THANK YOU

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**SPRING 2010 UNDERGRADUATE RESEARCH SYMPOSIUM**

Saturday, April 17, 2010
12:30 p.m. – 3:30 p.m.

**AGENDA**

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<th>Noon</th>
<th>LUNCH SERVED</th>
<th>Lobby, Seigle Hall</th>
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<tr>
<td>12:30 p.m. - 12:35 p.m.</td>
<td><strong>WELCOME</strong></td>
<td>May Auditorium, Simon Hall</td>
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<td>12:35 p.m. – 1:05 p.m.</td>
<td><strong>KEYNOTE ADDRESS:</strong>&lt;br&gt;Dr. Sarah C. R. Elgin,&lt;br&gt;Viktor Hamburger Distinguished Professor in Arts &amp; Sciences;&lt;br&gt;Professor, Department of Biology&lt;br&gt;“Undergraduate Research - A Personal Perspective.”</td>
<td>May Auditorium, Simon Hall</td>
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<td>1:05 p.m. – 1:20 p.m.</td>
<td>Mark Dudley&lt;br&gt;“The Effects of the Nonpartisan Blanket Primary on Electoral Change in Louisiana, 1964-2003”</td>
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<td>1:30 p.m. – 3:30 p.m.</td>
<td><strong>POSTER PRESENTATIONS</strong></td>
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EARLY AGGRESSIVE SULFONYLUREA THERAPY IN K−ATP INDUCED NEONATAL DIABETES MELLITUS

Sophia Agapova
Mentor: Colin Nichols

ATP-sensitive K⁺ (K_A TP) channels in pancreatic β-cells play an important role in insulin secretion, and therefore homeostatic control of blood glucose levels. Mutations that result in ATP-insensitive K_A TP channels cause neonatal diabetes. Early initiation of chronic treatment with sulfonylurea drugs helps maintain normal blood glucose and prevents development of diabetes. ATP-insensitive K_A TP mutant mice, which develop chronically elevated blood glucose and impaired glucose tolerance, can be used to model the disease. The purpose of this study was to test the effectiveness of immediate acute sulfonylurea treatment to investigate the progression of the disease. We injected K_A TP insensitive mutant mice with a high dose of glyburide for five days, or titrated them by adding the drug to their drinking water, and measured indicators of β-cell function long after the end of treatment. Among the mutant mice treated with glyburide, two populations emerged—those that failed to respond to treatment and developed blood sugar levels similar to untreated mice, and those that showed only slight elevation of blood glucose levels, which were maintained well after the end of treatment. The responders to the therapy also maintained higher levels of both β-cell insulin content and glucose dependent insulin secretion. This response to treatment suggests the potential of early aggressive glyburide treatment to prevent later development of hyperglycemia and preserve β-cell insulin content. Further studies are necessary to determine the compensatory mechanisms responsible for the two markedly different responses to treatment, knowledge of which may be useful for treatment of human neonatal diabetes.

GERMAN SOCIETY AND FOOTBALL: AN ANALYSIS OF THIS DYNAMIC RELATIONSHIP

Nicholas Alexander
Mentor: Stephen Schindler

In Europe, football/soccer has been a platform for Europeans to engage with members of their own nation and with citizens of other European countries. Football plays a critical role in the formation of national identities and thus has been a way for European citizens to define themselves. Due to its dark history, Germany is a country marked by a shadow; particularly because of the human rights atrocities committed by the National Socialists in the 1930s and 1940s. It has struggled to establish and express national identity despite its guilt and shame. This dissertation seeks to understand ways in which Germany has used football to positively identify with its culture, traditions and those patriotic sentiments that are so common to other nations, and how Germany can express national pride without guilt. Through an exploration of certain football matches and their reception in German society and by using an interdisciplinary method which includes elements of sports studies and community theory, it is clear football affords Germans the opportunity to regain a sense of normalcy with respect to their sense of pride and patriotism regarding their country.

PERSUADED BY THE ECHOES OF THEIR OWN VOICES: HOW COGNITIVE BIASES CRUCIALLY INFLUENCED THE BUSH ADMINISTRATION’S DECISION TO GO TO WAR WITH IRAQ

Greg Allen
Mentor: Gary Miller

This research argues that the conventional wisdom of a broad failure of the U.S. intelligence community prior to the 2003 War in Iraq mistakenly ignores the oversized influence of the Pentagon’s Office of Special Plans, whose repeated and colossal errors in judgment were the direct cause of mistaken beliefs about the existence of Iraqi WMD and ties to terrorist organizations. The work details six crucial erroneous judgments made by the Bush Administration’s intelligence analysts and evaluates the connection of those policies to the predictably irrational effects of cognitive bias. The cognitive biases approach offers a powerful explanation for why top administration officials not only made serious errors in judgment, but also ignored consistent and compelling evidence that contradicted their faulty assessments. It is concluded that the errors made by intelligence analysts and the consumers of that intelligence neatly align with the predictions of a bounded rationality model that takes into account the effects of cognitive bias.
DEVELOPMENT OF ANTIBODIES TO SELF ANTIGENS, K ALPHA1 TUBULIN AND COLLAGEN V, FOLLOWING LUNG TRANSPLANTATION IS ASSOCIATED WITH HLA-DR 51 AND 7 RESPECTIVELY

Chiraag Alur
Mentor: Thalachallour Mohanakumar

This research aims to develop antibodies to HLA and self antigens, K Alpha 1 Tubulin (KAT) and Collagen V (Col V) which have been strongly associated with development of chronic rejection (Bronchilotis obliterans syndrome, BOS) following human lung transplantation (LTx). In this study, we determined HLA-DR association for the development of denovo immunity to KAT and Col V in post LTx recipients.

103 LTx recipients and 55 normals were included in the study. HLA typing was done using PCR reverse line blot. Donor specific Abs(DSA) to HLA were detected using LUMINEX. Abs to KAT and Col V were measured using ELISA. Fischer's exact tests with Bonferroni corrections to determine corrected p values(Pc) were performed to analyze the significance of HLA association to Anti-KAT or Anti-Col V. Of 103 LTx pts, Abs to KAT and Col V were detected in 38.9%(n=41) and 32%(n=33) respectively. 42.7% of pts developed DSA, of which 30.09% developed Abs to KAT and Col V. HLA-DR7 was significantly associated with development of Abs to Col V (36.3% vs. 7.8%, Pc= 0.0335; OR=6.91, 95%CI= 2.2-21) and HLA-DR51 was significantly associated with Abs to KAT (26.8% vs. 3%, Pc = 0.0454; OR=7.1, 95%CI=2.1-23.1) compared to controls. It is concluded that there was a significant positive association between HLA DR51 and HLA DR7 with the development of Abs to KAT and Col V respectively following human lung transplantation. Therefore, it is likely that peptides derived from self antigens binding to HLA-DR 51 and DR7 are involved in the induction of an immune response to these antigens which is important in the pathogenesis of BOS.

U.S. REFUGEE POLICY: IMPLICATIONS FOR THE ADMISSION AND INTEGRATION OF REFUGEES OF THE IRAQ War SINCE 2003

Adina Appelbaum
Mentor: Carol Camp Yeakey

In the past three decades, the U.S. has resettled more refugees from around the world than all other developed nations combined. Yet following the U.S.-led war on Iraq in 2003, only minimal numbers of Iraqi refugees have been allowed into the U.S. despite the displacement of over 4 million as a direct result of the war. The U.S.’ response to the crisis has proved to be inadequate compared to that directed toward previous refugee crises in which the U.S. has been primarily responsible for events that led to displacements. Why has the U.S. failed to react steadfastly and meaningfully to the Iraqi refugee crisis?

In order to analyze the U.S. response, this thesis explores two research questions related to U.S. refugee policy and its implications for the Iraqi refugee crisis: (1) In terms of admissions, how have U.S. foreign policy interests affected the U.S. response to the Iraqi Refugee Crisis? (2) How has the USRAP (the United States Refugee Admission Program – the policy that manages the admission of refugees to the U.S.) met the needs of Iraqis who have been admitted to the U.S. during the integration process, particularly in urban areas?

The argument of this thesis is that the U.S. has not responded fully to the crisis because it has not been in its foreign policy advantage to do so. The U.S. has had an interest in legitimizing Iraq and its government, and therefore has not addressed the crisis through special resettlement programs and sufficient aid because doing so would otherwise illuminate Iraq’s instability and thus de-legitimize the U.S.’ mission there. Beyond U.S. strategy, the fragmented nature of the international community’s approach to refugee policy and the inadequacies of the USRAP have also been responsible for the cumulative failed response to the Iraqi refugee crisis, particularly the USRAP’s inconsistent and inflexible design which has resulted in dire rates of unemployment and homelessness for resettled Iraqi refugees.

Methodology draws upon both quantitative and qualitative data analysis. The quantitative data is taken from government sources, including the U.S. Department of State, Bureau of Populations, Refugees and Migration and the U.S. Department of Health and Human Services Administration for Children & Families, Office of Refugee Resettlement. Data is also taken from the United Nations High Commissioner for Refugees. Qualitative data derives from a policy analysis of the USRAP and various pertinent public laws, and sources including government reports and publications, scholarly research, policy reports and proposals, and newspaper articles.

HOME IS WHERE THE HISTORY IS: NOSTALGIA, AUTHENTICITY, AND IDENTITY IN AMERICAN HOUSE MUSEUMS

Caitlin Whitney Astrue
Mentors: Peter Benson and Heidi Kolk

Historic house museums are often represented as static places, moments frozen in time. While this time capsule image is alluring, it also distorts the reality of the consistent reinterpretation of history based on different forms of evidence. This research examines the role of nostalgia and authenticity in historic preservation and communicating history to a public audience. In the short history of American historic preservation, homes have been a primary target for preservationists. These homes, often of well-respected and wealthy individuals, are converted from
spaces of private habitation to spaces for public consumption. The themes of nostalgia and authenticity play a central role in this process as people used the argument that historic homes can offer a unique perspective on history. House museums also provide insight into the centrality of family in the discussion of American values and identity. Mount Vernon, nationally revered home of George Washington, and the Campbell House Museum, a downtown St. Louis home, were used as case studies examining how these institutions shape national and local identity respectively. I draw on my experience from site visits to Mount Vernon and the Breakers, a Newport Mansion, and work at the Campbell House Museum to look at the relationship between the narratives the visitor encounters and the decisions the institutions make about what and how to convey information to the public. Given the wide range of historic homes in the United States, I also reviewed a variety of publications covering historic homes, historic districts, and related policy. Findings include how historic preservation emerged as a field in the United States, how citizens use nostalgia to argue for preservation, the role of social history in reinterpreting the past, and what challenges historic house museums face moving forward.

BREAST CANCER MORTALITY DISPARITIES IN ST. LOUIS: VIEWS FROM INSIDE THE HEALTH CARE SYSTEM
Laura Bach
Mentor: Bradley Stoner

While white women are more likely to be diagnosed with breast cancer, African American women are more likely to die from it. Health disparities are pervasive in this country, and an examination of breast cancer mortality disparities in St. Louis provides an inside look into the factors that fuel health disparities. By examining the perspectives of professionals from within the health care system at Barnes Jewish Hospital through in-depth interviews, I look at how patient navigators can be a bridge between the medical community and the patient community, and how their views may reveal important areas for intervention that are not addressed by current epidemiological data. The factors that arise as explanations for breast cancer mortality disparities are: insurance problems, education, practical barriers, fear, myths, mistrust, screening delays, comorbidities, biological factors and financial issues after diagnosis. The results of this research show that the factors that health professionals consider important to the production of breast cancer mortality disparities do not necessarily subscribe to a particular health disparity “model,” but are a combination of social, economic, biological and cultural issues. An analysis of these results provides an assessment from the perspective of critical medical anthropology and emphasizes the role that structural inequities play in creating health disparities as compared to looking at health disparities from the individual patient level or from the lens of a particular model. Addressing health disparities requires not just health care reform, but structural transformation.

CROSSING THE RIVER JORDAN: EXPLORING INDIVIDUAL PERCEPTIONS OF NATIONAL IDENTITY IN JORDAN
Emily Becker
Mentor: Nancy Reynolds

The uniqueness of Jordan as a state, as a nation, and as a nation-state has been challenged along almost all conceivable lines. Demographically speaking, a majority or near majority of Jordanian citizens have Palestinian origins. Ideologically speaking, many frame Jordan as a smaller part of a Greater Syrian, Arab, and/or Islamic nation or as larger collection of separate familial or tribal groupings. Territorially speaking, Jordan only relinquished its claims to the West Bank twenty years ago. Politically speaking, Hashemite monarchs – who some consider to be foreigners – have ruled Jordan since its inception as a nation-state. Despite these challenges, Jordanian nationalism remains a powerful ideological force.

In this work, I look at how Jordanians – both Jordanian-Jordanian and Palestinian-Jordanian – understand their national identity on an individual level. Twenty-two in-depth interviews with Jordanian residents were conducted in the fall of 2008. I analyze three specific topics: how Jordanians imagine their past, present, and future, how national identity is expressed through language, and how Jordanians understand the relationship between national identity and natural resources. Ultimately, I find that there is no single sense of Jordanianness, but rather a fractured imagination of national identity that varies widely from person to person. I argue that it is important to understand the nuanced nature of national identity at the individual level so that we are better able to tackle resource scarcity, land conflict, and other environmental challenges in the current century and beyond.

DEFYING BUBBLED CIRCLE CLASSIFICATIONS: IDENTITY IN AFRICAN IMMIGRANT POPULATIONS IN ST. LOUIS
Lurit Bepo
Mentor: Carolyn Sargent

The process of immigration is one of changes, challenges, and adaptation; many factors determine the extent and quality of integration for different immigrant groups. This project investigates this process for black African immigrants integrating into the St. Louis community. In
particular, this research looks at how they define themselves in modern American society, how they adapt to life in St. Louis, the extent to which they retain their native culture, and the historical, social, political, and economic factors that affect each of these issues. Using the segmented assimilation theory as a theoretical framework, the project will incorporate previous case studies and community interviews in order to ultimately determine the implications of immigration for black African youth living in the St. Louis area and their educational achievement.

**SODIUM BICARBONATE ADMINISTRATION AND OUTCOME IN PRETERM INFANTS**

Carly Berg
Mentor: Terrie Inder

The treatment of acidosis in the sick newborn with sodium bicarbonate has been debated over many years. In the 1970s, several studies noted an association between rapid sodium bicarbonate infusion and an increased risk for intraventricular hemorrhage (IVH). Since then, the literature on sodium bicarbonate has grown to include potential mechanisms for the increased risk of IVH, analyses of its effectiveness in treating acidosis, and reports on the other consequences of bicarbonate administration. Recent literature has focused on the immediate (<4 hours) physiological and metabolic effects of sodium bicarbonate infusion, but there are few recent large scale studies that further investigate the outcomes of infants who received sodium bicarbonate.

