eating disorder symptomatology, and domain-specific perfectionism. In-depth interviews were conducted with 10 participants regarding their subjective understandings of the definition, adaptiveness and dynamism of perfectionism. Eating disorder symptomatology was significantly and uniquely correlated with perfectionism in specific life domains but not with general (domain-pervasive) perfectionism. Perfectionism in individual life domains was not significantly correlated with domain-pervasive perfectionism. Qualitative interview data suggest that individuals conceptualize perfectionism as both domain-specific and domain-pervasive; most participants considered perfectionism adaptive for themselves but maladaptive for others and view domain-pervasive perfectionism as an enduring, unchangeable construct. Results of the present research suggest that domain-specific perfectionism is distinct from domain-pervasive perfectionism, and that domain-specific perfectionism may better explain perfectionism relating to eating disorder symptomatology. These findings call for a revision of the theoretical framework of perfectionism to one that includes an understanding of domain-specific perfectionism. A domain-specific conceptualization of perfectionism may be more manageable and accessible to clients in therapy and may allow treatment more tailored to the needs of individual clients. Future research should address the development of a valid measure of domain-specific multidimensional perfectionism and should explore the relationship between this construct and other forms of psychiatric distress.

THE ROLE OF SUBCELLULAR LOCALIZATION ON THE ABILITY OF THE AJUBA LIM PROTEINS TO REGULATE THE HIPPO PATHWAY

Gregory Ripberger
Mentor: Gregory Longmore

The regulation of organ size during development is tightly controlled by a network of signal transduction pathways that instruct cells to grow and replicate until the organ has reached its appropriate size. The Hippo (Hpo) pathway is a central signaling pathway contributing to tissue growth by transmitting cell density cues to the nucleus. At low density, the pathway is “inactive” and cells proliferate. At high density, when cells make contact with one another, the Hippo pathway is “activated” leading to cell growth arrest. To activate the Hippo pathway the protein kinase LATS phosphorylates the transcriptional co-activators YAP or TAZ leading to their nuclear exit and sequestration in the cytoplasm. The Ajuba LIM proteins are adaptor proteins that localize to the cell surface at sites of cell-cell adhesion when cells come into contact with one another but also can translocate into the nucleus. Recent genetic experiments have identified the Ajuba LIM proteins as negative regulators of the Hippo pathway at the level of Lats kinase, however the precise biochemical mechanisms whereby they do so are not known. To answer this question we asked whether the subcellular localization of the Ajuba LIM proteins affects their ability to regulate the Hpo pathway. To do this, we generated myc-tagged versions of Ajuba constitutively targeted to various
subcellular localizations, including the plasma membrane, mitochondria, and the nucleus. After verification of proper protein expression by Western blot, and subcellular localization via immunofluorescence, we measured Hpo pathway activity as represented by phospho-YAP levels. We found that Ajuba was able to negatively regulate the Hpo pathway when cytoplasmic, by interacting with and inhibiting Lats kinase. Once Ajuba is recruited to the plasma membrane it is unable to interact with Lats1/2 and thus did not inhibit the Hpo pathway.

**Recycling Soda Cans into Anodic Aluminum Oxide Templates**

Elizabeth Russell  
Mentor: Parag Banerjee

Anodic Aluminum Oxide, or AAO, is a regular nanoporous structure formed by the electrochemical oxidation of aluminum. Under certain conditions, an ordered aluminum oxide structure forms with pores ranging from tens to hundreds of nanometers in diameter. Because of the tuneability of the structure, the nature of nanopores, and high surface area of AAO, potential applications range from photovoltaics to biosensing. Normally, researchers use high purity (99.999%) aluminum for AAO experiments and applications, but such aluminum is very expensive. I explored the methods and characterization for forming AAO on the surface of soda cans, which are free. Impurities can constitute up to 6% of the aluminum used for cans manufactured in the U.S. I found that aluminum can be anodized regardless of the metal impurities in the material. The anodization process, however, is disrupted by presence of organic material such as paint that has been integrated with the aluminum. The main difference in the anodization of pure aluminum and of aluminum from cans is the morphology of the pores. Can aluminum shows more disorder in the pore structure, and a greater range of pore sizes within one sample. This could have advantages in filtration applications and in providing a mold for creating nanostructures such as dendritic nanowires. Now knowing that anodization of impure aluminum is possible and having some characterization of the pore morphology, aluminum from cans may be used as templates, filters, and beyond.

**The Road Not Taken: China, Globalization, and the Development of St. Louis**

Bram Sable-Smith  
Mentor: Bret Gustafson

As the world economy expands the impacts of the process of globalization are becoming increasingly visible in communities that are not often associated with globalization or were once thought to have been immune from its consequences. This is especially true in communities in the United States. The recent initiative led by businessmen and political leaders in St. Louis, Missouri to create an international freight-forwarding hub at the city’s airport has brought the process of globalization into focus and into the public dialogue of development strategies in a major American urban center. This study utilizes geographic, ethnographic, and sociological methods to examine the intersection of the process of globalization with small-scale, grass roots development efforts in St. Louis. The study reveals how the process of insertion into a global commodity chain is constructed as a development strategy and how the process of insertion contributes to income polarization associated with globalization. Most significantly this study contributes to the understanding globalization by filling a gap in academic literature with a detailed examination of the creation the negative externalities of development strategies called “roads not taken” during the process of globalization.

**Community and Healing:**

**Black Hospitals and Racial Politics in the Jim Crow South**

Ezelle Sanford III  
Mentor: Peter Benson

African Americans have a long and tortured relationship with medicine and science. Use of black bodies as subjects for medical education and scientific experimentation necessitated the creation of parallel healing infrastructures created by African Americans for the use of the African American community. Such a parallel healing infrastructure valued the importance of the black community. This sentiment has continued into the 20th century with the establishment of Black hospitals as facilities to treat African American patients with dignity and respect. In the Jim Crow era when facilities were all but “separate-but-equal,” Black hospitals not only treated their communities, but also served as beacons of racial pride and mechanisms for social uplift. Lincoln Hospital of Durham, NC, a historically Black hospital, is used as a case study to understand the importance of community in Black health. In light of hospital integration in 1963, Black
hospitals succumbed to a complex interplay of exacerbating factors. Yet, fifty years after African Americans were granted access to all health facilities, the racial health gap is widening. This work seeks to understand the historical importance of community in the health of the African American community, in effort to understand its place in ameliorating growing contemporary racial health disparities.

**A Time and Place for Us: The Reconciliation of Judaism and Feminism**

*Paula Sass*

*Mentor: Nancy Berg*

This work examines the ways in which Jewish women in the modern world reconcile their identities as feminists and as Jews. The feminist movement of the 1960s changed the structure of American society, and Jewish communities were in no way immune from feminism’s demands. Given the social and historical milieu in which Judaism developed, traditional Judaism was a patriarchal system, thus bringing feminism and Judaism into conflict. Jewish women were therefore compelled to re-evaluate their religious roles and identities, and to find ways to reconcile their identities as feminists and as Jews. Because of the centrality of time and place to Jewish identity, in the process, they also reshaped the relationship between Jewish women and sacred time and space. This reconciliation was achieved primarily in two ways: through the modern revival and reclamation of traditional women’s spaces in Judaism, and through the creation of new spaces for women in Judaism. I discuss Jewish women’s assertion of themselves into the sphere of time, primarily through the reclamation and transvaluation of traditional women’s practices that are linked to the passage of time. I also discuss the creation of new spaces for women within Judaism through the broadening of Jewish practice to welcome women into the ritual and legal spheres. I found that for many women both of these types of Jewish feminism have been essential to modern women’s understanding of their roles and identities. Likewise, these techniques allow for a more cohesive and relatable feminist Judaism than simple ritual egalitarianism does alone.