The first goal of this study was to describe the characteristics of very low birth weight infants treated with sodium bicarbonate infusions in the first seven days of life in the Neonatal Intensive Care Unit (NICU). In addition, we aimed to explore the association between sodium bicarbonate therapy in very low birth weight infants and immediate (acid-base balance), short term cardiorespiratory and neurological outcomes. This was achieved by a retrospective analysis of the data collected from a chart review of 994 very low birth weight infants admitted to the St. Louis Children's Hospital NICU from 2002 to 2006. We found that those (n=165) receiving sodium bicarbonate were more immature at birth and had greater severity of illness. Further, sodium bicarbonate therapy was associated with a raised risk of adverse short-term outcomes (intraventricular hemorrhage, death prior to discharge) even after adjusting for patient illness and immaturity. Sodium bicarbonate therapy did not adjust acid-base status after administration. Thus, the benefit of sodium bicarbonate therapy in preterm infants remains unproven.

**STRATEGIC PLANNING IN RENEWABLE ENERGY POLICY**

Michelle K. Bernard
Mentor: Itai Sened

Successfully implementing renewable energies requires not only technological breakthroughs but also cooperation between the public, private, and non-profit sectors. However, little research has been done to analyze the difficulties of this type of cross-sector cooperation. The purpose of this research is to create comprehensive maps of institutional ecosystems around the world that support sustainable renewable energy implementation. By comparing said maps, we identified the determinants of strong versus failed "cleantech" ecosystems. We found that in the United States, while Texas and Minnesota are viable environments for wind energy, Texas has exceeded implementation expectations and Minnesota has failed to overcome basic collective action problems and subsequently failed to progress their "cleantech" sector. Globally, we have also plotted energy prices and subsidies against renewable energy use. Preliminary data suggests that institutional and policy factors are more influential than the progress and cost of technologies in this field. Further, the viability of this technology is contingent upon overcoming the basic collective action problems at the administrative levels.

**GENETIC SCREEN TO IDENTIFY REGULATORS OF SYNAPSE FORMATION IN DROSOPHILA MELANOGASTER**

Dominic Berns
Mentor: Aaron DiAntonio

The chemical synapse is a highly specialized structure dedicated to the process of intercellular communication, the fundamental basis of nervous system function. All higher order functions of the nervous system depend on precise synaptic contacts between appropriate cells. Understanding the process of synapse formation is therefore essential to understanding neural function in general. At the *Drosophila melanogaster* neuromuscular junction (NMJ), motor neurons synapse onto muscle cells in a highly stereotyped pattern, indicating a high degree of genetic control.

In order to identify gene products required for normal NMJ development, we performed an anatomical screen on a library of piggyBac insertion elements. Due to the consistent size, shape, and location of individual neuromuscular junctions, insertions affecting NMJ development are easily identified. NMJ structure was visualized using antibodies to the presynaptic active zone protein Bruchpilot, and the
postsynaptic glutamate receptor subunit DGluRIII. From this screen, we identified a mutant, 140-245, which exhibits several morphological defects at the NMJ. 140-245 exhibits a 40% decrease in bouton number, a 22% increase in terminal boutons, and a striking bouton spacing defect. When quantified using the postsynaptic marker DLG, this spacing phenotype is manifested as a 2.75-fold increase in discontinuous DLG foci. 140-245 does not appear to exhibit a functional transmission defect, as indicated by electrophysiological measures. The insertion in question is located in the 3' UTR of a type IV collagen gene, Dcg1. This collagen forms an essential component of basement membranes, which surround nerve and muscle cells, and are present at NMJs. A causal link between Dcg1 disruption and the observed phenotype has yet to be established, due to lethality of deficiency trans-heterozygotes. In order to conclusively demonstrate the Dcg1 dependence of the phenotype, transgenic rescue with wild-type Dcg1 is underway. Pending the outcome of this experiment, further studies of the role of Dcg1 in NMJ formation will be initiated. Future analysis of 140-245 could lead to a more complete understanding of pathways leading to proper synapse formation.

REGULATION OF PERIPHERAL NERVE REGENERATION BY THE mTOR PATHWAY

Steven Borson
Mentor: Valeria Cavalli

The peripheral and central nervous systems have clear differences with respect to ability to regenerate. Neurons in the CNS degenerate after injury, while those in the PNS have a remarkable ability to regenerate their axons and reinnervate their targets. The main goal of this work is to determine the molecular differences between the two neuronal types that give rise to the differences in their ability to regenerate. One pathway implicated in regulating the intrinsic ability of neurons to regenerate is the mTOR signaling pathway, which regulates cell growth, survival, motility and translation. Work from others has shown that CNS neurons downregulate the mTOR pathway following injury, and that this downregulation is correlated with decreased regenerative ability. We find that in contrast, dorsal root ganglia (DRG), which are sensory neurons in the PNS, upregulate the mTOR pathway following injury. To determine whether mTOR activity is sufficient to increase axonal growth capacity after injury, we took a genetic approach to constitutively upregulate the pathway in sensory neurons. We created a conditional knockout mouse in which the TSC2 gene, an inhibitor of the mTOR pathway, is deleted in all sensory neurons. Preliminary results show that DRGs dissected from TSC2 conditional knockout mice have enhanced axonal outgrowth in vitro, consistent with the role of the mTOR pathway in regulating axonal growth after injury. We are currently working to determine whether the TSC2 conditional knockout mice show enhanced regeneration in vivo, as well as investigating developmental affects due to this molecular manipulation.

MARITAL ATTITUDES AMONG ADULTS:
THE EFFECTS OF FAMILIAL INFLUENCE AND RELIGION

Stephanie K. Brewer
Mentor: Michael J. Strube

Based on the findings from a variety of previous studies concerned with the related issues of the intergenerational transmission of divorce, marital attitudes, attitudes toward divorce, religiosity, and future family formation, the present study aimed to answer several questions related to these issues. Forty participants completed surveys and scales designed to assess influential factors involved in their family of origin and religiosity as well as their attitudes toward marriage and divorce and the quality of their current romantic relationships if applicable. As hypothesized, effects of the intergenerational transmission of divorce appeared along with several predicted correlates of religiosity. The preliminary findings did not support hypotheses regarding participants’ ideal pace of future family formation, but this may be due to parental relationship quality, which will be assessed in further analyses. While several hypotheses were supported by these results, continued data collection and analysis is likely to further illuminate crucial aspects of this study.

STATISTICAL EVALUATION OF LANGUAGE RELATEDNESS
USING PHONETIC COMPARISON ALGORITHMS

Sarah Brooks
Mentor: Brett Kessler

Linguists have employed various techniques to test the historical connections and similarity between languages. However, all methods have fallen short due to their inability to specify how much similarity is sufficient to declare with any certainty that two languages are related. In this research, statistical significance tests were used to overcome this flaw and phonetic comparison algorithms (PCAs) were implemented to determine language similarity. If semantically matched words in two languages are significantly more phonetically similar than the background level of phonetic similarity expected by chance, then the languages can be deemed related. I developed a computer program to test the effectiveness of several PCAs on classifying the relatedness among 15 languages: 11 languages from the Indo-European language family and 4 from the Uralic family. Sounds (phones) were represented as 16 binary features (i.e. +/-voice, +/-continuant, etc.). The first PCA
implemented rated the similarity of two sounds by the number of features on which they differed (the Hamming distance). A second algorithm said sounds were the same if they agreed in voicing. A third declared sounds as equal if they shared the same place of articulation. The final PCA passed phones through a decision tree to determine similarity. The success of each PCA was judged based on whether it classified languages in the same family as being related and languages not in the same family as unrelated. PCAs that considered only a subset of features performed reasonably well (62% accurate for voicing and 81% for place), but those that looked at all 16 features performed the best (86% for the decision tree, 90% for the Hamming distance). This research demonstrates the utility of representing phones using multiple features when studying language relatedness using PCAs and statistical significance testing.

NEVER MIND THE EXTREMES, WHAT’S IN THE MIDDLE?
EDUCATION AND THE MIDDLE CLASS IN TWO MIDDLE EASTERN COUNTRIES

Naomi Burstein
Mentor: Itai Sened

This work detracts attention from the usual media obsession with extremism in the Middle East to pay overdue attention to more fundamental attributes of societies in the region. In particular, it explores the middle class as an important determinant of economic growth and political development and the role of in the sustainable growth of the middle class. I use most-different-cases comparison between the educational systems of Egypt and Israel. These two countries were chosen because they are both Middle Eastern countries, yet Israel is considered to be more western and to uphold more western ideals. I show that education is an important determinant in the analysis of the middle class and that higher education leads to a country's growth, development and overall prosperity. I hope to lend a new way of thinking of the Middle East conflict and aid in the understanding of issues that currently plague society there.

W. Éamon Callison
See Sunnie Hsiung

SWINE FLU AND SYMBOLISM:
A CLOSER LOOK AT THE SOCIAL AND CULTURAL FORCES BEHIND
THE 2009 SWINE FLU PANDEMIC

Jacqueline Chen
Mentor: Brad Stoner

In the fall of 2009, the H1N1 flu pandemic swept across the United States and the world. Not only was it an epidemic, but also a pop culture phenomenon. The hype that accompanied its reign set it far apart from the seasonal flu. Instead it took on a wholly different, symbolic meaning. In order to gain an understanding of why society reacted the way it did to the swine flu epidemic, the issue will viewed from three perspectives. First, we will consider the biology and epidemiology of the swine flu virus to understand how the virus evolved and how it spread. Then, findings will be presented from interviews of four individuals who were diagnosed with swine flu in order to gain a better understanding of the personal experience of swine flu from an anthropological perspective. Finally, we will look at the swine flu epidemic in the context of symbolic anthropology to see how society made sense of this disease. By employing these three viewpoints, how the 2009 Swine Flu epidemic played out and why society reacted the way that it did is made clearer.

CHANNEL CONFORMATION DETERMINES DHA INHIBITION
AND POLYAMINE BLOCK IN KAINEATE RECEPTORS

Kevin Chen
Mentor. James E. Huettner

RNA-edited kainate receptors found in postnatal developing rats exhibit a decrease in current in the presence of cis-unsaturated fatty acids such as docosahexanoic acid. A glutamine is normally coded for at the Q/R site, but an arginine is present in edited GluR6 subunits. In the present study, we have performed scanning mutagenesis with arginine across the three transmembrane helices (M1, M2, and M3) of wild type subunits and measured the current before and after application of DHA. In addition, we measured DHA susceptibility in alanine and tryptophan mutants along M2. It was discovered that DHA sensitivity is dependent on several factors including size, position, orientation, and functional group property. Mutation to arginine of residues that face away from the membrane bilayer and into another helix frequently confers susceptibility to DHA. Replacing a residue that has a small side chain with one that has a large side chain is also related to increased DHA inhibition, although this is less obvious in the reverse case. In addition, three locations were found where R substitutions caused
potentiation in the presence of DHA. Finally, in all mutants, we performed an I-V ramp for each mutant to test for block by polyamines. We found that mutations that increased DHA inhibition were more likely to have resistance to polyamine block. This supports the idea that susceptibility to DHA and resistance to polyamine block are more likely explained by modulation of conformational structure of the channel than by an addition of positive charge in the transmembrane helices per se.

CHEMICAL SOURCE LOCALIZATION USING ELECTRONIC NOSE SENSORS
Joy Chiang
Mentor: Arye Nehorai
The goal of this project is the development of a closed-loop system to estimate the location of an odor source, using a chemical sensor mounted on a robotic platform capable of moving in 2D. We model our electronic nose sensor’s response to different concentrations of ethyl alcohol, and apply the gradient descent method to iteratively converge on the location of the odor. We tested our chemical source location approach for different scenarios using numerical examples in MATLAB. The end goal is implementing our model on an actual robot, by programming a microcontroller and interfacing it with the robot’s sensors. When the sensors are exposed to an odor, the program will estimate the concentration and the gradient descent algorithm will guide the robot toward the source.

EFFECT OF CHARGE CONTENT ON CONFORMATION OF INTRINSICALLY DISORDERED PROTEINS
Caitlin Chicoine
Mentor: Rohit Pappu
Intrinsically disordered proteins (IDPs) are defined by a failure to adopt regular three-dimensional conformations under physiological conditions. An understanding of this behavior in connection with the amino acid sequence of the proteins allows further insight into the physiological function of IDPs. Protamines are a set of arginine-rich IDPs involved in the packaging of viral genomes and of chromatin during spermatogenesis. Charge content was modulated in protamines with the addition of arginine residues, and the resulting peptide conformations in solution were studied with fluorescence correlation spectroscopy. As net charge per residue increased, a globule-to-coil transition was observed. This corroborated previous computational studies.

MORPHOLOGICAL AND GENOMIC CHARACTERIZATIONS OF REDI, A NOVEL MYCOBACTERIUM PHAGE
Re-I Chin, Weina Dai, and Tiffany Lin
Mentors: Sarah Elgin and Kathy Hafer
Bacteriophages, one of the most diverse life forms on Earth, continue to captivate researchers’ interests because they are relatively easy to study and lead to understanding of the biomolecular world. To expand upon the realm of phages, a bacteriophage that infects the soil bacterium Mycobacterium smegatis was isolated from a mulch pile in St. Louis. After isolation, this bacteriophage was named Redi and its morphology and genome were characterized. Redi yields uniform and clear plaques of approximately 1.5 mm in diameter, an observation that demonstrates its lytic lifestyle. Transmission Electron Microscope (TEM) revealed that Redi has an average head width of 52.8 nm, head length of 64.4 nm, and tail length of 138 nm. Redi’s genome is 42,591 bp long, as determined by DNA sequencing at the Genome Sequencing Center at Washington University in St. Louis. This result distinguishes Redi as having one of the smallest genomes of all the mycobacterium phages sequenced thus far. Preliminary analysis of the genome reveals that it contains no tNRA genes. Additionally, the organization of its 70 genes, found in four operons, suggests that Redi does not fall within any pre-established phage clusters. Work is underway to compare the putative open reading frames (ORF) with already identified genes using the Basic Local Alignment Search Tool (BLAST). This comparative genomics study will lead to improved understanding of the diversity, evolution, and ecological impact of phages.

MECANOSENSITIVE CHANNELS INTERACT WITH STARCH METABOLISM TO CONTROL THE OSMOTIC SENSITIVITY OF PLASTIDS IN ARABIDOPSIS THALIANA
Cara E. Clure
Mentor: Elizabeth S. Haswell
The activation of mechanosensory (MS) ion channels is thought to be responsible for responses to physical force stimuli including touch, gravity, and osmotic pressure in vertebrate and invertebrate systems. Identification of the bacterial MS ion channel MscS led to the characterization of the related MscS-like (MSL) proteins in Arabidopsis thaliana. Two MSL proteins, MSL2 and MSL3, were shown to be fundamental in controlling the size and shape of plastids. Mutations in both MSL2 (msl2-1) and MSL3 (msl3-1) cause variegated leaves, enlarged chloroplasts,
and large, round non-green plastids. Plants carrying a lesion in the PGM gene in combination with msl2-1 and msl3-1 alleles were found to have a wildtype non-green plastid phenotype and exhibit less variegated leaves. Mutating PGM results in a deficiency of the chloroplast enzyme, phosphoglucomutase (PGM), which causes a plastidic starchless phenotype, but increases the concentrations of other sugars such as glucose and sucrose in the cytoplasm. Data shows that mutating PGM rescues msl3-1 and msl2-1 mutant phenotype of non-green plastids. We will determine which of the two effects of mutating PGM are responsible for suppressing the mutant phenotype. Data will be presented that argues against the role of starch as causing the effects, but rather experiments will be discussed that support the model that cellular sugar levels rescue the non-green plastid mutant phenotype.