*Neil Savalia*

*See Philip Chen*

**The Intersection of Sexual Relationships and Sexual Rights: Comparing South Africa and Uganda**

*Clare Schroder*

*Mentor: Shanti Parikh*

This work addresses the adoption of sexual rights by women in Uganda and South Africa. I conducted a historical investigation into sexuality and the role of women in controlling their own sexuality, revealing major differentiations upon British involvement. Women lose control of their bodies, while men and states gain more power. Many of these changes are economically based, but Christianity also plays a major role in creating an immorality around sexual liaisons. I also analyze material gathered from interviews with youth in South Africa and Uganda about their perceptions on sexual relationships today. Themes of gendered economic inequity, sexual prowess, material gains, and threatened masculinities become apparent when discussing monogamy, multiple concurrent partners, cross-generational relationships, and transactional relationships. The nuances between South Africa and Uganda reveal a more individualized, regular, and poorly ascertained rights discourse in South Africa juxtaposed by a collective movement invoking sexual rights at opportune moments to challenge cultural norms. Ultimately this work indicates that before sexual rights are employed a strong consideration of the particular context and the viability of rights discourses in that environment should be assessed. This has implications for public health campaigns that call upon the use of sexual rights in HIV and AIDS prevention campaigns without first considering the context in which those rights will be named.

**WBS Homologs Are Regulated with Behavioral Changes in Drosophila Females: Evidence of a Conserved SocioGenetic Program**

*Michael Schultz*

*Mentor: Yehuda Ben-Shahar*

Evolutionary developmental biology has demonstrated that conserved genetic programs, even in distantly related species, control many developmental processes. We hypothesize that conserved genetic programs control other complex phenotypes, including social behavior. To that end, we seek to identify conserved regulators of social behavior across metazoa. The human genetic disorder Williams-Beuren Syndrome (WBS), caused by a heterozygous deletion of 25–28 genes, is associated with hypersociability, making all the WBS genes candidates for novel regulators of human social behaviors. Unpublished research suggests that WBS genes are involved in social decision-making in the honey bee Apis mellifera. I present evidence that WBS-loci are similarly involved in social decision-making in...
the fruit fly *Drosophila melanogaster*. I found that seven of the fourteen WBS homologs in *D. melanogaster* are regulated in the heads of virgin versus mated females. Virgin females are more receptive to male courtship behavior than are mated females, suggesting that transcriptional regulation of one or several WBS homologs is responsible for the mated females’ decreased interest in male courtship, or their increase in aggregation. Current experiments aim at directly implicating candidate genes in regulating social decision-making. Using a reversed-genetics approach, we seek to knockdown the expression of each of these seven genes using RNAi, and to perform behavioral assays of male receptivity in virgin and mated females. In addition, I analyzed in-situ hybridization data of gene expression in the mouse brain, to identify spatially co-expressed genes in brain regions that may be involved in the hypersocial phenotype. While I found no localized expression pattern shared among WBS genes, many genes showed spatial overlap. These results, while not yet conclusive, do suggest that WBS loci are involved in regulation of social decision-making in several species, supporting the hypothesis that conserved genetic programs control social behavior.

**Dump City: The Environmental Hazards of Illegal Dumping in St. Louis**

Jason David Schwartzman  
Mentor: Carol Camp Yeakey

The issue of illegal dumping has become a pervasive environmental problem in cities across the United States. Scrap tires are an especially insidious species of dumping material. The bizarre black mounds are more than eyesores in the inner city or excesses of an obese car culture. The tires constitute a considerable threat to public health and the environment. In St. Louis, most of the illegal dumping occurs in the poorer North Side of the city, largely housing persons of color. The illegal dumping of tires raises troubling questions of environmental justice and environmental racism. This research uses the Wellston Loop Area in North St. Louis as a case study to investigate the nature of illegal tire dumping, its consequences, and the ways in which a city can defend itself against the hundreds of thousands of tires left to rot in its core. Research methodology includes ArcGIS mapping to visualize and examine the issues involved. In addition, the work analyzes existing markets for scrap tires and the best practices of cities in reducing illegal dumping, culminating in its own recommendations to the city of St. Louis.

**Potential Influence of Neuroinflammatory Processes on Changes in BOLD Signal in the Early Pathology of Alzheimer’s Disease**

Bryan Shalloway  
Mentor: Denise Head

Noninvasive neuroimaging methods such as functional Magnetic Resonance Imaging (fMRI) have aided researchers in characterizing neuropathology at clinical and pre-clinical stages of disease. The change in the blood oxygen level dependent (BOLD) signal commonly used in fMRI methods emerges as a result of the complex interactions of the neurovascular unit and is thought to most closely correspond with the synaptic activity of neurons. Measurements of BOLD fMRI during memory tasks show that prior to the onset of Alzheimer’s Disease (AD) there is an increase in signal in regions that will later atrophy. Neurovascular changes in abnormal populations complicate interpretations of BOLD fMRI. Alzheimer’s disease, along with various other neurodegenerative diseases, is accompanied by chronic inflammation in the brain. Inflammatory processes cause significant modulations in the neurovascular unit and may alter the relationship between neural and cognitive activity, and the BOLD signal. Inflammatory processes are also shown to contribute to synaptic hyperactivity and may cause some of the synaptic changes seen in early AD pathology. This project reviews the physiological origins of the BOLD signal and the current explanations for BOLD signal changes in AD pathology. The work closes by discussing the possibility that increases in BOLD activity in early AD pathology may be influenced by neuroinflammatory processes.

**Refugee Hospitality: A Comparative Analysis Across Countries**

Michelle Shapiro  
Mentor: Sunita Parikh

There is tremendous variation in the level of hospitality that host countries extend to their refugees. Some countries provide refugees with nearly the same rights as they provide their citizens, other countries restrict the freedom of their refugees while another set of countries refuses to recognize refugees as anything more than illegal foreigners. In this work, I try to understand why certain countries are more hospitable to refugees than others. I focus on understanding how a past conflict influences refugee hospitality. A country with a past conflict may be apprehensive about creating hospitable conditions that invite in refugees since refugees may create security risks. However a country with a past conflict also may be more sympathetic to refugees and therefore treat them more hospitably. To determine refugee hospitality, I created scores that reflect how well countries’ refugee laws comply with international refugee laws. I perform statistical tests to determine the impact of different types of conflicts occurring less than 10 years, 10-19 years and more than 20 years ago. Results indicate
that a past ethnic conflict may result in inhospitable treatment regardless of when the conflict occurred. A country with an adverse regime change should initially provide inhospitable treatment, though it should become hospitable as the conflict becomes farther in the past.

Nancy Shen
See Philip Chen

How Effective Are Campus Tobacco Bans?
The History and Effects of Tobacco Control Legislation
Dana Sherman
Mentor: Peter Benson

This research shows the efficacy of campus tobacco bans. Tobacco bans are hypothesized to decrease freshmen exposure to smoking. These freshmen, therefore, are less likely to initiate smoking than students not influenced by tobacco bans. This is shown through an examination of the influence social norms and tobacco control legislation have on smoking behavior, risk factors for initiating smoking, and a study of students at a recently tobacco-free university. Results reveal underclassmen, who entered the university after the tobacco ban was implemented, reported less exposure to tobacco products than upperclassmen. More stringent tobacco control measures cause smoking behaviors to be viewed more negatively. Tobacco bans increase negative perceptions of smoking and decrease freshmen exposure to smoking, thereby decreasing their likelihood of initiating smoking.

MRI Using Hyper-Polarized ³He
Mark Sholte
Mentor: Mark Conradi

The human lung is a complex organ with an intricate network of small pathways. We would like to be able to image it and measure its functionality quantitatively. We accomplish this by having a patient inhale a bolus of hyper-polarized ³He–N₂ mixture before being conducting a lung MRI. The specially prepared ³He is visible on the resulting images and its flow through the lung can be quantitatively determined.

The polarization process begins by forcing the ³He–N₂ mixture into a spherical glass cell located inside an oven with two transparent view ports. The oven is pre-filled with a lump of solid Rubidium (Rb). At the oven's operating temperature of 160 Y, the Rb vaporizes and a 795 nm laser shines through the view ports. Some photons from this laser beam are absorbed by the Rb atoms and polarize their electronic spins. The Rb atoms then collide with the ³He atoms and transfer their electronic spin to nuclear spin of the ³He atoms. The oven temperature controls the vapor pressure Rb and thereby controls the rate of exchange of spin from Rb to ³He.

Before any of this can happen, the ³He must be loaded into the cell. The (unpolarized) ³He–N₂ mixture is pumped in a stainless steel, welded plumbing apparatus. The apparatus has a vacuum pump and 13 valves that can be used to selectively depressurize specific paths through the apparatus. One valve connects the system to the polarizer cell and another valve connects it to a removable plastic baggie for dispensing. The path from the mixture storage cylinder to the polarizer is purged by successively filling with N₂ and pumping down to vacuum. Mixture is then metered into the polarizer using the vacuum system. From there, the polarized mixture is pumped into the baggie from which it can be dispensed to patients.