**URBAN AGRICULTURE: TRANSFORMING SOCIOECONOMIC STATUS AND FOOD SECURITY AMONG REFUGEE COMMUNITIES**

Stephanie Co  
Mentor: Peter Benson

Urban agriculture historically served as a response to food scarcity in economic crisis, war, and rapid urbanization. More recently, urban agriculture developed to address environmental, social, economic, and community health issues resulting from industrialized agriculture and poor food distribution patterns in urban areas. These issues primarily affect underserved communities, including refugees who experience challenges in accessing healthy and affordable food as well as satisfactory education and employment, and consequentially socioeconomic success.

The impact of urban agricultural practices in refugee communities in the United States is discussed in this work. I look at the role of urban gardens in addressing socioeconomic inequalities, challenges in food access, and community-building among refugees, in particular the Hmong and Somali communities. A wide disparity in regards to economic opportunity and health currently exists between refugees and native-born Americans. The majority of refugee communities come from agrarian backgrounds and experience difficulties qualifying for urban jobs with upward mobility. Low socioeconomic status, dependence on food stamps, and cultural adjustment further instigate problems in accessing healthy foods. By examining case studies of urban agricultural programs integrating refugee communities, the beneficial impact of urban agriculture in decreasing socioeconomic inequalities and food insecurity among refugees is seen.

**NOT SO BEAUTIFUL: A CONTEXTUAL ANALYSIS OF MARTHA ROSLER’S BRINGING THE WAR HOME: HOUSE BEAUTIFUL**

Alexandra Collins  
Mentor: Angela Miller

Martha Rosler (b. 1943) is an American artist whose work in a variety of media regularly addresses political and social issues. She is known as a political artist because her activism and aesthetics are inextricably bound. She first came to public attention with her politically motivated series of photomontages on the Vietnam War, entitled *Bringing the War Home: House Beautiful* (1967-72). In this series of thirteen photomontages, Rosler integrated details of photographs of the Vietnam War published in *Life* magazine into images of the perfect American home taken from the women’s journal *House Beautiful*. Rosler’s main intention in creating the series, as clearly indicated by its title, was to bring the war home in the minds of American viewers, to make them more fully aware of the conflict that was half a world away. Although this series, which is arguably her seminal contribution to twentieth-century art, has often been included in general discussions of the art that addressed the Vietnam War, it has not been analyzed extensively. A deeper understanding of the series only emerges from a consideration of the work in its full and varied contexts, which include the Vietnam War and the opposition it generated; the history of photomontage; the fledgling feminist movement; the critical debates being conducted in late 1960s America on the nature and functions of art; and the events and circumstances of the artist’s own life. A contextual analysis suggests is that the effectiveness of Rosler’s *Bringing the War Home: House Beautiful* series was a unique product of its time and underground political context.

**INDIVIDUAL DIFFERENCE IN AUTOBIOGRAPHICAL MEMORY: ILLUSIONS OF CHANGE OR STABILITY**

Ileana Culcea  
Mentor: Michael J. Strube

Personal assessments of the self rely on comparisons of the current self to selves from the past. The perceived temporal distance of an event, whether suggested or internally driven, can be as important as objective measures of the time passage when judging the amount of personal change. Previous research has found that individual differences (e.g., self-esteem) affect the amount of perceived change an individual reports.
The current study attempted to identify additional individual differences that predict the amount of perceived change over time. Washington University students participated in a two-session experiment with the second session occurring two weeks after the first. During both the initial and final session, participants were asked to provide current assessments of their performance in several life domains (e.g., academics, friendships, extra-curricular activities, etc), recalled performance for two weeks prior and to predict their performance for two weeks in the future. Baseline measures on a battery of personality questionnaires were collected at the first session. An experimental manipulation of suggested temporal distance was introduced during the last session when participants were asked to recall their previous performance ratings. Some participants were induced to view the two-week period as lengthy and so were likely to report change, whereas others were induced to view the two-week period as brief and so were unlikely to report much personal change. Results indicated that extroversion, openness to experience, latitudes of self-description, and personal theories of self-change were found to affect the magnitude and direction of reported change in performance.

THE HOLOCAUST IN BRAZILIAN LIFE:
A COMPARATIVE ANALYSIS WITH THE WAY IT IS PERCEIVED
AND HANDLED IN AMERICA
Fernando Cutz
Mentor: James Wertsch

This research explores the different ways in which the Holocaust is remembered, perceived and handled in the United States as compared to Brazil. It analyzes the way that memory of the Holocaust developed and was shaped over the course of the past six decades in the United States and how different tendencies and interests have shaped it in a drastically different way in Brazil. Despite the vastly different paths to the creation of national memories of the Holocaust, it is noted that both countries now seem to have similar memories and the paper analyzes why and how this convergence may have occurred, ultimately concluding that the issue is one of humanity which transcends more political or national considerations.

SEX, LIES, AND BUNNY-LUV:
BABY-CUT CARROTS AND MODERN ADVERTISING
Madeleine G. Daepp
Mentor: Timothy Mullaney

Though quantity, quality, and price clearly play a role in consumer decision-making, producers spend a great deal of time and money differentiating products in other ways. In the baby-cut carrot market, where there is almost no difference between one bag of carrots and the next, producers use advertising to capture possible future consumers’ attention. The packaging of Grimmway Farms’ Bunny-Luv Baby-Cut Carrots is a particularly good example of the use of modern advertising techniques for product differentiation. This paper investigates the tendency of the Bunny-Luv carrot packaging to use fact-based labeling to appeal to rational consumers, paying particular attention to the bag’s incorporation of imagery that pushes the boundaries of truth. Through the combination of fact and fiction, the packaging appeals not only to consumer intellect but also to consumer emotions.

Weina Dai
See Re-I Chin

FROM BOMBS TO SUNFLOWERS: THE DENUCLEARIZATION OF UKRAINE
Hana Damore
Mentor: James Wertsch

Ukraine was born nuclear. With the break-up of the Soviet Union in 1991, Ukraine inherited approximately 5,000 nuclear weapons, making it the owner of the third largest nuclear weapons arsenal in the world. Shortly after statehood, threats from Russia and a poor economy ignited a nuclear debate in Ukraine. Yet, in 1994, Ukraine became a non-nuclear state. In 1996, five years after it inherited the weapons, the defense secretaries of Russia, Ukraine and the United States watched as sunflowers were planted where a Ukrainian nuclear facility once stood.

This research provides a comprehensive look at the denuclearization process and its effects. It aims to demonstrate that the United States played a critical role throughout, and that without its excellent foreign policy, the denuclearization might not have taken place. It seeks to demonstrate that without Ukraine’s decision to denuclearize, the world might not be the same today. In 1991, there were 30,000 Soviet nuclear weapons, 52 countries had not signed the Nuclear Non-Proliferation Treaty (NPT) and there were five nuclear free zones throughout
the world. Today, there are approximately 23,000 nuclear weapons in the entire world, 9 nuclear free zones and only 4 countries that have not signed the NPT. This progress can be attributed to leaders such as Presidents Obama and Regan and Premier Gorbachev, but also to smaller players like those in Ukraine.

DIFFERENTIAL EXPRESSION OF 15-LIPOXYGENASE ISOZYMES IN COPD
Geoffrey Dang-Vu
Mentor: Michael Holtzman
The levels of arachidonate 15-lipoxygenase (15-LO) are increased in the airways of patients with asthma and may contribute to immune cell recruitment and associated airway pathology via the production of 15- and 12(S)-hydroxyeicosatetraenoic acids (HETEs). Similarly, expression of 12-lipoxygenase (the mouse homolog) is increased in association with IL-13, arginase 1, and related markers of alternatively-activated macro-phages in a mouse model of virus-induced chronic airway disease. Two isoforms of 15-lipoxygenase (15-LO-1 and 15-LO-2) with 40% sequence homology have been identified in humans. Although both forms appear to be expressed in airway epithelial cells, the relative expression in chronic lung disease still needs to be defined. Here, we examined the expression of 15-LO-1 and 15-LO-2 in lung samples from patients with COPD. We find that levels of 15-LO-1 and 15-LO-2 mRNA correlate significantly with IL-13 and MUC5AC mRNA levels in lung resection samples from patients with GOLD 0-4 COPD. In addition, we observed that immunostaining for 15-LO-1 is found predominantly in ciliated epithelial cells, whereas 15-LO-2 also localized to subepithelial PMNs and macrophages and vascular endothelial cells. Epithelial immunostaining for 15-LO-1 is more intense in COPD than non-COPD subjects. Moreover, the levels of 15-LO-1, but not 15-LO-2 are markedly increased in cultured human airway epithelial cells stimulated with IL-13, a cytokine that appears to drive the development of COPD. Together, results indicate that 15-LO-1 and 15-LO-2 expression is increased in COPD, and the distinct pattern of expression for each of these isoforms implies separate roles in the epithelial and immune cell events that contribute to the pathogenesis of COPD. These isoforms therefore represent potential biomarkers to stratify patients with chronic inflammatory lung disease.

OWNING AYAHUASCA:
THE ROLE OF A MEDICINAL PLANT IN COLONIAL BIOPROSPECTING AND CONTEMPORARY CONSERVATION
Elizabeth Dankenbring
Mentor: Andrea Campatella
Banisteriopsis caapi, or “Ayahuasca” is a plant found in the Amazon Rainforest that is sacred to many Latin American indigenous groups. In 1986, United States citizen Loren Miller obtained a patent on Ayahuasca giving him exclusive rights to sell and breed new varieties from the plant. This research examines the environmental history and contemporary controversy over the ownership of Ayahuasca, and natural resources more generally.

The use of Ikechi Mgbeoji’s theory of “Common History of Mankind” is posed as justification for historical acts of bioprospecting, and the theft of knowledge, against its current use as justification for biopiracy and instigator of ecological conservation. Research such as historical writings about the U.S. patent system, Ayahuasca uses and current government documents of Miller’s patent lawsuit elucidates pertinent arguments over land rights and conservation agendas by offering a historical framework of the same issues. I argue that incorporation of historical knowledge of the ecological interactions between the United States and Latin America is necessary to achieve just policy decisions concerning Indigenous and Non-Indigenous rights to medicinal plants and Amazonian land, consideration of the goals of Intra-American conservation, and purposes of Natural and National Resource Managements.

THE INTRICACIES OF EXPRESSION: ISLAMIC FEMINISM IN MOROCCO
Tess deBlanc-Knowles
Mentor: Nancy Reynolds
Grounded in historical and religious specificities, this research explores the emerging expressions of Islamic feminist thought in Morocco, and illustrates how feminism has been applied productively in society. Islamic feminism differs greatly from western conceptions of feminism as it focuses on improving women’s place in society using religious justifications, through a rereading and reinterpretation of the religious texts as vehicles for an egalitarian and emancipatory message. I argue that this ideology presents the future of the women’s movement in Morocco. The historical political structure and the pivotal role played by religion in maintaining the power of the monarchy paired with the Sufi expression of popular religion, which historically allowed for the participation of women in religious practice, have established the groundwork for the growth of Islamic feminism in Morocco. I assert that the loose construction of the ideology and its preservation of Islamic identity bridges the socio-economic divides in Morocco and attracts adherents from diverse backgrounds, creating a new broad-based ideology whose expressions are beginning to flourish in Moroccan media, scholarship, and everyday life.
A RETROSPECTIVE REVIEW OF THE EFFICACY OF BOTOX TREATMENT WITH SURGICAL DECOMPRESSION AS A DEACTIVATOR OF MIGRAINE HEADACHE TRIGGER SITES

Arjun Dhanik
Mentor: Jeffrey E. Janis

Migraine headache (MH) is a medical condition that affects 28 million patients, resulting in billions of dollars of productivity loss. Though various pharmaceutical treatments are available, these medications just reduce MH severity and/or frequency and often have adverse side effects. The surgical treatment of migraines, however, has been documented to completely eliminate migraines in more than one instance. Additionally, the side effects of surgery are minimal. Thus, one can see why nerve decompression and muscle resection are such good alternatives to traditional treatment.

In 2000, Guyuron et al. first published their experience with the association between corrugator supercili muscle resection and elimination or significant improvement in MH symptoms. Further studies corroborated Guyuron’s findings. Since that time, more “trigger points” have been identified: doctors now believe the underlying peripheral nerve structure of three major trigger sites and the septum is responsible for migraine pain. Furthermore, plastic surgeons have developed systematic methods of Botox injection to identify these points. The concept of using Botox to identify trigger sites and then using surgery to remove the problematic nerve/muscle is based on the theory that migraines are the result of peripheral, rather than central, nerve insult.

In order to underscore the reproducibility of both the use of botulinum toxin and surgery to treat MH, this study provides an analysis of a patient population that had undergone nerve avulsion and/or muscle resection at multiple trigger points. Furthermore, the principal investigator singularly conducted the entire treatment protocol, providing an unparalleled level of consistency and minimizing biases intrinsic to multi-provider protocols.

ASTRAGALUS BIBULLATUS (PYNE’S GROUND PLUM) RESTORATION PROJECT: A GIS-BASED HABITAT SUITABILITY STUDY

Christine Diepenbrock
Mentor: Matthew Albrecht, Missouri Botanical Garden

Astragalus bibullatus (Pyne’s ground-plum) was added to the U.S. Fish and Wildlife Service’s list of endangered species in 1991. Both then and now, all remaining A. bibullatus populations reside along the perimeters of limestone cedar glades in central Tennessee. An effort undertaken in 2000 to restore the species into the Stones River National Battlefield in Murfreesboro, TN, was unsuccessful, at least in part due to variations in microhabitat. The objective of this project was to examine these variations and thereby identify suitable sites for restoring A. bibullatus within the National Battlefield’s park boundaries so that the second A. bibullatus restoration effort, for which my mentor is now preparing, will succeed in establishing self-sustaining populations. To determine the microhabitat conditions that are positively correlated with the plant’s survival and reproduction, environmental data layers such as land cover, soil composition, and rock type along with Element Occurrence records for A. bibullatus were entered into a Maximum Entropy (Maxent) model. ArcGIS was then used to create a map of the glade sites in which the maximum number of suitable conditions is achieved and groups of introduced A. bibullatus seedlings will thus have the highest probability of surviving and developing into self-sustaining populations. Data for the project was obtained from the National Resources Conservation Service, the U.S. Geological Survey, and the Environmental Systems Research Institute.