From Seed to Mighty Tree:
Susan Blow and the Development of the American Kindergarten
Madelyn Silber
Mentor: Margaret Garb

St. Louis is home to the first continuously running public kindergarten in the United States. In 1873, Susan Blow began teaching a small group of students at the Des Peres School using the methods of German educator Friedrich Froebel, “the father of the kindergarten.” Despite the rejection of Froebel's ideas in Germany, Blow studied his pedagogy and implemented his curriculum into classrooms in America. Her first class was known as the kindergarten “experiment,” which would later become a standard in schools across the nation. Froebel's kindergarten curriculum was unique because it was based on learning through play, an understanding of nature, and an appreciation for art. He believed childhood should be separated from adulthood and sought to create a learning environment that would interest and accommodate young people, asserting that children's earliest experiences would shape their entire lives.

This research explores the lives of both Froebel and Blow to better understand their motivations for creating and spreading the
kindergarten movement. It discusses how this movement brought women into the public sphere as educators, and how Blow worked to improve the reputation and competency of teachers through the rigorous training programs she created. It looks at the changing ideas about early childhood education since the seventeenth century, and argue that Blow’s kindergarten represented the culmination of centuries of theories about children. The curriculum she created allowed children, on a large scale, to benefit from the many theories about education developed by previous educators and scholars. The fate of the kindergarten movement came down to the experiment at the Des Peres School. Blow’s devotion to the project and careful implementation of Froebel’s curriculum made it possible for children through age six to have a place to play, learn, and grow across the country.

**NOW OR NEVER: THE CURRENT STATE OF KENYAN THEATRE**

Diamond Skinner  
Mentor: Garret Duncan

In a sense, every play, whether it be romantic, tragic, naturalistic, existentialistic or absurd is an expression of our human existence. Genres are simply the different aesthetics we use to convey different truths. Theatre is a reflection of life. However, pre-colonial African ‘theatre’ was not just a reflection of life- it was life. This work explores the ways in which the pre and postcolonial government affected theatre in Kenya. When the colonists arrived they viewed these dramatic expressions as works of the devil. Armed with strong Christian values and an ethnocentric ideology anything unknown to them was up for replacement. Kenya's Independence in 1963 ushered in an era of Africanization of Kenyan ministries, agencies and institutions. Nevertheless, the hold that the British Colonial Government and then the British expatriate community had on the cultural identity of Kenyan Theatre didn't begin to fade until the 1970s. Another challenge for Theatre in Kenya, despite the lack of playwrights, is a lack of willing and talented individuals in the field. There is lack of support among the common Kenyan for those choosing to pursue a career in the arts. It is mostly through participant-observation and personal interviews that the period of theatre under its three presidents has been examined. It was the people who have lived through it that have shared their experiences and stories with me. I have shown how even today the theatre of Kenya is closely tied to its politics. The Kenyan is a political being- as such their art form is all the more crucial to their existence and voices being heard. This research has examined the current state of Kenyan theatre. And in doing so it has examined a large part of the current Kenyan.

Satchel Siegel  
*See Brody Frink*

Monirath Siv  
*See Nickolas Nauman*

Yeamie Smartt-Nalli  
*See Jay Mohan*

**VESSEL SEGMENTATION ANALYSIS OF ISCHEMIC STROKE IMAGES ACQUIRED WITH PHOTOACOUSTIC MICROSCOPY**

Brian Soetikno  
Mentor: Lihong V. Wang

We have applied optical-resolution photoacoustic microscopy (OR-PAM) for longitudinal monitoring of cerebral metabolism through the intact skull of mice before, during, and up to 72 hours after a 1-hour transient middle cerebral artery occlusion (tMCAO). During tMCAO, photoacoustically measured oxygen extraction fraction (OEF) was significantly elevated in brains regions that eventually went on to infarct as determined by postmortem triphenyltetrazolium chloride (TTC) staining. The high spatial resolution of OR-PAM enabled us to utilize vessel segmentation techniques for segment-wise analysis of cerebrovascular responses. Our results revealed differential responses in cortical brain regions that eventually infarcted compared to regions that did not.
A PLACE TO CALL HOME
THE INESCAPABILITY OF HOUSE AND HOME IN AMERICAN FAMILY DRAMA

Amanda Spector
Mentor: Henry I. Schvey

Though a distinction between the terms “house” and “home” is often disregarded, the two terms are hardly synonymous. The house is a physical structure whereas the home creates a collective sense of belonging that dictates identity. Defining home becomes a conduit through which we can define ourselves. Applying such an understanding of home becomes particularly useful in terms of identifying American cultural trends. Art offers a lens through which the American identity can be examined and the fatalistic ideas of home can be applied. This research examines the home in three canonical American plays: Long Day's Journey into Night by Eugene O'Neill, Curse of the Starving Class by Sam Shepard, and August: Osage County by Tracy Letts. The similarities among all three texts reinforce the defining aspects of the American home and the perception of the self, and especially the woman, in American society. Their differences, however, provide insight into the evolving nature of the American home. Moving through the plays chronologically offers an examination of how the shifting nature of the home impacts our understanding of family and belonging from 1940 to the present. The generally accepted nature of the American home in all these texts reveals something quite frightening – that there is no escape for any of us, no matter the decade or the circumstances. In each case, home represents a kind of prison for the family.

UNDERSTANDING FRENCH FEMINISM THROUGH THE LENS OF FGM

Lian States
Mentor: Seth Graebner

Female genital mutilation, often known as excision, has recently become a prominent issue in France. Immigrants from West Africa have brought the practice from their countries of origin, or return home with their daughters to have it performed. Reports vary, but it is estimated that between 13,000 and 27,000 girls and women have been exposed to some type of FGM. The extent of women affected is significant, but gains greater importance in the wider context of immigration in France. France has taken an unusually strong response to ending FGM. Proponents of stronger FGM regulations typically use rhetoric that mirrors the rhetoric of proponents of banning the hijab. Thus, FGM has become part of the French pushback against its Muslim immigrant population, a movement that includes the recent hijab and burqa bans.

This research looks at feminist stakeholders’ response to FGM, through advocacy and legislation. Much of this work is done by mainstream NGOs and the French state; in other words, by women who are frequently white, middle-aged, and French natives. These women make decisions for young, dark-skinned women who are the children of immigrants or immigrants themselves. Because of this disparity, I question the role of women-of-color feminism in France, particularly in a feminist movement that can appear extremely homogenous.

ANALYSIS OF ALONG-TRACK OVERSAMPLED CRISM OBSERVATIONS USING TIKHONOV REGULARIZATION

Nathaniel Stein
Mentor: Raymond Arvidson

The Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) aboard the Mars Reconnaissance Orbiter (MRO) is an imaging spectrometer used to remotely infer mineralogy of the Martian surface at a spatial resolution of 18m/pixel. CRISM is mounted on a gimbaled optical system which can be adjusted for pixels to overlap in the along-track direction. The resulting pixel overlap may be used to increase the spatial resolution of CRISM observations to better than 18m/pixel, but gimbal jitter causes irregular pixel spacing in along-track oversampled (ATO) observations. These pixels must be regularized before collecting spectra from contiguous spatial regions. One approach is to solve a minimization problem for the difference between the “smoothness” of the solution and modeled regularized pixels through Tikhonov Regularization for ill-conditioned problems. Regularization improves spatial resolution of ATOs in highly over-sampled regions, becoming less “smooth” as the amount of oversampling decreases. Tikhonov Regularization is currently being applied to gain higher spatial resolution of spectral data of periodically recurring slope lineae (RSL) in some southern latitude Martian craters. This may be used to study scheduled ATO observations of Gale Crater, the landing site of Mars Science Laboratory (MSL).
This study seeks to investigate the relationships between tourists, the tourism industry and two indigenous Mapuche communities near the popular vacation destination of San Martín de los Andes, located in the province of Neuquén in Argentinean Patagonia. Historically, these Mapuche communities have had a difficult and complex relationship with the tourism industry of San Martín de los Andes due to repeated human rights violations, discrimination, and marginalization on the part of this industry. By talking with public officials and business owners, I attempt to gauge the focus and key attractions of tourism in and around the city and how the Mapuche communities are portrayed in relation to these touristic attractions. I visited two nearby Mapuche communities, Chiuquilihuin and Curruhuinca, with the goal of understanding how they adapt to and control the presence of tourists in their communities and how they are affected by the actions and assumptions of the mass tourism industry in San Martín de los Andes. Although cooperation and respect between the institutions of the city and the Mapuche communities is growing, the objectives and interests of the two groups are still quite different; thus, the institutions assert their asymmetrical power over the Mapuche communities when it is necessary to protect their interests. Tourism, although it has the potential to exacerbate this imbalance of power, also can be used by the communities as an economic and cultural tool to revitalize their own culture and distinguish themselves from dominant culture. By gaining control of sectors of the tourism industry, the Mapuche communities gain control and agency over how they present themselves to the rest of the world, allowing them more autonomy and stronger, more unified cultural identities.