THE EFFECTS OF THE NONPARTISAN BLANKET PRIMARY ON ELECTORAL CHANGE IN LOUISIANA, 1964-2003

Mark R. Dudley
Mentor: Gary J. Miller

Do the institutional differences of state election laws help to explain the uneven process of electoral change in the Deep South during the last quarter of the 20th Century? Previous research on Southern electoral change has studied the effects of numerous variables within an assumed context of similar electoral institutions. This work examines the unique institution of Louisiana’s nonpartisan blanket primary through a comparative study of Deep South state legislative elections between 1964 (the first election following the passage of the Civil Rights Act) and 2003 (the last election before Hurricane Katrina in 2005). Employing statistical and spatial analysis, regression, and elite interviews, the study finds three initial effects of the nonpartisan blanket primary on electoral change that have faded with the increase in two-party competition: impact on candidate number, impact on party performance, and an impact as a direct result of the set of unique electoral situations created, such as single party run-off elections and candidate election through a single electoral primary.
CORRELATION OF POST TRAUMATIC STRESS DISORDER SYMPTOMATOLOGY WITH PERFORMANCE ON EVENT SEGMENTATION, MEMORY AND ATTENTION TASKS
Michelle Eisenberg
Mentor: Jeff Zacks

Event segmentation refers to the process by which people break incoming information about the world into discrete segments. To determine where each event begins and ends, the brain relies on error buildup between its predictions about the world and the events that occur in reality. When the error level reaches a certain threshold, people perceive event boundaries. Performing event segmentation requires attentional resources and influences memory. Previous studies provide indications that event segmentation may involve a region of the brain called the anterior cingulate cortex (ACC); however further evidence is necessary. Studying a population that has less activation of the ACC compared to controls provides one method of determining whether the ACC is necessary for event segmentation tasks. People with post traumatic stress disorder (PTSD) provide a promising model for studying event segmentation and the ACC, as studies have found that people with PTSD display less activation of the ACC than controls. Furthermore, people with PTSD often exhibit deficits on tasks testing memory and attention. This study therefore investigated whether severity of PTSD symptomatology correlated with deficits on tasks involving event segmentation, memory, and attention. The results demonstrated that higher levels of PTSD symptomatology were significantly correlated with greater variability in placement of event boundaries. A non-significant trend also suggested the possibility of an association between higher levels of PTSD symptomatology and faster time to completion of a test requiring attention. However, PTSD severity was not significantly correlated with performance on tests of memory.

MAPPING MOOD IN THE SUBTHALAMIC NUCLEUS (STN)
Victor Ekuta
Mentor: Tamara Hershey

Deep brain stimulation (DBS) of the subthalamic nucleus (STN) in Parkinson disease (PD) can produce dramatic improvements in the motor symptoms associated with the disease, but its effect on mood can be variable and has not been well understood. Given the proposed anatomical organization of the STN (dorsal STN connected to motor cortex, ventral STN connected to mood-related cortex), it is possible that the location of the active contact within the STN could determine whether mood effects are induced. The aim of the study was to test whether ventral STN DBS is more likely to induce mood change than dorsal STN DBS. We examined motor symptoms with the Unified Parkinson’s Disease Rating Scale (UPDRS) and mood-influenced task (Affective Go-No-Go [AGNG]) performance in PD patients undergoing selected STN DBS conditions (unilateral dorsal vs. unilateral ventral STN DBS vs. Off STN DBS) Effects of stimulation condition on behavior is presented in a sample of 6 patients

EFFECTS OF OBSERVATION: A STUDY OF CAPTIVE BLACK-TAILED PRAIRIE DOG BEHAVIOR
Adam Eltorai
Mentor: Robert W. Sussman

Black-tailed prairie dogs (Cynomys ludovicianus) are diurnal, omnivorous rodents that live in intricate cities. Black-tailed prairie dog social complexity rivals that of some primates, and, in some respects, resembles the behavior of humans. Due to the rich variety of readily-observable, sophisticated behaviors such as coloniality, infanticide, anti-predator behaviors, kin recognition, cooperation, conflict, and reproductive success, the black-tailed prairie dog is a wonderful model species for the study of behavior. Using a captive population of black-tailed prairie dogs, we were able to quantify the effects of observation on key behaviors.

A POLITICS OF THEIR OWN. BARRIOS DE PIE: A CASE STUDY OF HYBRIDITY AND MODERN YOUTH POLITICAL PARTICIPATION IN SAN MARTIN, ARGENTINA
Rachel England
Mentor: Stephanie Kirk

Scholars in the field of Latin American studies have carefully maintained the distinctions between social movements and political parties in the study of modern political manifestations due to traditionally different ideological backgrounds. While social movements tend to operate outside of institutionalized political apparatuses and thus use non-institutional tactics to push for political and social change, political parties utilize institutional channels in order to gain elected representatives in government. However, through the case study of the youth branch of Barrios de Pie, the self-declared “social arm” of the political party Free of the South Movement (Libres del Sur), in San Martín, Argentina, I argue that the distinctions that traditionally separate the two have become more porous. This study takes a particular look at what it is about this hybrid structure that works so well and what aspects of this organizational structure make it particularly attractive to youth.
Through the case study that follows, it is postulated that this youth branch of *Barrios de Pie* exhibits a type of hybridity rarely seen in the panorama of Argentine politics. After defining the ideological and practical differences between political parties and social movements, I contextualize this thesis so as to bring to light the specific social, political and economic realities in Argentina that led to the formation of such an interesting expression of youth popular politics. The manifestations of both ideological structures in the tactical and organizational structure of *Barrios de Pie* are also noted. Finally, I conclude that the youth branch of *Barrios de Pie* spans the ideological space between a social movement (exhibited through *Barrios de Pie*) and a political party (manifested through their intimate link *Libres del Sur*) and speak to the particular reasons this hybrid movement took shape in the small Patagonia town of San Martín.

**A FEASIBILITY STUDY OF RENEWABLE ENERGY GENERATION**

Zeynep Esin  
Mentor: Arye Nehorai

Renewable energy generation has become a very important topic in the last decade, as fossil fuels are rapidly becoming depleted. Most US states have accepted Renewable Energy Standards in order to promote sustainable living and generate 10-30% of their total energy from renewable sources. Prior research on renewable energy scatters across different methodologies and regions; there is no comprehensive database that spans the entire country and takes into account all factors affecting renewable development. This study aims to fill this gap by taking a systems-thinking approach to the subject and aggregating all the data available for wind and solar energy into a main database. The resource efficiency for wind and solar development is investigated by taking into consideration factors such as local climate, geographical factors, current land use, legislation, load demand, environmental concerns, cost, transmission lines and energy storage. Capacity factors for over 30,000 sites in the US are calculated using data made available by the National Renewable Energy Lab. The calculations are then translated into an easy to read representation through zone analysis. This study also integrates time-series data for solar and wind energy to explore the possibility of providing a fixed resource of power and overcoming the instability of by peak/off-peak hours.

**SEQUENCES LOCATED WITHIN THE N-TERMINUS OF THE PD-LINKED LRRK2 LEAD TO INCREASED AGGREGATION AND ATTENUATION OF 6-HYDROXYDOPAMINE-INDUCED CELL DEATH**

Mark Fahey  
Mentor: Karen O'Malley

Parkinson’s disease (PD) is caused by the death of substantia nigra neurons resulting in clinical manifestations of postural instability, bradykinesia, rigidity, and tremor. The pathological hallmark of PD is the presence of intracellular protein aggregates, but it is not known whether the aggregates contribute to disease progression or whether they represent a protective mechanism. Although most aggregates are composed of α-synuclein and ubiquitin, other aggregated proteins are also found in PD. Mutations in the LRRK2 gene have recently been linked to PD in 5-10% of familial cases and 1-2% of idiopathic cases and aggregates of the LRRK2 protein are present in postmortem PD brain samples. Because aggregated proteins are frequently cleaved, we hypothesized that intracellular LRRK2 aggregates may also contain cleaved protein. Here we show that LRRK2 does undergo cleavage at a site located within the LRR domain. Using two independent algorithms we identified an N-terminal amino acid sequence as being aggregation-prone. Cells subsequently transfected with a construct containing this domain were found to have significantly increased protein aggregation compared to both the Wild Type (WT) and a construct containing only the last half of the molecule. Finally, in agreement with the hypothesis that aggregates may represent the cell’s attempt to save itself from deleterious processes, we found that aggregated N-Terminal LRRK2 constructs significantly attenuated cell death induced by the PD-mimetic, 6-OHDA.

**“ONE MAN ACTING ALONE:”**

**THE CONSOLIDATION OF THE EMPOWERED EXECUTIVE IN FOREIGN AFFAIRS, 1945-1963**

Ben Fifield  
Mentor: Randall Calvert

This work holds that the early Cold War period, beginning in 1945 and ending in 1963, marked the consolidation of an interpretation of the Executive Branch that vested in it substantial authority in the realm of war and foreign affairs at the expense of the Legislative Branch. Although the controversial formation of that power put forth by the Truman Administration encountered considerable resistance in Congress and amongst the wider public, a mildly chastened version of the Truman Administration’s arguments were quietly advanced by President Eisenhower and his Cabinet during the mid-1950s. Subsequent Congressional acquiescence to this interpretation laid the groundwork for
the arguments about Executive authority in wartime that would be put to wider use in the Vietnam War. This shift in expectations plagued not just Congress but the wider public as well, as displayed in the shift in rhetoric and arguments made by the leading opinion-makers of the era in response to instances of strong Executive action in the realm of foreign affairs and war.

**HOLOCAUST EDUCATION IN ISRAEL:**
**THE EFFECTS OF HOLOCAUST COMMEMORATION AND EDUCATION ON ISRAELI IDENTITY**
Yael Friedman
Mentor: Nancy Berg

The Holocaust has increasingly become an important identity marker for Jewish Israelis since the establishment of the State of Israel in 1948. This research explores the evolution of Holocaust education as a reflection of social, political and cultural shifts in Israeli society as well as a contributor to changing attitudes. The Israeli government has played a significant role in incorporating this period of Jewish history into the collective national identity, primarily through Holocaust education. The history of Holocaust education and commemoration was divided into three periods: the establishment of Israel through 1960, the Eichmann Trial (1961) through the early 1980s, and the mid-1980s through the present. In the early years of the state, recognition of the Holocaust was limited to the public commemoration of Holocaust Martyrs’ and Heroes’ Remembrance Day; there were no curricula on the subject, and to a large extent, any discussion of the topic was taboo. It was not until the Eichmann trial that the silence surrounding the Holocaust was broken. Survivors were encouraged to share their experiences with the public. By the 1970s, Holocaust study was established at universities. With the threats posed by the Six Day War and the Yom Kippur War, Israelis further internalized the messages of the Holocaust within the context of Jewish history. Since 1979, the Holocaust has officially been incorporated into Israeli high school curricula for 11th and 12th grade students. Educational efforts soon extended beyond the classroom. In the late 1980s, the Israeli government encouraged students to visit sites of death and destruction in Poland. These trips have increased students’ sense of national pride and the importance of Israel’s existence. As time passes, and the number of Holocaust survivors dwindles, the subject has become a more popular topic in schools, suggesting the strong connection between the Holocaust and national identity.

**“IT WOULD RUIN ST. LOUIS:”**
**PUBLIC RECEPTION, CARL MILLES’ MEETING OF THE WATERS AND RICHARD SERRA’S TWAIN**
Lucy Gellman
Mentor: John Klein

In 1936, the Swedish sculptor Carl Milles was commissioned to create *Wedding of the Rivers*, celebrating the meeting of the Mississippi and Missouri rivers, for Aloe Plaza across from the Market Street entrance of Union Station in St. Louis. Unveiled in May 1940, the fountain was immediately controversial to the St. Louis public for its shameless display of nudity. Forty-two years later, citizens demanded that Richard Serra’s *Twain* be removed from the East Gateway Mall area of Downtown St. Louis. The work, still standing and referred to simply as “The Serra Sculpture” by many St. Louis citizens, has very publicly fallen under fire. Many in the city see it as a symbol of urban decay; others believe that it has great potential to raise St. Louis’ artistic integrity on a national map. It is my contention that these works, in complicated relationships with the areas around them, are not particularly successful in terms of public art, despite their physical permanence in the city. Both have been criticized - and defended - by the citizens of St. Louis and beyond, both have been renamed, vandalized, neglected and conserved, and both have complex and changing roles in the local print media, as well as with the areas around them. The presentation will explore the largely local influence of the print media in mediating and manipulating public opinion alongside the works’ controversial patronage and production, site-specificity and material, and gendered connotations.

**THE OPENING AND CLOSING OF SPACE AND BELONGING:**
**AN EXAMINATION OF HEALTHCARE ACCESS FOR THE LATINO POPULATION IN ST. LOUIS**
Wesley Gibbert
Mentor: Bradley Stoner

This work provides a wide-reaching assessment of healthcare access for the Latino population in St. Louis through the lens of Anthropology, Sociology and Geography theory. It provides as deep an understanding as possible not just of the daily realities of healthcare access but also some of the underlying reasons for and mechanisms of those realities.

The foundation of this project is the interviews and surveys conducted to evaluate healthcare access in the St. Louis area. Interviews were conducted with community leaders, healthcare personnel and other interested parties to establish an overview of access in St. Louis. The
surveys were conducted with Latino community members who would likely have used the recently closed La Clinica, and they provided a ground level portrait of the realities of healthcare access mentioned above. From this foundation, a model of healthcare access in St. Louis showing the importance of community and the availability of community space was constructed, which hopefully provides some new insight into the healthcare access needs and realities of the Latino population of St. Louis.

**THE LIBERATION OF COLOR AND DECORATIVE ART AT THE DAWN OF THE 20TH CENTURY IN FRANCE**

Betty Gibson  
Mentor: John Klein

This research examines the changing use of decoration and color by artists of the French avant-garde, specifically Claude Monet, Paul Gauguin, and Henri Matisse, from 1880-1930. These artists’ developing interest in color and decorative art questioned the relegation and feminization of color and decoration by the academic art system by creating a new visual language, bringing the definition of high art into question, and raising the status of decoration and colorful art. This study is important because, as many art historians have pointed out, decorative art and the study of color are under-researched subjects in modern art and warrant more attention. Although a variety of studies have shown how color and decoration were commonly gendered female throughout the history of art, there is not a lot of research on the specific ways fin-de-siècle art began to question this convention. A close examination of artists’ statements, critics’ responses, and the paintings themselves reveals that these artists began to change the way color and decoration were viewed and used. The next important question for this project to answer will be: if these artists are questioning the feminization and relegation of color and decoration, are they actually, whether consciously or unconsciously, masculinizing color and decoration?

**THE ROLE OF LYSOSOMES IN CARDIAC PATHOPHYSIOLOGY**

David Giles  
Mentor: Anthony Muslin

Autophagy is an evolutionarily conserved catabolic process involving the degradation of macromolecules and organelles through lysosomal machinery. Phosphoinositide 3-kinase (PI3K) signaling initiates the formation of a double-membrane vesicle called the autophagosome which sequesters proteins and organelles for degradation. The autophagosomes fuse with the lysosomal membrane to form the autophagolysosome where the contents are degraded and made available for reuse in the cell. The cardiomyocyte is a post-mitotic cell, so autophagy occurs at basal levels in the heart. However, autophagy is known to be upregulated in failing myocardium caused by conditions such as dilated cardiomyopathy, ischemic heart disease, and myocardial hypertrophy. Transcription factor EB (TFEB) has been shown to regulate a complex network of genes that are involved in lysosomal biogenesis and function. We are in the process of generating a transgenic mouse with cardiac-specific overexpression of TFEB in order to characterize the role of TFEB and autophagy in cardiac pathophysiology. The transgene construct contains the TFEB coding sequence fused downstream of the alpha-myosin heavy chain (MHC) promoter. The MHC promoter drives cardiomyocyte-specific gene expression and will permit the study of TFEB in cardiac physiology in the absence of confounding extra-cardiac factors. The construct is epitope-tagged with myc at the C-terminus for specific pull-down of overexpressed versus endogenous TFEB protein. The transgene has been synthesized, sequenced, and is currently being injected in the male pronuclei of one-cell mouse embryos. We hypothesize that TFEB overexpression will lead to reduced aging, increased tolerance to starvation, and reduced cardiac hypertrophy in response to stress.

**LANGUAGE POLICY IN CONTEMPORARY SOUTH AFRICA**

Claire Glasspiegel  
Mentor: Joachim Faust

The Apartheid policy in South Africa sanctioned economic and political discrimination against nonwhites and made segregation a part of the national way of life from 1948 to 1994. Since the fall of Apartheid, the country has sought to forge a cohesive national identity and address the many grievances of the past. One of the most interesting ways the country has tried to alleviate the aftereffects of Apartheid is through language policy. South Africa currently has 11 official languages, all equal in the eyes of the government. All of these languages are used as mediums for instruction in public schools. However, due to the global nature of English and the perceived increased opportunities that it provides, many students and families with an indigenous first language are choosing to attend schools taught in English. English does prepare students for a wider variety of opportunities, but students whose first language is not English are inherently disadvantaged by this system because they perhaps do not speak English as fluently. Even though the policy was originally designed with equality in mind, indigenous language speakers are still disadvantaged. Language policy in South Africa is complicated by the country’s multiculturalism and it’s history with Apartheid, and it is therefore very difficult, perhaps impossible for the government to ensure the equality of all languages.
BILINGUALISM AND COSTS TO THE L1: MODELS OF BILINGUAL PRODUCTION
Stacey Lynn Goebel
Mentor: Mitchell Sommers

A common question in applied linguistics asks how a bilingual can produce speech in one language without experiencing detrimental intrusions from the unused language. Many techniques have been used to investigate this phenomenon, including naming task. Research in language switching and blocked naming tasks has shown significant effects of bilingualism on first language naming. Using this effect, many researchers have come closer to understanding models of bilingual production. Some have suggested that the model of production a bilingual uses changes during development of the second language. This study replicated blocked naming and language switching tasks to further study developmental effects of bilingualism on the first language, and in turn bilingual production. Results, although not conclusive, support the hypotheses that as bilinguals become more fluent in their second language they switch from using an inhibitory model to the use of a language specific selection model.

THE SOULS OF NATIONS: REPATRIATION, NATIONAL MUSEUMS, AND CULTURAL IDENTITY IN SOUTHERN EUROPE
Michael Goodwin
Mentor: David Freidel

Consider the Parthenon Marbles, Picasso’s Guernica, and the Sarajevo Haggadah. It is almost impossible to imagine what connects an enormous sculptural ensemble made in Athens in about 450 BC, a heroic oil painting created in Paris in 1937, and a delicate illuminated manuscript likely crafted in Aragon in about 1350. In addition to their places and dates of origin, these objects differ in their materials, formal and thematic complexity, scale, function, and condition. Yet all are considered cultural treasures and are housed in national museums. All three objects, whether or not their museum plaques tell their complete stories, are marked by repatriation.

The return of cultural treasures to their rightful owners is an enormously complicated issue, particularly in Southern Europe, where there is a need to reconcile traditional and contemporary understandings of culture. Through a multifaceted prism of anthropology, sociology, art history, aesthetics, politics, law, and ethics, this study explores many of the theoretical and practical arguments for and against the return of cultural treasures to national museums in Greece, Spain, and Bosnia and Herzegovina. It also considers the evolution of such museums within changing meanings of nationalism and regionalism as well as peoplehood.

While realizing that repatriation issues can never be completely resolved and that national museums are themselves cultural treasures, a set of criteria for evaluating claims is proposed. These include historical, legal, and moral considerations. Ultimately, however, one nation must determine if it can spiritually possess the essence of another.

THE ORIGIN OF K-FELDSPAR MEGACRYSTS OF THE CATHEDRAL PEAK GRANODIORITE, CALIFORNIA
Benjamin Gross
Mentor: Valbone Memeti

A fervent debate has been rekindled concerning the origin of K-feldspar megacrysts in granites. Some authors favor subsolidus growth of megacrysts by textural coarsening. This explanation contradicts textural and structural observations. Alternatively, the megacrysts grew while always surrounded by melt. Repeated replenishment by new magma may frequently change the material supply for crystal growth, producing a favorable environment for continued growth of K-feldspar.

To test these hypotheses, three samples were collected from the same location in the 88-86 Ma Cathedral Peak granodiorite (CP) in the Tuolumne Batholith, CA. One sample each was collected from the main CP body, a K-feldspar megacrystic dike, and an aplite dike. Thin sections were analyzed by construction of X-ray element distribution maps and BSE images using a JEOL JXA-8200 electron microprobe to measure relative abundances of Al, Ca, Fe, Ba, K, Mg, Na, Si, Sr, Ti, and Zr.

K-feldspar megacrysts show extensive sawtooth oscillatory zoning of Ba in samples from the main pluton and porphyritic dike, whereas K-feldspars in the aplite show simple to no zoning. The matrix minerals around and abundant mineral inclusions aligned along growth zones in K-feldspars show either simple normal or no zoning. Since a) K-feldspar megacrysts contain simple zoned magmatic inclusions, b) element distributions are consistent with magmatic processes, and c) both complexly and simply zoned K-feldspars occur together at cm to outcrop scale with complexity in zoning pattern correlated with crystal size, we interpret the megacrysts to be magmatic and related to preferential mineral growth during chamber replenishment.
AGE DIFFERENCES IN MEMORY FOR FACE-NAME ASSOCIATIONS: 
THE EFFECTS OF SPACED RETRIEVAL ON LEARNING
Mitra Hashemi Haeri
Mentors: David Balota and José Luis Bermúdez

Although past research has demonstrated the benefits of spaced retrieval on long-term memory performance in both young and older adults, no studies have addressed how these two age groups naturally apply spaced retrieval. In the current study, young and older adult participants learned name-face associations and were instructed to test themselves using a self-selected strategy, equal spaced intervals, or expanded intervals across three experimental blocks. Participants also completed a questionnaire on strategy use. Results indicated that both age groups naturally spaced their retrieval using expanding intervals, utilizing an early retrieval attempt in order to strengthen encoding. Also, both younger and older adults were able to apply equal and expanded retrieval schedules after a brief explanation of each technique. Additionally, results suggest that there is no significant difference in final recall performance between the equal and expanded spacing strategies. Findings on corrective feedback vs. no feedback and objective vs. subjective timing manipulations are discussed, along with metacognitive findings.

THE SITUATIONIST CITY
Marc Hajjar
Mentor: Alicia Walker

The Situationist International was a group of radical-leftist artists, poets, and theorists that operated in Paris during the 1950s and 1960s. Founded by Guy Debord and Constant Nieuwenhuys, the Situationists tried to inspire the public to realize that mass production, consumerism, and the post-World War II planned city constrained humanity’s creativity. The group produced publications mocking the glossy magazines of the time and proposed alternative plans for the urban environment. The Situationists directly reacted against the culture and urban designs of the post-WWII gridded city by creating web-like superstructures that would blanket European civic centers. Yet the Situationists’ experimental, even fantastical models were never implemented in the major cities of Europe because of the group’s lack of political and social traction.

This project sheds new light on the Situationists’ practices of the dérive (urban wandering), détournement (re-appropriation of popular imagery), and their theory of unitary urbanism. After examining the Situationists’ textual and visual archives, it becomes evident that these three tenets are infused with playful interactions. This project shows how the Situationists centered their lives and designs on play in order to foster uninhibited creativity.

THE EFFECT OF DIETARY VITAMIN A ON GUT DENDRITIC CELL HOMEOSTASIS
Elyse Hanly
Mentor: Rodney D. Newberry

Previous studies demonstrated a critical role for vitamin A metabolites produced by dendritic cells (DCs) in directing the homing of lymphocytes to the gut and for the production of secretory IgA. However, the direct effect of dietary vitamin A on intestinal DCs has not been previously investigated. In this study we evaluated the direct relationship between dietary vitamin A intake and the presence of intestinal DCs. We hypothesized that reduced dietary vitamin A directly affects intestinal DC populations by inhibiting cell proliferation and/or promoting apoptosis, thus contributing to decreased gut lymphocyte homing and secretory IgA production. To test this hypothesis, we compared the number of DCs found in the gut between mice fed a diet deficient in vitamin A, mice gavaged with all-trans retinoic acid (ATRA; the biologically active vitamin A metabolite), and mice fed a control (vitamin A sufficient) diet. We found that the number of myeloid CD103+ DCs was significantly decreased in the intestines of mice fed a diet deficient in vitamin A and significantly increased in the intestines of mice given ATRA through gavage. In the intestine, the myeloid CD103+ DCs have the property of directing gut lymphocyte homing and inducing IgA class switch. These cells also form clusters associated with intestinal lymphoid tissues and accordingly we observed that the number of DC clusters was significantly decreased in mice fed a vitamin A deficient diet and significantly increased in mice given ATRA by gavage. To evaluate the direct effects of vitamin A on DCs, we generated bone marrow derived myeloid DCs and evaluated their proliferation and apoptosis in response to ATRA. We observed that DC proliferation was increased in response to ATRA. This observation correlated with changes in expression in the apoptotic genes Caspase 2 and Caspase 8. Findings demonstrate a direct relationship between dietary vitamin A and the maintenance of the gut DC population. Dietary vitamin A promotes the survival and proliferation of a subpopulation of gut DCs, which then facilitate gut lymphocyte homing and secretory IgA production. Further discovery and verification of the role of DCs in the production of IgA could ultimately lead to innovative approaches in lessening the effects of vitamin A deficiency on the population.
Exploring Causality: What is the Relationship Between Intellectual Property Rights and Foreign Direct Investment in Developed Economies?

Vidhyarth Hariharan
Mentor: Nate Jensen

Do strengthened intellectual property rights policies drive FDI inflows in developed economies? Canada and Japan increased IPP in the late 1980’s. These policy changes were followed by increases in FDI in R&D in Canada and Japan, respectively. This research examines the assumptions necessary to infer causality from this correlation. Policymakers have long sought to design institutions that stimulate economic growth. In this work, I explore the role of intellectual property protection in affecting foreign direct investment (FDI) inflows in developed economies. Using two empirical case studies assessing Canada’s 1987 patent reforms and those in Japan in 1988, I evaluate whether the heightened level of protections encouraged greater FDI inflows. In particular, data on patent protection and research and development (R&D) investment by foreign firms was employed. This research shows that FDI inflows to each country’s R&D sectors rose significantly in the years post-reform. This unambiguous increase in R&D expenditures suggests a strong positive association between the implementation of intellectual property rights protection and foreign investment.

Evolution of a Sensory Pathway Mediating Social Communication Behavior in Mormyrid Electric Fish

Saad Hasan
Mentor: Bruce Carlson

The African family Mormyridae consists of over two hundred species of fish that communicate using electric organ discharges (EODs). The EOD waveform is stereotyped within species, but can differ markedly between species in duration and number of phases. The sequence of pulse intervals (SPI) varies, conveying the behavioral state of the sender. Information about the EOD and SPI is first processed in the mid-brain exterolateral nucleus (EL), which is generally subdivided into anterior and posterior regions (ELa and ELp). Despite the importance of this pathway in social communication behavior, there has been no attempt to record evolutionary change in its structure. The purpose of this study is to quantify variation in ELa/ELp size throughout the mormyrid family and relate this variation to species and signaling diversity. I have analyzed horizontal sections of fixed brains from fish in the subfamily Mormyrina, finding a division between ELa and ELp in each species studied. EL of the subfamily Petrocephalinae, however, generally lacks this subdivision. The EL volume, normalized by brain mass, was calculated and the EL in Mormyrinae was found to be much larger than in Petrocephalinae (2-4 mm³/g vs. ~1 mm³/g). However, it was discovered that Petrocephalus microphthalmus is an exception, displaying a subdivided EL comparable in volume to the EL of Mormyrinae. This pathway divergence between the Mormyrinae and Petrocephalinae relates to major differences in the diversity of EOD waveforms and distribution of Knollenorgan electroreceptors. Thus, variation in social communication behavior may be related to evolutionary change in the size and complexity of neural circuits that process communicative signals.

Isolation and Characterization of Vortex, a Novel Mycobacteriophage

Nathaniel Hausfater, Andreas Mitchell, and Hanci Zhang
Mentors: Sarah Elgin and Kathy Hafer

Although there are approximately $10^{31}$ phages in the world, remarkably little has been documented regarding bacteriophages; despite their large population, these viruses may be the least explored aspect of the biosphere. Better characterization of Mycobacteriophages in particular has been identified as important for treating diseases caused by pathogenic mycobacteria, such as tuberculosis. To better understand the mycobacteriophages as a population and eventually help elucidate a diagnostic tool or cure for tuberculosis, a novel mycobacteriophage, Vortex, has been isolated from a soil sample from St. Louis, Missouri. After an amplification process and plating with Mycobacterium smegmatis, plaques were picked so that a high titer phage stock and phage lysate of a single isolate could be prepared. The Vortex genomic DNA was isolated and sequenced using 454 technology at the Joint Genome Institute (JGI). After annotation of its genome, Vortex appears to be a member of the documented B1 mycobacteriophage cluster that also includes the phages Uncle Howie, Puhltonio, and Colbert. The genome has a length of about 68,000 base pairs and an estimated 98 genes. The entire genome shows a remarkable similarity to that of the phages Morgushi and Murdoc, both of which were also isolated from soil samples in the St Louis, Missouri area. It is possible that these three phages are derived from a common ancestor, yet all were isolated independently from different sites.
THE ROLE OF AUTOPHAGY IN CROHN’S DISEASE
Aaron L. Hecht
Mentor: Thaddeus Stappenbeck

Recently, genome-wide association studies for Crohn’s Disease (CD) identified a susceptibility locus for ATG16L1, a protein involved in the autophagy pathway. CD is an inflammatory, autoimmune disease of the distal small intestine and colon that afflicts one million people in the US. Although the connection has been made between autophagy and CD, a mechanistic understanding remains undetermined. Previous studies indicated that mice deficient in Atg16L1 and humans with CD and homozygous for the susceptibility allele of ATG16L1 contained abnormal Paneth cells in the intestinal epithelium. In addition, mucus-producing goblet cells of the colon in these Atg16L1 deficient mice were defective for secretion. As the loss of mucus layer in the colon has implications for predisposition to CD, we further examined the nature of this goblet cell defect. To gain a better understanding of the role of autophagy in the secretory function of colonic goblet cells, two experimental approaches were developed. First, utilizing a lentiviral/shRNA system, a stable knockdown of an autophagy gene in a human goblet cell line was created. Second, wild type mice were treated with an autophagy inhibitor, desmethylclomipramine, and explored the goblet cell defect. Decrease in autophagy was found to alter goblet cell morphology in a cell-autonomous fashion and reveal that the secretion defect is directly linked to autophagy or another membrane-related process. Most importantly, however, these experiments generated new models with which to explore the autophagy-deficient phenotype and its relation to secretion. Ultimately, we hope these and future studies will allow us to better understand CD at the cellular level and provide insight for future treatment of CD patients.