Kenya's squatter problem was a colonial construction that developed as the first British settlers arrived at the start of the twentieth century. 'Squatters' were individuals living and cultivating illegally on land to which they had no official titles of ownership. Population growth, diminishing arable lands, and the imposition of increasingly oppressive colonial legislation led to growing anxieties among both squatters and settlers throughout the first half of the century. When Kenya became independent on 12 December 1963, the national government inherited the social, economic, and political burden of landlessness. By 1965, there were 75,000 squatter families in Kenya, approximately half a million individuals, who had no claim to land. In response, the government appointed Zachariah Shimechero as the Special Commissioner for Squatters, who tried to prioritize Kenya's development efforts to target poverty alleviation among the landless. However, President Jomo Kenyatta focused instead on increasing economic development, believing that the country's overall growth would relieve poverty and also secure his own political power and authority. Kenyatta believed that large-scale agricultural development schemes, supported through foreign aid and investment, would produce domestic economic growth and provide spillover benefits to the greater population. Instead, the benefits were largest for the elite and negligible for the poor. Foreign aid was not a cure-all answer to poverty. In fact, there was no singular antidote for poverty in Kenya. This research shows that there is a fundamental difference between poverty alleviation and economic growth. Kenya's development experience in the 1960s demonstrates a basic unwillingness of those in power to privilege the needs of the poor landless squatters. Yet, a commitment to provide sustainable relief to the world's marginalized, disenfranchised, and peripheral communities must first start by understanding and prioritizing their actual needs for any hope of a sustainable future.

The central nervous system (CNS) is a target for persistent viral infections because of the opposing needs for viral clearance and protection of neurons from immunopathological damage. However, congenital viral infections evade host immune responses via immunological tolerance. Lymphocytic choriomeningitis virus (LCMV) is a prototypical arenavirus that can be vertically transmitted and thereby persist in hosts due to immune tolerance, providing a useful model to investigate the effects of persistent CNS viral infections. Adult mice that are immunologically tolerant to LCMV following congenital infection (LCMV-cgPi mice) exhibit learning deficits. Because deficits in
learning have been linked to defects in neurogenesis, we investigated the impact of LCMV on the generation of neuroblasts in LCMV-cgPi mice. Quantitative RT-(Q)PCR and immunohistochemistry detected presence of LCMV RNA and nucleoprotein, respectively, in the hippocampus and subventricular zone (SVZ), sites of adult neurogenesis that harbor populations of neural progenitor cells. Using flow cytometric assessment of 5-bromo-2’-deoxyuridine incorporation, we observed reduced proliferation of transit amplifier neural progenitor cells in both the infected hippocampus and SVZ, suggesting that the generation of new neuroblasts is reduced in LCMV-cgPi mice. However, no change in total numbers of neuroblasts were detected in the infected neurogenic zones despite a decrease in the proliferation of transit amplifiers, suggesting that differentiation of neuroblasts may be inhibited during persistent LCMV infection. Infected hippocampal and SVZ tissue also exhibited significant increases in the levels of CXCL10, a pro-inflammatory chemokine, as assessed by QPCR and ELISA. Given that CXCL10 promotes apoptosis in neurons, our findings suggest that immune-mediated neurotoxicity may be involved in the reduced proliferation of transit amplifiers and arrested differentiation of neuroblasts. This suggests a role for pro-inflammatory chemokines in the inhibition of neurogenesis and in the cognitive deficits associated with persistent viral infections.


Abby Sung

Mentor: Jean Allman

Malaria is probably the most notorious “tropical disease.” Given the global importance and prominence of malaria, this work interrogates twentieth-century efforts to eradicate it. Changes in medicine in the 1900s, experiments in the 1930s and 1940s, and World War II played important roles in replacing traditional malaria control methods with a new malariology based on insecticides and synthetic antimalarial drugs. Although the newly established World Health Organization (WHO) hoped to act in a political vacuum, the Cold War context encouraged the WHO to seek scientific solutions rather than incorporating medicine with social determinants of disease. The post-War period brought a wave of optimism for public health and the WHO initiated a Global Malaria Eradication Programme from 1955 to 1969 under several assumptions: insecticide resistance jeopardized future attempts at eradication, sufficient resources could be mobilized, and “malaria blocks development.” As the campaign proceeded, the WHO’s Expert Committee on Malaria began to stress the need for health systems before eradication was attempted. In contrast to initial concepts that malaria had to be eliminated before development, it appeared that infrastructure had to exist prior to eradication. The idea that malaria control or eradication would be universally beneficial to local populations is one that has been widely accepted. However, the experiences of several malaria programs in Mexico, South Africa, and Liberia suggest that the relationship between malaria and development is far more complex. Malaria control is essentially linked to political interests and local patterns in ways that shape different malaria ecologies. This study traces the rise of global malaria eradication and argues against viewing the complex relationship between malaria and development as only “malaria blocks development.”

**PHYSIOLOGICAL, MORPHOLOGICAL, AND MOLECULAR CLASSIFICATION OF NEURONAL SUBTYPES IN A 3-LAYER VISUAL CORTEX**

Stephen Thornquist

Mentor: Ralf Wessel

Characterization of neuronal circuits and systems approaches to understanding visual processing are of great interest to neuroscience research, but much is obscured by the diversity of the components therein (such as distinctions between the electrophysiological profiles of types of neurons). It is useful to assemble a finer classification of subtypes of cells within already well-known classes. Our interest lies in the pyramidal neurons known to make up much of the processing in the visual cortex of mammals. The turtle brain (which expresses the visual cortex pathway of visual signal integration in conjunction with the optic tectum) presents itself as an ideal candidate for study because its cortex is stratified into three layers, rather than the six in mammalian cortex, reducing the complexity of the system. Furthermore, the pyramidal cells are condensed into a “cellular layer,” a narrow band densely packed with neurons. We hypothesize that many of the subtypes present in mammalian cortex are present in the turtle cortex as well, in the cellular layer, rather than distributed throughout the cortex. To classify the pyramidal cells, the cells were current-clamped in the whole-cell configuration and subjected to electrical stimulus (in the cell, in those fibers which project into the visual cortex, and in nearby neurons of the cellular layer) to assemble an electrophysiological profile. The cells were also filled with biocytin, which was then used to study the histology of the neuron using the fluorescent dye Alexa Fluor 488. We then performed cluster analyses on these parameters to discern distinct subtypes of pyramidal neurons, which we hope to use to develop a greater understanding of connectivity and neural response in the visual cortex system.

Mai Phuong Tran

See Philip Chen
A TALE OF RHyme AND REAsON: THE BATTLE BETWEEN SCIENCES AND HUMANITIES IN THE PHANTOM TOLLBOOTH

Nishanth Uli
Mentor: Eileen G’Sell

Norton Juster’s classic 1961 children’s novel The Phantom Tollbooth has, since its publication, been beloved by millions both young and old. Captivating with its vibrant depictions of the adventures of a boy named Milo, it also explores deep themes that speak to the fractured Cold War times in which it was published. This work examines the treatment of one such fracture throughout the novel: the division between the sciences and the humanities. Although born of the same philosophical background, the two areas of study have recently diverged greatly, with each discipline becoming hostile to the intellectual efforts of the other; to the humanities, the sciences are cold and heartless; to the sciences, the humanities are useless and impractical. In this work, I examine the novel’s take on this conflict. Through textual analysis, I argue that the division in Juster’s world is treated as unnatural and ultimately dangerous, as it allows ignorance to take hold in the mind. Instead, I propose that The Phantom Tollbooth sees the proper fate of the sciences and the humanities not as the division, but rather the synthesis of the two. Using an essay published by Mario Biagioli, a professor of the history of science, I examine how the decades-old novel handles this dichotomy in a very modern way. I then turn to a psychological study published by Hannah Pimperton to reaffirm the novel’s commitment to the inextricable nature of the sciences and humanities in intellectual growth. Living in a time where the dominance of the sciences comes at the expense of the humanities, the unifying message of The Phantom Tollbooth serves to inspire hope for increased collaboration between the two to fight ignorance that can only be driven off by their synthesis.