MUSIC AND CONTEXT OF THE ARGENTINEAN ROCK BAND LAS MANOS DE FILIPPI
Kayliegh Hill
Mentor: Claire Solomon

Las Manos de Filippi, an Argentinean combative-rock music group, dedicate their lyrics and music to social and political causes of the political Left in Argentina. This research project is an exploration of their music through close analysis of individual songs, chosen to represent the band’s full body of work from each of their six albums. The style of music ranges from punk to rap to reggae, while the lyrical themes are consistently social and political critiques. In addition to analysis of specific songs, this project also looks at some of the various causes and movements to which Las Manos de Filippi have been committed to at various points in their sixteen year career as a band. These causes include, but are not limited to: the Piquetero movement; the FaSinPat movement; the Músicos Unidos por el Rock movement; and the Communist Worker’s Party of Argentina. The purpose of this research is to familiarize the reader not only with the music of Las Manos de Filippi, but with the specific social, political, and historical movements of Argentina that provide the musical context.

ISOLATION AND GENOMIC ANALYSIS OF MYCOBACTERIOPHAGE MURDOC
Sunnie Hsiung, W. Éamon Callison, and Alan Sariol
Mentors: Sarah Elgin and Kathy Hafer

A bacteriophage is any one of a staggering number of viruses that infect bacteria. In this experiment, a temperate phage named Murdoc was isolated from a soil sample from the St. Louis Zoo and cultured on lawns of *Mycobacterium smegmatis*. The phage was isolated through direct plating and purified. DNA was then isolated and purified from a culture of phage particles. The quality and size of the DNA was assessed with restriction digests and gel electrophoresis; we found Murdoc to be a unique phage, both in terms of morphology and genetic make up, though similar to two others isolated by our lab. The DNA from Murdoc was sequenced at the Washington University in St. Louis Genome Center using 454 technology. Using the sequence data, we found that the phage had circular DNA. Using the programs GeneMark and Glimmer, Murdoc’s genes were tentatively identified and annotated. Using BLAST and other tools, we also conducted an in-depth analysis of gene function. We have tentatively assigned Murdoc to the B1 cluster of mycobacteriophage; also shown is our analysis of the similarities and differences to other phage isolated in the St. Louis area, such as Vortex, Morgushi and Uncle Howie. Research into mycobacteriophage could lead to new strategies for molecular biology and evolutionary biology research, new therapeutics, and new insight into infectious diseases. The analysis of Murdoc presented here contributes to that effort.

ISOLATION AND CHARACTERIZATION OF NOVEL MYCOBACTERIOPHAGE BONGO
G. Jason Huang, Connor J. Liu, Marilyn L. Piccirillo, and Han Yuan
Mentors: Sarah Elgin and Kathy Hafer

Bongo, a lytic mycobacteriophage that infects *Mycobacterium smegmatis*, was isolated and purified from a soil sample collected at Washington University in St. Louis, GPS: N 38°38’39.15”, W 90°18’53.74”. Bongo forms uniform plaques about 1 mm in diameter. The phage morphology was observed using transmission electron microscopy, revealing a phage particle with a hexagonal head 68.6 nm by 62.5 nm, and a long tail
(350 nm) with a square end. DNA sequencing indicated a genome of 80,220 bp. \textit{Bam}HI restriction digests of Bongo, in addition to sequencing, showed that Bongo is a novel phage. tRNAscan software indicated that in the 60-80 kbp region there are 16 putative tRNA genes. Similarly, Genemark and Glimmer revealed a tape measure protein 6,821 base pairs long, which correlates with the original phage tail length estimates. Six operons, three on each of the top and bottom strands, were located. Preliminary BLAST analysis shows strong similarity between Bongo and mycobacteriophage Wildcat, although further analysis will be needed to confirm this relationship. Research on Bongo will open the gate for further study of phage genomics and contribute to comparative genomic analysis of new mycobacteriophage yet to be isolated.

EDUCATION VOUCHERS AS A TOOL FOR URBAN REVITALIZATION?:
A CASE STUDY OF CLEVELAND, OHIO
Jennifer Janovitz
Mentor: Carol Camp Yeakey

This work addresses the use of education vouchers in the city of Cleveland, Ohio and their role in the city's revitalization. Education vouchers are funds given to parents so that they can take their children out of under-performing public schools and send them to private schools. The amount of the voucher is equal to the amount that the government would have allocated to the student in the public school system. This thesis establishes that the condition of a city is intimately tied to the condition of its schools. Therefore, the improvement of the city's failing municipal schools will help foster revival of the city, and conversely, revival of the city will lead to improvements in the city's schools. The author contends that the key to urban renewal is making the city an attractive place in which the middle-class will desire to live. However, one of the primary reasons why the middle-class fled Cleveland for the suburbs was because parents wanted their children to receive the higher quality education offered by the suburban public schools. This middle-class flight resulted in the erosion of the city's tax base and the decline in its property values, which sent the schools into a downward spiral. Thus, the middle-class' movement back into the city will improve the city's schools through the capital - financial and otherwise - that the middle-class provides, but the middle-class will not do so until they feel that there are good educational opportunities in the city for their children. For this reason, the author concludes that education vouchers are a viable policy solution to entice middle-class families to move into the city. Vouchers are an important intermediate step to bringing capital into the city and consequently to its schools.

IDENTIFICATION OF GENETIC VARIANTS IN TRANSFERRIN
AND THE EFFECTS ON AMYLOID PRECURSOR PROTEIN PROCESSING
IN ALZHEIMER'S DISEASE
Amanda Jeng
Mentor: Alison Goate

Alzheimer's Disease (AD) is the most common neurodegenerative disorder resulting in dementia and is characterized by neuronal loss and the accumulation of extracellular β-amyloid (Aβ) plaques and intracellular neurofibrillary tangles in the brain. The amyloid hypothesis suggests that changes in amyloid precursor protein (APP) and/or Aβ homeostasis results in aggregation of Aβ and deposition of Aβ into plaques. Furthermore, these events are proposed to be sufficient to initiate the cascade of pathologic abnormalities in AD. We have utilized cerebrospinal fluid (CSF) Aβ levels as a quantitative endophenotype to identify genetic variants that influence Aβ. It has been shown previously that variation in transferrin (TF), an iron transport protein, is significantly associated with CSF Aβ levels and/or AD risk. In this study, we intended to detect additional variants in the TF gene that are associated with Aβ levels. The TF gene was sequenced in individuals selected based on low and high CSF Aβ42 levels. We identified single nucleotide polymorphisms (SNPs) in the promoter and intronic regions as well as two synonymous SNPs. Additionally, we identified four non-synonymous SNPs associated with low CSF-Aβ42 levels: two novel SNPs (R343W and G671E) and two known SNPs (G277S and P589S). The functional impact of transferrin variants on APP metabolism was determined using site directed mutagenesis and cell culture approaches. Levels of full length APP were lower in cells co-transfected with APP and TF (wild-type or mutant) than in cells co-transfected with APP and a control plasmid expressing GFP. The abundance of full length APP did not differ between wild-type TF and mutant TF co-transfections. Furthermore, APP mRNA levels were significantly lower in cells co-transfected with APP and TF-R343W than in cells co-transfected with APP and wild-type TF. This trend was also observed for TF-G277S and TF-G671E, though not at a significant level, and was not observed for TF-P589S. Together, these findings suggest that transferrin may play a role in AD pathogenesis by altering APP homeostasis.
AN INVESTIGATION OF GROWTH ALTERING PROTEINS IN ASTROCYTOMAS

Neel Joshi
Mentor: Jeffrey Leonard

Juvenile Pilocytic Astrocytoma (JPA) is a type of brain tumor exclusively affecting younger patients. While JPA’s slow growth rate has served as an obstacle to establishing an animal model, we believe that the expression of telomerase is important to increasing its growth and making a model possible. This has been supported by tests with a glioblastoma (GBM) cell line, showing that increasing telomerase expression increases growth rate.

Additionally, we are looking at nucleolin as a possible target of future treatments. Involved in ribosome synthesis, nucleolin is theorized to be involved in cell growth, due to its prevalence in rapidly dividing cells. While nucleolin is not normally found in astrocytes, it is present in astrocytomas. Additionally, nucleolin expression increases with increasing WHO grade of brain tumor. An initial attempt to observe the effects of nucleolin knockdown on growth rate was unsuccessful, but this may simply be a reflection of the redundancy of the nucleolin structure, which allows it to be functional despite a truncated amino acid sequence.

AN EXPLORATION OF AFRO-ECUADORIAN CITIZENSHIP: HISTORICAL TRANSFORMATIONS AND CONTEMPORARY MOVEMENTS

Carleen Kadlec
Mentor: Bret D. Gustafson

In Ecuador, Afro-descendent populations have been marginalized economically, socially, and politically since the colonial era. Their overall subalternity in Ecuador has resulted in exclusion from contemporary citizenship both formally and informally. Through examining the historical foundations of citizenship in the late colonial and early republican periods through current day, this research focuses on how the omission and contradictions of Ecuadorian history leave out Afro-descendants and impact their subalternity. Their exclusion extends to national identity which leaves out blackness and Afro-Ecuadorian culture. However, recent political developments and the expansion of federal programs aimed at resolving some of the inequalities that Afro-Ecuadorians face demonstrate the strongest steps ever taken by the government to ensure the constitutional rights of Afro-Ecuadorians. Several examples of contemporary obstacles that Afro-Ecuadorians have encountered in their present efforts to expand the idea of citizenship to include afro-descendent populations are discussed. I conclude by discussing the current challenges of reimagining the idea of Ecuador as a plurinational state in which the dominant paradigm shifts to break apart the historically hegemonic idea of the country as a nation-state with a singular or unified nationality.

FUNCTION OF THE N-TERMINAL DOMAIN OF HEPARIN COFACTOR II

Grace Julie Karue
Mentor: Douglas M. Tollefsen

Heparin cofactor II (HCII) is a glycoprotein found in human blood plasma that inhibits the serine protease thrombin. Thrombin is involved in hemostasis and vascular remodeling through stimulation of platelet aggregation, clot formation, and proliferation of smooth muscle cells. HCII acts as a pseudosubstrate and covalently links to thrombin by an acyl ester bond to form a stable 1:1 complex, thus inhibiting thrombin’s proteolytic activity. Inhibition of thrombin is accelerated by more than 1000-fold when HCII is bound to certain glycosaminoglycans present in the arterial wall. Two mechanisms for this acceleration have been proposed from in vitro experiments: (1) displacement of the N-terminal domain of HCII, which is then better able to interact with thrombin; and (2) the ability of the glycosaminoglycan to serve as a template for HCII and thrombin binding. We prepared a truncated form of HCII, which lacks the N-terminal domain, by limited proteolysis utilizing endoproteinase AspN. The proteolytically modified HCII was characterized in terms of the site of proteolysis, the affinity for binding to heparin, and the kinetics of thrombin inhibition in the presence and absence of a glycosaminoglycan. HCII-deficient mice injected with either native or truncated HCII are being studied in an arterial thrombosis model. The results of these experiments will indicate whether or not the N-terminal domain of HCII is required for its function in vivo.

FROM ΣΙΚΕΛΙΑ TO SICILIA: ADMINISTRATIVE, ARCHITECTURAL, AND EPIGRAPHIC ROMANIZATION IN ROME’S FIRST PROVINCE

Philip Katz
Mentor: Judith Evans Grubbs

For nearly five centuries, the island of Sicily was the foremost center of Greek civilization in the western Mediterranean. Many aspects of this Greek culture survived the Roman conquest of the First Punic War and remained strong until the end of antiquity, leading many scholars to conclude that Sicily was never Romanized. Yet despite this Hellenic identity, after 241 B.C.E. Sicily was officially a Roman province, with
many of the typical Roman institutions and customs. By utilizing textual, archaeological, and epigraphic evidence, this study examines the impact of Rome on three distinct aspects of Sicilian culture. First, as a result of the turmoil created by the Punic, Servile, and Civil wars during the final two centuries of the republic, Sicily’s administrative institutions were gradually transformed, with new Roman magistracies, status distinctions, and laws establishing Sicily as the first provincia. After the reign of Augustus, many of the island’s physical structures, most notably entertainment facilities and private homes, were remodeled or rebuilt to reflect new Roman customs and preferences. Finally, throughout the principate, the Latin language and other elements of Roman epigraphy became increasingly popular in public and, to a lesser extent, private inscriptions. Contemporary with these instances of Romanization, however, were a number of countervailing trends. At least until the end of the republic, agricultural taxes continued to be collected according to the previous Greek tax code; many of the island’s archaic Doric temples and native cults retained the appearance and function during the Roman period; and Greek never disappeared from private inscriptions and, in the late empire, even reemerged in public inscriptions. These divergent trends combine to show that even though Sicily never became completely Roman, her bureaucracy, physical structures, and linguistic habits were substantially Romanized during the late republic and early empire.

“IT’S OUR TRADITION:” CHANGES IN MOROCCAN GENDER RELATIONS AND ATTITUDES IN THE FACE OF GLOBALIZATION

Jessica Katzenstein
Mentor: Lois Beck

Anthropology is uniquely suited to explore how individuals negotiate shifting norms within a geopolitical context and how different societies engage with one another. Drawing on research conducted in Morocco in spring 2009, I argue that social, political, and economic interactions within and among societies reveal a “multitude of contradictions and ambiguities.” In Morocco, twelve women in the capital and a small village were interviewed. I found that some women’s attitudes toward patriarchal gender roles have changed, partly due to expanded access to education, the mass media, and the global economy. In urban areas, some women’s attitudes toward gender roles are shifting toward more egalitarian ideals. In rural areas, some women are emphasizing the inevitability and rightness of separate, gendered spheres of influence. Food, with its centrality in Moroccan culture, serves as a lens through which to examine these changes. The similarities and differences between the attitudes of rural and urban women toward cooking were also explored. These attitudes shed light upon the shortfalls of a modern-traditional dichotomy. I contend that the seeming resilience of rural women’s attitudes toward gender roles is due not to their “traditional culture” or their lack of integration in the global economy but to powerful patriarchal structures and a particular form of Islamic feminism. The assertion of development institutions that economic growth must lead to greater gender equality is challenged.

VIDEO GAME TRAINING, ATTENTION, AND MEMORY IN OLDER ADULTS

Laura Kelly
Mentors: David Balota and Ashley Bangert

As an extremely cognitively demanding activity, real-time strategy video games provide a unique opportunity for cognitive psychologists to understand how visual, attentional, and executive control tasks can be “trained” or improved. Multiple studies have found that video gamers outperform non-video gamers in a number of cognitive tasks. For instance, video gamers are able to visually search an environment faster than non-video gamers. Moreover, researchers have found that training non-gamers to play video games improves these same attentional skills. This experiment extended video game training research to older adults, as attentional and cognitive control skills tend to decline with age. Participants were given a battery of 13 attention, memory, and cognitive control tests and were taught how to play the real-time strategy game Rise of Nations. Participants played the game for 12 hours and were given a post-training set of cognitive tests. Their data was compared to an age-matched control group who played less attentionally demanding puzzle games.

COSTS OF THE KEYWORD METHOD: COGNITIVE IMPAIRMENT DUE TO CONFUSING SEMANTIC LINKS IN SECOND LANGUAGE VOCABULARY LEARNING

Katherine Kerschen
Mentors: Mitchell Sommers and Joe Barcroft

Current research is central to the debate over the effectiveness of using the keyword mnemonic as a second language vocabulary learning strategy. In the keyword mnemonic a word in the native language that is orthographically similar to the target foreign word is used to link the target word and its translation via an interactive image. The hypothesis for the current experiment is that use of the keyword method might impair future lexical acquisition because of the confusing, artificial semantic associations that it creates. To test this theory participants learned a set of German words using either the keyword method or rote rehearsal. All participants learned the first set of words to 100% accuracy, and
then received a second set to learn. Words in the second set were categorized as either novel or non-novel. Novel items had never been seen before by either group while non-novel items had been seen only by the keyword group because these items had been used as keyword links for target items in the first phase. We predicted that, for non-novel target items, recall accuracy would be lower and recognition latency higher for the keyword group. The data did not fully bear out these predictions: there was not a statistically significant interaction between learning condition and word novelty; however, a paired samples test revealed that reaction times within the keyword group were slower for non-novel words. In addition, there was a clear trend in all the data in the direction predicted by the hypotheses and many of the statistical analyses approached significance. Therefore, modifications to the current experiment are discussed extensively. This study suggests that due to the trending in the data, future research in this area is warranted and could contribute to psycholinguistic theory regarding lexical acquisition.

ADAPTIVE ROBOTIC CONTROL FOR IMPROVED ACOUSTIC SOURCE LOCALIZATION IN 2D
Zachary Knudsen and Raphael Schwartz
Mentor: Arye Nehorai

In this project we expand our previous work entitled “Design of a Robotic Platform and Algorithms for Adaptive Control of Sensing Parameters.” We have shown that the performance of our algorithm for acoustic source location in 2D can be improved by adaptively controlling the microphone array geometry. To this end, we built a robotic microphone array with capability of autonomous control of array geometry constrained to movement in 1D. We increased the degrees of freedom of our robotic platform and designed a new controlling algorithm in order to further improve performance. In particular, the robots move in 2D and the pair of microphones can also rotate independently of the robot orientation. And a heuristic approach for the control of robot locations is presented and validated with real experiments. Labview and Matlab are used for the implementation of the system.

ISOLATION, CHARACTERIZATION, AND ANNOTATION OF MYCOBACTERIOPHAGE MORGUSHI
Samuel A. Kolander, Morgan B. Schoer, and Yuqi Wang
Mentors: Sarah Elgin and Kathy Hafer

Bacteriophage are viruses that infect bacteria. The virus we isolated is a mycobacteriophage, which is a phage that infects mycobacteria. Mycobacteriophage Morgushi was recovered from a soil sample collected on September 3, 2009 in a garden on the campus of Washington University in St. Louis. We isolated Morgushi using an enrichment technique followed by a series of three plaque purification steps. This phage displays small, lightly turbid plaques of about 1.5 mm in diameter on lawns of Mycobacteria smegmatis, suggesting a lysogenic life style. Using transmission electron microscopy, we determined that Morgushi has an average tail length of 289 nm and an average head width and length of 55 nm. The genome of Morgushi was sequenced by the Washington University Genome Sequencing Center using 454 sequencing. We report here that the genome is a circular double-stranded DNA of length 68,303bp. By comparing the location of Morgushi’s approximately 100 genes, including the organization of its predicted four operons, to other mycobacteriophages, we have tentatively determined that Morgushi belongs to the B1 cluster of mycobacteriophage. This work on mycobacteriophages can lead to insights about the evolutionary mechanisms and expansive diversity of various phages in the current collection and those yet to be found.

MYELOID CELL INDEPENDENT CONDITIONAL HIF-1 INDUCED MULTISTAGE ANGIOGENESIS
Joanna R. Kovalski
Mentor: Jeffrey M. Arbeit

Under low oxygen conditions, activation of HIF-1 induces a strong pro-angiogenic response through upregulation of downstream pro-angiogenic targets, which stimulate mobilization, recruitment and retention of myeloid cells from the bone marrow. Pro-angiogenic myeloid cells stimulate endothelial cell proliferation, survival and sprouting, a process in cancer termed the angiogenic switch. Using a conditional model of doxycycline-regulated expression of a constitutive, and oxygen-insensitive mutant HIF-1alpha expressed from the basal keratinocytes, I performed a time course analysis of myeloid cell infiltration by immunofluorescent cell specific labeling on both untreated, and anti-VEGFR1 and anti-VEGFR2 immunoblockade treated conventional mouse ear cross-sections. As early as day one, there was substantial myeloid cell recruitment, reaching a maximum by day 14 with a plateau thereafter. To mechanistically probe our model, we employed receptor-blocking antibodies, which prevent ligand binding to the extracellular domain, blocking the signal through VEGFR1 or VEGFR2. Treatment against either receptor from day 0-14 resulted in sizeable decrease in infiltration of all myeloid cell types. Only blockade of VEGFR2 from day 0-14 reduced the normal level HIF-1 induced neovascularization. This suggests a critical function of local VEGF-VEGFR2 signaling for proliferation and the insufficiency of VEGFR1 directed pro-angiogenic myeloid cell recruitment for rescue. Day 14-28 blockade of VEGFR1 or R2 resulted in no abrogation of myeloid cell retention compared to a typical day 30. Moreover, there was little decrease in vessel density, implicating independence of the mature vasculature from VEGFR2 signaling. However, combination blockade of both receptors from day 14-28 decreased myeloid cell retention, but with only a slight decrement in vessel density. This suggests
myeloid cells are dispensable for both vascular development and maintenance with sufficient support from local angiogenic mechanisms. Myeloid cell independent adult angiogenesis is a departure from past findings in pathological models of the tumor microenvironment, wherein these cells are crucial in initiating the tumor vasculature and evading anti-angiogenic therapies. These results suggest myeloid cells are not an absolute requirement for neovascularization, and the resolution of this discordance may lead to the identification of novel angiogenic maintenance factors and therapies.

**DISRUPTION OF METABOLIC GENE CG9009 SUPPRESSES RESPONSE TO SLEEP DEPRIVATION IN DROSOPHILA MELANOGASTER**

Natalie Kress  
Mentor: Paul Shaw

Sleep is an essential biological function that, when insufficient, can adversely affect physiological processes, such as cognitive performance. Importantly, in mammals, lack of sleep can result in metabolic defects, including obesity and endocrine dysfunction. Shaw lab microarray experiments indicate that transcription of lipid metabolism genes is altered in response to sleep deprivation in Drosophila melanogaster. In addition, the lab has also shown that mutations in enzymes involved in lipid metabolism change sleep behavior. Unfortunately, the mechanism of how lipids control sleep is unknown. CG9009, a predicted acyl-CoA ligase, is a prime candidate gene for the study of the reciprocal interaction between sleep and metabolism. Flies with a mutation that disrupts CG9009 exhibit a suppressed sleep rebound compared to their background controls. After sleep deprivation, wild type flies typically exhibit a characteristic increase in sleep distributed across a 48-hour recovery period. Thus the suppressed rebound of CG9009 mutant flies can be characterized as an abnormal response to sleep deprivation. Control experiments confirm the suppressed sleep rebound phenotype is not a result of genetic background effects. This reduced rebound is phenocopied when CG9009 RNA is knocked down ubiquitously using RNA interference (RNAi) techniques and verified by quantitative PCR (qPCR). Protein homology indicates that CG9009 is involved in aspects of lipid metabolism. Quantified lipid levels show mutant flies are more lean than control flies and when exposed to starvation conditions, survive on average 15 hours less than control flies. These results suggest that disruption of CG9009 prevents either proper lipid storage or usage, which manifests in a differential response to sleep deprivation. Current and future research will use tissue specific drivers to degrade CG9009 RNA in localized tissues and implement learning assays to assess the nature of lipid metabolism on sleep.

**“MAUS: THE DISGUISED COMPLEXITY OF GENERATIONAL TRAUMA”**

Aiko Krishna  
Mentor: Leah Chizek

Art Spiegelman portrays the hovering presence of generational trauma in his graphic novel, *Maus: A Survivor’s Tale*, an autobiographical narration of his father’s Holocaust experience. In this work, I argue that although the novel itself focuses on his father’s past, it implicitly serves as a place for the author to store his internalized burden of guilt, one of the main symptoms of generational trauma. Additionally, Spiegelman’s use of anthropomorphic animals to represent the characters suggests artificiality, but it is because of this artificiality that he is able to disclose the internal complexities of Artie, Spiegelman’s depiction of himself. Past psychological studies that investigate the effects of trauma both on Holocaust survivors and their offspring are used to analyze the internal conflicts evident in Artie. Additionally, the complex relationship between the author and his depicted self in the text was explored with the aid of Cathy Caruth’s study on trauma and literature. I conclude that the author selectively recreates himself on the pages so that this newly constructed Artie, the illustrated character seen in the pages of *Maus*, becomes the one responsible for comprehending the inherited trauma and resolving his internal conflicts. It is important to acknowledge that the depiction of “reality” in *Maus* is not the kind of reality that differentiates works of nonfiction from fiction, but more importantly, a reflection of “reality” defined in terms of oneself.

**GABA AND GLUTAMATE MAY MEDIATE CIRCADIAN FUNCTIONAL CONNECTIVITY IN THE SCN**

Rebecca Krock  
Mentor: Erik Herzog

The suprachiasmatic nucleus (SCN) of the mammalian hypothalamus orchestrates circadian rhythms in behavior and physiology, allowing the organism to predict and adapt to daily and seasonal environmental changes. Although the molecular basis of individual cells’ ability to keep daily time has recently been well-characterized, the rules that organize SCN cells into a working circuit remain unclear. Specifically, it is not known whether fast excitation plays a role in SCN function. Therefore, we mapped functional connectivity in the SCN to elucidate patterns of fast neurotransmission. Functional connectivity was revealed by cross-correlating spike trains of SCN neurons plated at high density on multielectrode arrays. We observed sparse positive and negative cross-correlations between firing patterns of neuron pairs that
peaked within approximately 10 ms of firing and varied daily in strength and number in phase with multiunit activity. We found that an average of 80% of these negative cross-correlations and 0-50% of positive correlations were blocked by GABAA receptor antagonists. Furthermore, application of ionotropic glutamate receptor antagonists abolished 75% of positive and more than 50% of negative cross-correlations. These results indicate that fast synaptic connections mediated by GABA and, surprisingly, glutamate release within the SCN change in strength and number over the circadian day.

MALE CIRCUMCISION AS HIV PREVENTION:
THE POLITICS OF LOCAL PERCEPTIONS AND GLOBAL PUBLIC HEALTH POLICY IN UGANDA
Anupam Kumar
Mentor: Shanti Parikh

Recent studies have shown that medical male circumcision (MMC) reduces HIV transmission by over 50%. However, broad institutionalization of MMC carries profound societal implications. Circumcision has long been practiced as a rite of passage in many communities in Uganda and throughout sub-Saharan Africa. As the government of Uganda seeks to create a nationwide network of MMC sites as part of an effort to combat the spread of HIV, its policies may encounter diverse local responses. Thus, cultural understandings of male circumcision and of non-circumcised men should be illuminated prior to implementation of the MMC policy. During the summer of 2009, I conducted ethnographic research and interviews in Eastern Uganda to examine how men currently understand the procedure of MC, as it relates to masculinity and adulthood, and how government-sponsored MMC may be received in these communities. The conclusions of this work specify the need to emphasize the importance of empowering men to reflect on personal responsibilities in deciding to get circumcised and practice safe sexual behaviors. This work is a preliminary analysis of the important transition of male circumcision from a cultural practice embedded within a larger coming of age process into state-sponsored public health and medical procedure.

THE HEART OF THE MATTER:
DISPARITIES IN MORBIDITY AND MORTALITY DUE TO HEART DISEASE IN AFRICAN AMERICANS
Susan Kunihiro
Mentor: Garrett A. Duncan

This thesis investigates why African Americans experience a higher incidence and death rate than their non-Hispanic white counterparts when it comes to heart disease with the purpose of determining how to overcome these disparities. A variety of sources were used in the investigation, from personal interviews with health professionals, to a literature review of scientific studies, government pamphlets, and a documentary, among others. African Americans have complex cultural experiences, including the distrust of the medical community as a result of the legacy of exploitation of black bodies by medical professions, most notably in the Tuskegee Syphilis Study. Additionally, the tradition of soul food is a source of pride as well as high blood pressure and high cholesterol. African Americans have decreased access to hospitals, doctors, heart-healthy food options, exercise areas, and medical procedures as compared to whites, which demonstrates racism prevalence in health care. Also, physiological differences in African Americans show salt sensitivity, increasing the likelihood of high blood pressure, a precursor to heart disease.

To reduce these disparities, changes need to be made from the individual to the national level. Meeting community needs starts with training community members to provide health education and requiring physicians to learn how to practice medicine in diverse populations in order to obtain a medical licens. To promote participation in cardiovascular research, investigators need to establish a rapport and illustrate the relevance of the research to African Americans. Greater access to health care services is especially relevant during these times of health care reform. Increased voter registration initiatives empower African Americans to enact changes on municipal, state, and federal levels regarding their health. By understanding the complex sources of heart disease morbidity and mortality, overall health disparities can begin to be addressed.