MECHANISMS OF SORTASE-DEPENDENT SEC LOCALIZATION IN ENTEROCOCCUS FAECALIS

Charles Wang
Mentor: Scott J. Hultgren

The Gram-positive Enterococci are responsible for a wide variety of diseases including endocarditis, bacteremia, meningitis, wound infections, and urinary tract infections. Conserved among Enterococcus and other Gram-positive species is the utilization of sortase enzymes to catalyze the attachment of proteins to the cell wall. In Enterococcus faecalis, SrtA and SrtC are involved in the attachment of monomeric surface proteins and the biogenesis of endocarditis and biofilm-associated pili, respectively. The sortase machinery has previously been shown to localize with the Sec secretion apparatus to distinct foci in the cell. This localization is crucial for normal pilus secretion and assembly, yet to date little is known about the mechanisms that underlie it. In this project, we investigated the effects of domain swaps and directed mutagenesis of the cytoplasmic tails of the sortases on sortase and Sec localization in order to identify the specific cytoplasmic signals that are involved in the proper targeting of these proteins to their foci. An extensive panel of SrtA and SrtC mutant constructs was created and expressed in E. faecalis for use in immunoelectron microscopy (IEM) experiments. The IEM data showed that a negatively-charged SrtA cytoplasmic tail is sufficient to disrupt SecA localization, which is consistent with our hypothesis that a positively-charged tail is needed for proper localization. Data on the localization profiles for other mutants are currently being collected. In addition, we also engineered SrtA/C cytoplasmic tail- and transmembrane helix-tagged GST constructs for use in pulldown assays. So far we have identified two putative interacting partners for the SrtA and SrtC cytoplasmic tails; identification of the proteins by mass spectrometry is pending. Future studies will confirm the cytoplasmic tail interacting partners identified here and further investigate their roles in Srt/Sec localization. Future studies will also include examining the effects of Sec (mis)localization on generalized secretion.

ACTIVATION OF FGFR1 IN ADULT CARDIOMYOCYTES LEADS TO DEVELOPMENT OF A HYPERTROPHIC CARDIOMYOPATHY

Joy Wang
Mentor: David Ornitz

In both humans and mice, Fibroblast Growth Factor (FGF) is upregulated following injury to the heart, and published studies have shown that FGF2 serves as a mediator in cardioprotection following cardiac stress or injury. Although FGF2 plays an important role following injury, mice that lack or overexpress FGF2 develop normally and do not have a phenotype under homeostatic conditions. It is currently unknown how FGF signaling is regulated in the adult heart and why the effects are only observed following injury. We hypothesized that FGF signaling may be repressed in the adult heart under homeostatic conditions and becomes reactivated following injury. A doxycycline-inducible, cardiomyocyte specific, constitutively-active FGF receptor mouse model (αMHC-rtTA, TRE-caFGFR1-myc) was utilized to test whether the cardiomyocyte has the capacity to respond to a cell autonomous FGF signal. Twelve- to 14-week old mice were fed doxycycline-containing (DOX) chow to induce caFGFR1 in cardiomyocytes. Histologic analysis showed significantly increased cardiomyocyte-cross sectional area in caFGFR1 hearts one week following induction. Trichrome and H&E staining also indicated an
increase in fibrosis and myocyte disarray in caFGFR1 hearts. These findings demonstrate that activation of FGF signaling in adult murine cardiomyocytes results in hypertrophic cardiomyopathy (HCM). The in vivo mechanisms by which FGF signaling affects cardiomyocyte hypertrophy are currently under investigation.

Judy (Jingxuan) Wang
See Jay Mohan

**Distribution of Dopamine Transporter (DAT) and Vesicular Monoamine Transporter 2 (VMAT2) Within Striatum of MPTP-Treated Monkeys**

Kainan (Sally) Wang
Mentor: Joel Perlmutter

Parkinson’s disease (PD) results from loss of nigrostriatal dopaminergic neurons with greater loss in posterior parts of the striatum. 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine hydrochloride (MPTP) is a neurotoxin that selectively destroys dopamine neurons in non-human primates but the distribution of that loss remains unknown after intracarotid administration of MPTP. These dopaminergic neurons contain dopamine transporter (DAT) and vesicular monoamine transporter 2 (VMAT2) that can be labeled with radioligands, (+)-[^3H]DTBZ for VMAT2 and [3H]WIN 35,428 for DAT. This research examined these two radioligands to determine the distribution of neuronal loss in different anatomical subregions of the caudate and putamen in 10 male macaque monkeys. The monkeys were unilaterally treated via internal carotid infusion with MPTP dosage ranging from 0.0 to 0.31mg/kg. Two months later, the brains were removed and the caudate and putamen were anatomically divided into a total of 7 subregions to determine the distribution of specific radioligand binding to the DAT and VMAT2 on both the control side and MPTP side of each monkey. Using one-way ANOVA with repeated measures with a Greenhouse-Geisser correction, we found that the striatal subregional binding of DTBZ to VMAT2 was statistically different among the 7 subregions on the control side \((F(1.887, 16.979)= 5.824, P<0.05)\). However, MPTP did not affect the heterogeneity of VMAT2 distribution in the monkey striatum \((F(2.104, 18.938)= 5.324, P<0.05)\). We also found that the striatal subregional binding of WIN to DAT was statistically different among the 7 subregions on the control side \((F(2.627, 23.642)= 7.824, P<0.005)\). Similarly, MPTP did not affect the heterogenous distribution of DAT in monkey striatum \((F(2.104, 18.938)= 5.324, P<0.05)\). Our quantitative results support the conclusion that DAT and VMAT2 are heterogeneously distributed in the caudate and putamen of monkey striatum. This heterogeneity of DAT and VMAT2 distribution in striatal subregions was largely preserved in MPTP-induced monkeys.

Vivian Wang
See Philip Chen

**The Chinese Community in Chile**

Yichen Wang
Mentor: Yuko Miki

The often overlooked Chinese community has settled in Chile for more than a century and plays a major role in Chilean life as China has become the top trading partner of Chile. Why are Chinese people migrating to Chile? How are they perceived by Chileans as their influence grows? What is it like being perceived ethnically/racially as Chinese/Asian in Chile? Will Chinese people have a more profound impact on Chilean society beyond its commercial role? Through interviews, government documents, and secondary sources, this research helps to understand what it is like being Chinese in Chile. I interviewed 10 members of the Chinese community in Chile. They are from diverse backgrounds that cover age, gender, class, and occupational differences. I find that while many Chinese people in Chile are becoming more confident about their prospects and opportunities as their influence grows, they adopt a passive approach to engaging with Chilean society about issues concerning their existence in Chile, as the Chinese community is still perceived negatively by the host society. The claim “there is no racism in Chile” that many members of the Chinese community make is more likely a result of avoiding conflict than active negotiation of their identity with Chilean society. The small but vibrant community has benefited from the increasing globalization of markets in the past 30 years and represents a part of the larger trend of Chinese migration to marginalized parts of the world in order to expand the market for Chinese goods. Therefore, the Chilean example will be useful for other researchers who are interested in contemporary Chinese migration.
EXPLORING THE ROLES OF NMD3 AND 14-3-3 PROTEINS
IN TETRAHYMENA THERMOPHILA DEVELOPMENT
Mollie Wasserman and Ellisa Zhang
Mentor: Douglas Chalker

Tetrahymena thermophila are single celled eukaryotic ciliates with complex biology. THERM_01386060 and THERM_00470530 are genes of unknown function found in Tetrahymena thermophila that have increased expression during conjugation, or Tetrahymena sexual development. Protein products of these genes have not been extensively studied in Tetrahymena, though both genes encode for proteins with domains of known function in other organisms. The THERM_00470530 in Tetrahymena thermophila encodes for the highly conserved NMD3 protein, which is associated with transporting the 60S ribosomal subunit from the nucleus to cytoplasm. The THERM_01386060 gene is entirely comprised of a highly conserved domain called the 14-3-3 domain, which encodes for a family of proteins that have been found to play a role in cell cycle regulation. Data compiled from reverse transcriptase polymerase chain reaction (rtPCR) of Tetrahymena RNA showed consistent expression of THERM_00470530 during growth and conjugation, and increased expression of THERM_01386060 during hours 8-12 of conjugation. Both protein products were separately tagged with a yellow fluorescent protein (YFP) epitope and transformed into Tetrahymena cells. THERM_00470530-YFP localized specifically to the cytoplasm and macronucleus of mating and growing Tetrahymena cells. THERM_01386060-YFP localized to the cytoplasm during growth and to the conjugation junction and intracellular fibers during development. Specific roles of each protein are currently under further investigation.

Laura Watkins
See Bryan Ciccarello

Jeffery Wei
See Bryan Ciccarello

THE STUDY OF BONE MARROW MORPHOLOGICAL CHANGE IN HIBERNATING AND NON-HIBERNATING GROUND SQUIRRELS AS A MODEL FOR STUDYING BONE MARROW DISORDERS IN HUMAN BEINGS.
Kory Wilkinson, University of Wisconsin, LaCrosse
Mentors: Scott Cooper and David Howard, University of Wisconsin, LaCrosse

This study examined differences in the number of megakaryocytes in hibernating and non-hibernating ground squirrels. Thirteen-lined ground squirrels (Ictidomys tridecemlineatus) have developed profound physiological adaptations in order to survive during hibernation. The hibernation process induces a state of thrombocytopenia in which bone marrow no longer produces platelets. Congenital Amegakaryocytic Thrombocytopenia, a rare autosomal recessive disorder which causes bone marrow failure in young children, shares striking similarities to the bone marrow found in hibernating ground squirrels. By counting megakaryocyte numbers and measuring their area during the hibernation and arousal periods in squirrels, the rate at which megakaryocyte number and total size change was determined. By combining these data on morphological change with other data, we believe that the mechanism by which megakaryocytes return to normal levels in squirrels can be determined. It is anticipated that the discovery of this mechanism can be used to develop new methods besides bone marrow transplantation to treat related bone marrow disorders in humans.

BLACK REBEL IN UNION GARB: AN ARCHETYPAL TALE OF LOYALTY AND IDENTITY
Brandon R. Wilson
Mentor: Iver Bernstein

Born into slavery as the biological son of his legal owner, John Lyle Wilson lived a life of seeming peculiarity. While enslaved, he served as “his master’s right hand.” During the Civil War, he fought under both Confederate and Union flags. And during his 45 years of life succeeding the war, he acquired a 125-acre estate, fathered eleven children, “gave liberally of his means” to the Falmouth Colored Baptist Church, and was among “the best known and wealthiest colored citizens” in Northern Kentucky. From slave to Confederate servant to prosperous citizen, this piece traces John’s ever-changing loyalties and identities as he adapted to ever-changing conditions. He was a diplomatic individual, shifting from the beloved slave of a prominent white Virginian to a beloved leader of a thriving post-bellum black community. As this piece illustrates, 19th-century Americans maintained highly complex inter- and intra-racial loyalties. The narrative of real enslaved people like John Lyle Wilson superseded the oversimplified narratives of the proverbial Nat Turners and Uncle Toms. At his very core, John Lyle Wilson was a determined survivor of America’s cruelest institution. He internalized the social realities of the
world around him, utilizing the ethos of the era for the benefit of himself and his kin. Though his circumstances seem uncommon, I show John Lyle Wilson as a representative—an archetype, if you will—of the intrinsic and variable human relationships and loyalties that influenced the 19th-century Southern experience.

**Depletion of Geminin in Medulloblastoma Triggers Cell Cycle Arrest and Sensitizes Cells to DNA Damage**

*Jacob Witt*

Mentor: Kristen Kroll

DNA replication is a tightly controlled process that occurs once per cell cycle in normal cells. Geminin is an inhibitor of DNA replication and ensures that only one round of DNA replication takes place per cell cycle, thus maintaining genome fidelity and preventing aneuploidy. Additionally, Geminin is highly expressed in many aggressive cancers, including medulloblastoma. Our previous work has shown that reduction of Geminin does not compromise growth and viability of normal neural stem and precursor cells. However, loss of Geminin in several types of cancer cells has been found to trigger DNA re-replication, cell cycle arrest, and apoptosis. We therefore hypothesized that Geminin represents a potential therapeutic target for the treatment of medulloblastoma. In this study, we evaluated the effects of Geminin depletion in a medulloblastoma cell line (DAOY) in vitro. We employed siRNA-mediated knockdown of Geminin and stained cells with propidium iodide to evaluate the effects of Geminin depletion in the cell cycle. We also employed a selective inhibitor of the G2/M checkpoint to test the effects of Geminin knockdown in combination with CHK1 inhibition. We found that depletion of Geminin in DAOY cells triggered cell cycle arrest at the G2/M checkpoint, and increased levels of phosphorylated histone H2AX, a marker of DNA damage. The combination of CHK1 inhibition and Geminin loss enhanced gamma-H2AX positivity. These data suggest that Geminin may protect cancer cells from checkpoint arrest and DNA damage in medulloblastoma, and may represent a useful therapeutic target for future research.

**Risk Evaluation in the Foraging Behavior of a Trap-Building Predator: Larval Myrmeleon Crudelis**

*Amanda Wolff*

Mentor: Alex Gilman, The Organization of Tropical Studies, Palo Verde National Park

While sit-and-wait foragers, specifically trap-building predators, spend no time or energy searching for food, they are less likely than mobile foragers to encounter prey items and must form adaptive strategies to maintain their generalized foraging behavior. By presenting *Myrmeleon crudelis* (Myrmeleontidae) larvae with different potential food resources, we examined the level of risk discrimination made by antlions when foraging. In order to quantify antlion foraging behavior, several species of ants, which represented a gradient of increasingly riskier prey items, were placed in the antlion’s pit or pit-zone and used to determine intent of predation. Analyses indicate that antlions forage indiscriminately across each ant type and attempt to catch prey more frequently than they are successful in actually doing so. Both antlion size and their rate of successful prey capture also do not lead antlions to discriminate among ant types when foraging. Food resource limitation serves as a possible explanation of the indiscriminate foraging behavior in antlions. Additionally, efficiently-constructed pits and body structure allow antlions to forage without risk.

**Laboratory Experiments with Eukaryotic Microbes**

*Harry Wong and Han Yuan*

Mentor: Douglas Chalker

Tetrahymena is a unicellular eukaryote that is used as a model organism in biology research. It has two types of nucleus with different functions. Its micronucleus is the germline. It is silenced during vegetative growth and replicates and develops into macronucleus during conjugation. The macronucleus is a gene expression machine. It is developed from the micronucleus by eliminating the repeats and amplifying the chromosomes. In the macronucleus, there are 45 copies of about 275 chromosome and 9000 copies of a particular chromosome encoding ribosomal RNA. Because of this nuclear dimorphism, Tetrahymena is a good model organism for studying gene regulation machinery. Even though Tetrahymena has been sequenced, many proteins haven’t been characterized experimentally. In this study, we characterized two proteins that are expressed highly during conjugation, TTH00221150 and THERM_00492780. Each gene is amplified and tagged with GFP. Then each gene is introduced into Tetrahymena cell and the protein localizations are observed under microscope. TTH00221150 is a homolog of equilibrative transmembrane nucleoside transporter and it is localized to both the macronucleus and micronucleus membranes. It is hypothesized that this protein helps in the transportation of nucleosides into the nuclear membrane. It is also possibly involved in transporting nucleosides out of the old macronucleus during new macronucleus development because the protein is obviously denser on the new macronucleus than on the developing ones. Similarly, it is very likely
that TTERM_00492780 codes for a HPRTase due to conserved sequence homologies with other organisms. This HPRTase, which is localized to the cytoplasm, functions in nucleotide metabolism where it converts hypoxanthine, a nucleotide breakdown product, to IMP, which in turn can be converted to AMP and GMP. An interesting result is that this enzyme appears to be up-regulated during conjugation possibly due to increased purine nucleotide demand.

**Identification of the Integrated Stress Response-Inducing Kinase in Mitochondrially Inhibited Cells**

Cayce Workman
Mentor: Jeffrey Milbrandt

A mouse model of peripheral neuropathy was recently established by Viader et al. that was secondary to mitochondrial dysfunction in Schwann cells. This was accomplished through a tissue-specific deletion of the mitochondrial transcription factor A gene (Tfam) in Schwann cells, the peripheral glia. Molecular analysis indicated a maladaptive stress pathway was active and likely contributing to the accumulation of toxic lipid intermediates in the peripheral nerves of these mice. This pathway has been dubbed the Integrated Stress Response and activates a transcriptional profile with a broad range of metabolic consequences, including changes in lipid metabolism.

Since lipid species were shown to be driving much of the pathology, elucidation of the specifics of pathway activation in this context could allow for the development of therapies that alleviate this phenotype. The pathway is known to have four protein kinase sensors, among them Heme Regulated Inhibitor Kinase (HRI), Double Stranded RNA Protein Kinase (PKR), Double Stranded RNA Protein Kinase-like Endoplasmic Reticulum Kinase (PERK), and General Control Non-Depressible 2 (GCN2). Each activates the common pathway by phosphorylating translation initiation factor α (eIF2α) at serine 51. As a first step in elucidating the specific activation of the pathway in this context, I modeled the insult in vitro with pharmacological mitochondrial inhibitors and infected 3T3 cells with siRNA constructs against the different kinases to discriminate between their activation. Quantitative PCR analysis didn’t conclusively differentiate between their activation, indicating either (1) it is a broad insult that causes several, distinct problems within the cell, (2) it instead inhibits the phosphatases that normally regulate eIF2α, or (3) my model is too simple and failed to correctly reflect the in vivo conditions. Further work will be needed to corroborate one of these possibilities over others.

**Happiness Increasing Strategies: What Do People Do in Everyday Life to Feel Happy?**

Youyou Wu
Mentor: Randy Larsen

One hundred university students reported what they do in everyday life to maintain or promote their happiness. These descriptions were coded for the content, characteristics and purpose of the activities involved. Participants also provided ratings of their personality traits and happiness level. Analysis of the self-reported happiness activities produced eight factors, which we call “happiness increasing strategies”. These general strategies are “Conversation and Relationships”, “Casual Socializing”, “Small Achievement”, “Self-reward”, “Entertainment”, “Hobby”, “Music”, and “Thoughts and Attitudes”. The relationship between strategies and long-term subjective happiness was not as pronounced as seen in previous studies. However, we found that the effectiveness of strategies to a large extent depends on people’s personality. These findings point to the importance of considering person-strategy fit when evaluating happiness increasing strategies. They also shed new light on the promising possibility of pursuing happiness.

**An Explanation of the Credit Premium using a Lexical Decision Task**

Laura Xiao
Mentor: Cynthia E. Cryder

The credit premium refers to the increased willingness to spend using credit compared to using other forms of payment (e.g., cash), and has been accounted for by a variety of explanations. In the current study, we hypothesize that there is a terminology heuristic for the word, credit—a novel explanation for the credit premium. The word credit itself may shift consumers’ subjective outlook on a payment because of its positive connotation in comparison to similar terms, such as loan. Consumers may actually associate spending with the term credit as spending down a gain, which is less psychologically aversive than incurring an equivalent-sized loss.

The current experiment used a Lexical Decision Task to gauge automatic processing and establish whether priming participants with credit encouraged them to think in terms of gains rather than losses, and therefore, respond more accurately and quickly to gain-related words. Accuracy and latency scores of gain, loss, and neutral word responses were captured using a three condition (control, credit, and loan) within-subjects experimental design.

Results indeed showed that participants responded to gain-related words more accurately when they were primed with credit rather than loan, and this difference was marginally significant. The heightened awareness of gain words in response to the word credit offers a
new explanation for the credit premium. Inconsistent results occurred with reaction time data, as participants were faster at responding to gain words across the board, independent of any primes. This effect may be due to an overall faster tendency to respond to approach-oriented words. Future studies using implicit paradigms, such as a LDT, to gauge underlying processing can enhance the current knowledge in the field. In sum, this experiment finds initial evidence that semantics make a difference in automatic reaction and perception of credit-related spending.

**ENVIRONMENTAL ART: THE COEVOLUTION OF MODERN ART AND ENVIRONMENTALISM**

Siyang Yang  
Mentor: Mike Bezemek

Environmental art, unlike preceding artistic movements, is not defined by particular aesthetic but by the themes conveyed by the relevant artwork. The environmental art style since the 1960s has evolved in parallel to both mainstream art, changing focus from physical aesthetics to modern abstract concepts; and environmentalism, shifting from stagnant landscapes to interactive systems. Through comparison of art theory and environmentalism, this project shows how this coevolution allowed humans to perceive the environment as dynamic, vulnerable and volatile. I analyze changes in the public perception of the environment by examining three representative environmental art pieces: *Time Landscapes* by Alan Sonfis (1978), *Tree Mountain* by Agnes Denes (1996), and *Cloud-Specific* by Tomás Saraceno. Presented chronologically, these three exhibit the differences attitude shifts within the movement. From Sonfis’s focus on the past, to Denes’s emphasis on the present, to Saraceno’s concern about the future, each artist and his or her work reflect the changing public attitude about the human relationship with nature. This project shows how art can reflect environmental attitudes and how environmental art might be used to cultivate better public understanding of the human-nature relationship.

**Yijun Yang**  
See Philip Chen

**AGE-RELATED DIFFERENCES IN THE RELATIONSHIP BETWEEN NAVIGATION SKILL AND BRAIN VOLUME**

Teresa Yao  
Mentor: Denise Head

The goal of this study is to examine the relationship between regional brain volume, age, and self-reported navigation skill in older adults. Understanding more about this relationship helps us determine how changes in the brain as we age can influence our abilities to navigate in the environment. We administered three questionnaires via phone to obtain self-reported navigation scores from a pool of older adults from the Knight Alzheimer’s Disease Research Center. The Santa Barbara Sense of Direction (SBSOD) measures general direction sense (mental map, use of cardinal directions, etc.) The Questionnaire on Spatial Representation (QSR) measures spatial representations of environments, including landmark representation. The Wayfinding Strategies Scale (WSS) estimates navigation strategies and use of navigational aids. All measures demonstrated adequate reliability. Additionally, we acquired the subjects’ most recent structural MRI data. We then compared the self-reported navigation scores with the subjects’ brain data to find correlations between regional brain volumes and navigation skill. In particular, total SBSOD score was strongly correlated with the sense of direction factor on the QSR. Additionally, we found that age was correlated with increased reliance on landmarks (based on the landmark factor from the QSR) and navigational aids (assessed by the WSS). Regarding structural MRI data, age was negatively correlated with all regional brain volumes except caudate nucleus. Specifically regarding associations between navigation and regional brain volumes, dependence on landmarks was negatively correlated with frontal, parietal, and hippocampal regions. Reliance on navigational aids was correlated with decreased volume in superior frontal and precuneous regions. Responses on the SBSOD showed positive correlations with hippocampus and frontal and parietal regional brain volumes. By looking at the relationships between age, brain volume and navigation skill, we may be able to find structural brain explanations that account for the decline in certain navigation skills as we age.

**THE CELL CYCLE, OXIDATIVE STRESS, AND snoRNAs**

Debra Yen  
Mentor: Jean E. Schaffer

During normal oxygen metabolism in cells, highly chemically reactive byproducts are formed called reactive oxygen species (ROS). When ROS levels are abnormally increased, these free radicals damage cellular structures. Under hyperlipidemic conditions, saturated fatty acids accumulate in non-adipose tissues and lead to lipid-induced generation of ROS, organ dysfunction, and lipotoxicity. This stress response contributes to the pathogenesis of diabetic and related cardiovascular complications. The Schaffer Lab recently discovered three small nucleolar RNAs (snoRNAs), U32a, U33, and U35a, play a critical role in lipotoxicity and oxidative stress. During studies of
these snoRNAs, changes in cellular proliferation were also observed in cells with lost function of snoRNAs through knock-down. Because progression through the cell cycle requires ROS, we hypothesized that these snoRNAs might be regulating proliferation by affecting ROS levels during the cell cycle. We found that this is indeed true, and these snoRNAs are required in both the G1 to S transition as well as the transition out of G2/M before entering the cell cycle again. We then examined whether oxidative stress inducers act through cell cycle changes to increase snoRNA content. However, the mitogenic properties of our stressors overcame the cell cycle arrests. Our findings establish a relation between oxidative stress, snoRNAs, and the cell cycle, which may prove relevant to associated cardiovascular disease conditions.

**Swing Vote: The Impact of the Health Care Vote in the 2010 Midterm House Elections**

Jun Yoon  
Mentor: Gary J. Miller

In the 2008 elections, the Democrats won 257 seats in the U.S. House of Representatives, receiving support from the Obama coalition composed of minorities, white professionals, students and a substantial number of white middle-class voters. But just two years later in the midterm elections, the Democrats lost 63 seats to the Republican Party, marking the biggest midterm loss since 1938. What caused such a historic turnover in the House of Representatives? In this work, I argue that the incumbents’ vote on the Patient Protection and Affordable Care Act played a significant role in whether or not the candidate was reelected. The empirical analysis supports this argument, showing that marginal Democrats who voted for the passage of the health care bill were likely to be voted out of office in the midterm elections, while safe Democrats who voted for the bill were more likely to be reelected.

**Investigating Localizations of Kelch Motif Family, Bromodomain Containing, and Protein Kinase C Family Protein**

Megan J. Yu, Allison J. Li, Chengchao Luo  
Mentor: Douglas Chalker

The characterization of *Tetrahymena thermophila*, a single-celled ciliate, has led to many discoveries of universal gene functions. While its genome has been completely sequenced, many genes remain uncharacterized. In our experiments, we studied three previously uncharacterized genes that are upregulated and potentially participate in cellular processes critical to conjugation including cell structure organization, gene activation, and signaling. The kelch motif family protein contains zinc finger domains in addition to kelch domains which suggests that the protein may be involved in mediating protein-protein interactions in addition to potential roles in organizing cell structure. The bromodomain-containing protein may be involved in gene expression and recognizing acetylated histones. The protein kinase C domain-containing protein may be involved in signal induction related to conjugation. Visualization of the YFP-tagged gene products showed that each protein was found to have unique localization patterns within the *Tetrahymena* cell. The kelch motif family protein was found be expressed uniformly throughout the cytoplasm during vegetative growth and conjugation. The bromo-domain containing protein localized to the macronucleus during both vegetative growth and conjugation. The protein kinase C domain-containing protein was localized to the cytoplasm during starvation and the oral apparatus during conjugation. Further experiments are underway to elucidate the functions of these proteins.

Han Yuan  
See Harry Wong

**Open for Resistance: Refugees, Neoliberal Subjectivities and Social Microenterprise**

Laura Zaim  
Mentor: Bret Gustafson

This work is an ethnographic case study of refugee and immigrant microloan takers, their lending institution, and the microfinance sector. Using anthropological studies of the relationships between knowledge, power, and resistance, I argue that the microloan clients resist the subject-regulating technologies of microfinance designed to shape them into ideal neoliberal citizens. They do so by pursuing social rather than financial endeavors through their microenterprises. The lending institution participates in this resistance as well. At the same time, leaders of the dominant microfinance paradigm, who have a vested interest in structuring microfinance as a profitable asset class rather than a tool for social development and community empowerment, purposefully render this transcript of socially oriented refugee enterprises illegible.

However, due to recent humanitarian crises caused by unregulated and unscrupulous microfinance practices, the entire sector has
entered a phase of self-evaluation with the purpose of returning the focus to the clients. We must recognize that clients’ goals do not equal funders’ goals, and that we cannot conflate the two. Instead, we can learn from the International Institute and its microenterprise clients that success comes in many forms, and trust that community development, rather than individually focused improvement, is a valuable endeavor.

**Weaving a National Narrative: the AKP Project in Turkey**

Rachel Zemke  
Mentor: James Wertsch

This project looks at the national narrative the Justice and Development Party (Adalet ve Kalkınma Partisi, AKP) is constructing and transmitting to the public in Turkey. The AKP is marked by its great electoral success and by being one of the first political parties to succeed as an Islam-inspired party in the rigidly secular Turkish political establishment. Using narrativity theory and works by Ernest Renan and Benedict Anderson on the creation of a nation, I seek to understand how the AKP views itself, and what its understanding of a future and successful Turkey looks like.

The work explores the history of Ottomanism, the Turkish nationalist project, and more recent Turkish Islamist parties, in order to clearly illustrate the interconnected roles of religion and nationalism in the history of the Turkish Republic. This, along with a discussion of economic shifts in Turkey and subsequent re-definitions of political legitimacy, clarifies extant narratives, which the AKP is now modifying, resurrecting and recycling. Drawing from general election campaign ads that ran in newspapers and as billboards during the spring of 2011, I examine the AKP’s goals, self-understanding and its view of the ideal, and future, Turkish state to delineate the AKP’s national narrative.

As the AKP continues to win elections, I argue that the party adheres to a vision of Turkey that accepts a larger swath of Turkish society than any other political narrative in Turkey’s history; the party has been successful in creating a narrative of national democratic practice that is flexible enough to include secularism and Islamic practice. This common goal makes it possible for individuals anywhere on the spectrum of religious to secular, to identify with and support the AKP narrative.

Betty Zhang  
*See Emily Gray*

Ellisa Zhang  
*See Mollie Wasserman*

Kaichen Zhang  
*See Ruth Nan*

**Dissecting the Cellular Response to DNA Damage**

**Using an Innovative “Laser-scissors” System**

Lindsey Zhang  
Mentor: Zhongsheng You

Proper DNA damage repair is essential for maintaining genomic integrity and stability of all living organisms. In instances of improper or inefficient repair by the cell, DNA double-strand breaks (DSBs), the most lethal form of DNA damage, can cause mutations and truncations of genetic material, and lead to human diseases such as cancer and premature aging. A great deal of research effort has been focused on the mechanism of DSB repair, using a variety of techniques to induce DSBs in cells. Examples of these techniques include gamma radiation and radiomimetic drugs. While effective in creating DSBs, these conventional techniques lack the precision and control necessary for investigating finer details of DSB repair processes. A newly developed “laser-scissors” technology overcomes drawbacks of traditional DNA damaging methods by inducing clustered DSBs in specific locations in cells in a user-defined manner. With advanced microscopic techniques, including live cell imaging, this laser method can visualize the DNA damage response in individual cells with high sensitivity and precision.

I used a customized “laser-scissors” system to study the human DNA damage response. I investigated the recruitment of the DNA repair protein 53BP1 (p53 binding protein 1) to DSBs. Using laser irradiation and imaging tools, we demonstrated that 53BP1 damage recruitment requires the function of the MMSET protein, which modifies the histone protein H4 in the chromatin region flanking the...
DSB ends, creating binding sites for 53BP1. The role of MMSET in DNA repair may provide an underlying mechanism for the function of MMSET in the formation of multiple myelomas. Thus, the “laser-scissors” system has lead to important insights into DSB repair and its relation to cancer.

Alec Zimmer
See Britt Devore

FORGETTING RATE DEPENDS ON SPACING OF REPETITIONS: THE ROLE OF REMINDINGS IN THE SPACING EFFECT
Fan Zou
Mentor: Sandy Hale

Past studies investigating the relationship between levels of processing and spacing have generally only obtained spacing effects for deeply encoded items under incidental learning conditions. As Challis argued, such findings indicate that semantic priming may play a role in the spacing effect. However, the current study, which manipulated levels of processing, spacing, as well as retention interval under incidental learning conditions, obtained spacing effects in both deep and shallow encoding conditions at the shorter retention interval, suggesting that an alternative explanation of the spacing effect is needed. The finding that long lag items showed forgetting across the two retention intervals, although short lag items did not, lends support to the remindings account of the spacing effect, which attributes the benefit of spacing to the difficulty with which a prior presentation of a particular item is retrieved.
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MIGRATION & IDENTITY

Keynote Address: 1:00pm — 2:00pm, Labsci 300
Lok Siu, author of “Memories of a Future Home: Diasporic Citizenship of Chinese in Panama”

Conference Panel: 2:30pm — 4:00pm, Labsci 300
Student research presented and round table discussion

2nd Conference Panel: 4:00pm — 5:00pm, Labsci 300
Workshop on research methods in International Studies

April 28, 2012

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Spring 2012
Saturday, April 28, 2012
10:00 a.m. – 4:00 p.m.
Laboratory Sciences Building

Washington University in St. Louis