POLITICS OF ESOPHAGEAL CANCER
Alina Kutsenko
Mentor: Carolyn Sargent

Esophageal cancer affects millions of people each year. Unlike other cancers, which are widely prevalent, esophageal cancer disproportionately affects certain regions of the world such as China and Iran. In these regions, high rates of esophageal cancer are not due to smoking, alcohol, or other risk factors associated with highly industrialized societies. In contrast, low vitamin and mineral uptake along with cultural habits are responsible for the cancer. While the physiology of the disease is the same in both countries, the governments’ approaches in determining the causes, distributions, and public health prevention methods of esophageal cancer vary widely. In Linxian, China, the government employed a heavy-handed approach that transformed esophageal cancer into a patriotic health movement and forced thousands
of people to participate in clinical trials. In contrast, with the advent of war and a less docile people, Iran was unable to perform the same public health interventions in the Caspian Coast. Each country's approach was shaped by its political philosophy and community organization. Nevertheless it is important to note the politics that affected China and Iran are not merely relevant to less developed countries. Instead, the approaches gleaned can be applied to the Native American experience with cancer in the United States.

“IT’S JUST GAY:”
AN ANALYTIC LOOK INTO THE LIVES OF BLACK LESBIANS IN SOUTH CAROLINA
Laura Lane-Steele
Mentor: Shanti Parikh

This research examines the gender identities, coming out narratives, and homophobic attitudes of self-identified Black lesbians in South Carolina. I find that historical influences of institutionalized racism on Black gender have played a role in many aspects of these women’s lives. The strict expectations in this Black community surrounding appropriate Black gender and sexuality that were created as a response to the hypersexualization of Black women and the emasculation of Black men influence they ways in which these women construct their own Black lesbian gender identities and their sexual relationships. These expectations, supported by Black churches and families, also play a large part in these women’s coming out narratives. While many of these women’s families hold religiously based homophobic beliefs, they do not disown their daughters, but instead adopt an ambivalent “don’t ask don’t tell policy.” The research finds that the homophobic attitudes these women hold towards Black men and other Black lesbians are also rooted in the Black community’s response to institutionalized racism. They view sexual relationships between two masculine people (or what I will call homomasculinity) in a negative light because of historically influenced expectations of Black masculinity. I also argue that these lesbians both reinforce and resist heteronormativity in their identities and relationships.

YOUTUBE AND CAMPAIGN ADVERTISEMENTS:
THE AFFECT OF WEB BASED VIDEO ON THE CONTENT OF CAMPAIGN ADVERTISEMENTS
Jake Laperruque
Mentor: Steven Smith

This work is a study of the impact of online video in presidential campaigns, specifically on the nature of campaign advertisements. Using the 2008 presidential election, I conduct a comparative study of the broadcast and online advertisements from the Obama and McCain campaigns, seeking to evaluate if there are differences in content between broadcast and online advertisements. The campaigns’ YouTube profiles were used as a data source; 998 campaign advertisements were viewed, totaling over 53 hours of video. The collection of data was based upon predicted differences in content that would arise due to the inherent differences between broadcast and online advertisements; broadcast advertisements are passive and involuntary while online advertisements are active and voluntary. The prevalence of vote requests, volunteer requests, donation requests, issue stances, personal attacks, and mention of campaign events were all studied to evaluate the hypothesized differences between broadcast and online advertisements. The data yields a variety of findings, reflecting a significant divergence in content between broadcast and online advertisements in several areas. The study also demonstrates potential for change and development in political advertisements and campaigns as a whole as a result of the prevalent use of YouTube and online video.

BIRTH IN THE SIXTEENTH AND SEVENTEENTH CENTURIES:
KNOWLEDGE AND REPRESENTATIONS
Lindsey Latteman
Mentor: Colette Winn

Birth is an experience that unites mankind. Even as societies change throughout time, we are linked to the past through our common human experiences. The sixteenth and seventeenth centuries were a time of great scientific innovation and advances in medicine that contrasted sharply with previous beliefs about birth drawn from religious ideologies and misunderstandings of the body. We look to this thesis as a way to elucidate the different conceptions of birth in the sixteenth and seventeenth centuries, in particular through the examination of contemporary art, poetry, literature, and the anecdotal accounts of a midwife from the period.

In examining the artistic trends of the time as well as contemporary poetry, we find that the only birth worth describing or narrating is that of Jesus, son of God. In a time when many paintings are religious, a great number of artists’ works often focus on the arrival on earth of Jesus. In poetry as well, the Virgin birth is the only actual delivery worthy of mention (and according to Christian texts, occurs without pain or suffering for the Virgin). The standard treatment of birth in these forms of expression, then, treated birth as a sacred event and one which was surrounded in mystery. We then turned to the writings of Louise Boursier, a contemporary midwife who not only had a thriving personal practice but eventually became the midwife to the Queen of France, Marie de Médicis. Her Récit véritable de la naissance de
messeigneurs et dames les enfants de France and Instruction à ma fille give us the perspective of someone who has seen births of both the highest and lowest order. Finally, in examining Gargantua and Pantagruel of François Rabelais, a physician-writer, we find the grotesque realities of birth weighed side by side with a mockery of the common people's ignorance of their bodies.

In this research, we found that the diverse perspectives of birth in the sixteenth and seventeenth centuries each became a thread that, when woven together, form a rich tapestry of ideas and conceptions about the life, the body, and its functions.

PUBLIC PEACE: AN ANALYSIS OF THE FEMINIST ANTI-WAR MOVEMENT IN SERBIA AND ITS USE OF PUBIC PERFORMANCES
Emily Levitt
Mentor: Linda Nicholson
The Socialist Federal Republic of Yugoslavia started to collapse with the rise of nationalism, increasing economic instability, political manipulation, and a constellation of other factors. A series of wars and conflicts that lasted from 1991 until 1999 divided the once unified country on the basis of nationality, religion, and ethnicity. Throughout the conflict Serbia acted as an aggressor under the political and military leadership of Slobodan Milosevic. Many Serbs supported Milosevic and his objective of creating a "greater Serbia," however, a small-but-determined collective established an oppositional movement engaged in anti-war and anti-Milosevic actions. Various feminist groups constituted the major force behind the anti-war movement in Serbia during the 1990s. This research examines why and how feminists quickly sprung to action and established the core of the anti-war movement. Feminists responded to the patriarchal nature of conflict, the use of rape as a weapon of war, the macho-warrior persona adopted during times of conflict by men, and the patriarchal and sexist attitudes propagated on behalf of Serbian nationalism. Feminism provided a cultural alternative to the nationalism that supported the Milosevic regime and allowed a minority population of individuals to establish a community capable of taking collective action in opposition to the totalitarian Milosevic regime. Feminist anti-war activists chose to show their opposition by intervening in public spaces through the production of public street performances, plays, vigils, and other creative means for protests. The use of public spaces and performance emerged out of a contextual necessity but was also informed by a feminist intellectual framework that attempted to break down public-private barriers, give voice to the oppressed, and inspire cultural, not just political, change. Ultimately, the feminist anti-war movement in Serbia serves as a case study of feminist beliefs in action and the importance of cultural change in addition to political change.

CASPASE-9: A CANDIDATE SUSCEPTIBILITY FACTOR IN MURINE ALKYLATOR-INDUCED THERAPY-RELATED ACUTE MYELOID LEUKEMIA
Yedda Li
Mentor: Timothy A. Graubert
Therapy-related acute myeloid leukemia (tAML) is caused by exposure to chemotherapies and radiotherapies and has a poor prognosis. To better understand the genetic factors involved in secondary leukaemogenesis, we studied alkylator-induced leukemias in murine models and found differing levels of tAML susceptibility among 20 inbred strains. Genome-wide mRNA profiling of c-kit+/lineage- (KL) hematopoietic stem and progenitor cells identified a correlation between strain-dependent differences in gene expression and tAML susceptibility. Of the differentially expressed genes, Caspase-9 (Casp9) is an initiator caspase crucial for the initiation of cellular apoptosis. We studied Casp9 expression in a reference tAML-resistant murine strain, C57BL/6J; and two tAML-susceptible strains, DBA/2J and PL/J. As measured by microarray profiling and confirmed by two independent qRT-PCR assays, Casp9 expression is significantly lower in the susceptible strains. PCR amplification of Casp9 cDNA isolated a novel isoform from the susceptible strains that lacks exon 2, creating a frameshift and a premature stop codon that is predicted to trigger nonsense-mediated decay. Functionally we predicted that cells with low Casp9 expression would be more resistant to alkylator-induced apoptosis and more likely to acquire mutations necessary for leukaemogenesis. Data from flow cytometric apoptosis assays suggest that KL cells from the tAML susceptible strains are more resistant to apoptosis than the reference C57BL/6J KL cells after treatment with a DNA alkylating agent. These results suggest that differences in Casp9 expression levels may influence strain-dependent tAML susceptibility, and that inherited genetic factors may explain the observed expression differences. Ultimately, our understanding of the role that genetics plays in determining susceptibility to secondary leukemias may allow us screen patients who are more susceptible and to prevent them from receiving treatments that are known to induce these cancers.

Tiffany Lin
See Re-I Chin
QUANTIFICATION METHODS AND ANALYSIS OF HEAD MOTION AND RS-FCMRI PREPARATIONS IN A PHARMACOLOGIC FMRI STUDY OF CORTICAL FUNCTION IN TOURETTE SYNDROME

Miranda Renée Lindburg
Mentor: Kevin J. Black

Tourette Syndrome (TS) is a chronic disorder characterized by motor and vocal tics. While it is commonly accepted that dopamine antagonists can lessen severity of tics, it has also recently been shown that tic acuity can also be reduced by dopamine agonists. To examine this, we are currently performing an fMRI study on TS patients and controls matched on several dimensions. A working memory task with multiple degrees of difficulty is given, interleaved with rest blocks, under double-blinded conditions of levodopa and placebo administration on two separate scan days.

In fMRI studies, head motion within the scanner causes large amounts of image degradation and loss of fidelity, and common correction methods often cannot mitigate this. We hypothesized that the TS group would move systematically more than the other, which could confound the results and show false activation differences between the two. In addition, levodopa, as a tic reducer, could also have a confounding effect on head motion. We examined the effects of each of our independent variables, including the working memory task, on head motion. Results suggest the only significant variable is the working memory task, which means that analyses of our study are feasible. Surprisingly, both TS patients and control subjects move more during rest, which we propose may relate to restless motion due to a lack of concentration.

Church et al. found that adolescents with TS have immature network connections in the brain's control system. To expand on their study, we performed resting state-functional connectivity analysis on our data, to find an “endpoint” of control network development in TS, as compared to controls.

Connor J. Liu
See G. Jason Huang

INCREMENTAL VALIDITY OF META-PERCEPTION: DO PEOPLE KNOW WHEN OTHERS SEE THEM DIFFERENTLY THAN THEY VIEW THEMSELVES?

Jordan Livingston
Mentor: Simine Vazire

For centuries, people have wondered how they can best come to know themselves. Traditionally, many philosophers have encouraged the use of introspection in the search for self-knowledge. However, the recent psychology literature challenges this idea and suggests that gut reaction may be a better technique for accessing self-knowledge. The current study asked whether self-knowledge is best accessed by introspection or gut reaction. To answer this question, we investigated the effects of cognitive deliberation on self-judgments of personality. Specifically, subjects were placed in one of three conditions when reporting their self-perceptions: (1) a control condition in which subjects were instructed to respond at their own pace, (2) a deliberate condition in which subjects were instructed to think long and hard about each item, and (3) a gut reaction condition in which subjects were instructed to respond as quickly as possible to each item. After reporting their self-perceptions, participants engaged in a variety of tasks (e.g. Wonderlic Intelligence Test, Brick Creativity Test) that served as criterion measures for the self-perceptions. We hypothesized one of two results. First, in the Introspection Hypothesis, we hypothesized that deliberated self-reports of personality would lead to an increase in accuracy of self-perception. Second, in the Gut Reaction Hypothesis, we hypothesized that fast self-reports would lead to an increase in accuracy of self-perception. In an analysis of three traits, intelligence, attractiveness, and creativity, we found different trends favoring both hypotheses. Future studies will need to explain why self-knowledge for different traits is best accessed by using different cognitive strategies. We suggest that the saliency of a trait in one's self-concept might determine which traits are best accessed by cognitive deliberation or gut reaction.

SPHERICAL ORBITS IN THE NEWTONIAN TWO-CENTER PROBLEM

Sean Lourette
Mentor: Clifford Will

The Kerr geometry of general relativity has many features that are not fully understood, including the Carter constant. There exists an analogous conserved quantity for the Newtonian two-center problem. We show that unlike the Kerr geometry, there exist no spherical orbits that are parallel to the xy plane.
PORTRAYAL OF THE HOME IN THE RACE FOR THE HOUSE: 
HOW CONGRESSIONAL CANDIDATES PRESENT THEIR PERSONAL LIVES TO VOTERS
Ruth Mandelbaum
Mentor: Mona Lena Krook

While male candidates have traditionally portrayed themselves as “family men” during their campaigns, female candidates, especially those with young children, must decide whether emphasizing their family lives will show that they are “family women” or will signal to the electorate that they may not have enough time to perform public duties. Previous literature has examined gender differences in the campaign strategy of Congressional candidates and has also studied the personal lives of Congressional candidates. This study is the first to focus solely on the combination of these two areas by examining the ways in which Congressional candidates portray their family lives during their campaigns using candidates from the 2004, 2006, and 2008 Congressional election cycles. Three methods were used: (1) content analysis of campaign commercials of 40 candidates; (2) content analysis of campaign websites of 63 candidates; and, (3) questionnaires sent to all female candidates in the three election cycles studied. In campaign commercials, women, especially Republican women, were far less likely to show or discuss their families than male candidates. On campaign websites, men and women tended to mention their families at the same rate, but women were more likely to mention their children and men were more likely to mention their spouses. Male and female Democrats were alike in the ways in which they portrayed their families on their websites, while male and female Republicans diverged greatly. These findings have practical implications for the ways in which campaigns are run as well as theoretical implications involving the continued prevalence of gender stereotypes.

PERFORMANCE AND PROTEST: THE FEMICIDES OF CIUDAD JUÁREZ, MEXICO
Nadia Mann
Mentor: Ignacio Sánchez Prado

Since 1993, hundreds of young women have disappeared from Ciudad Juárez in Chihuahua, Mexico. Some of these women’s bodies have been discovered bearing marks of mutilation and violent death; others have never been found. It remains unclear who actually committed – and continues to commit – this violence. The murders have been at times attributed to drug cartels, a backlash against changing gender roles precipitated by the employment of young women in maquiladoras, or various individuals. Ciudad Juárez has been the site of a great deal of violence in recent decades, but the murders of these young women have become distinct from drug and border violence. In academic, political, and popular discourse, these deaths are often classified as a femicide.

In this work the various types of discourse that surround the Ciudad Juárez femicide are examined. Performance and identity theory are utilized to examine the documentaries, books, and songs that take these murders as their topic. I argue that many of these works reduce the victims to symbolic ideas and forget their humanity. I also examine the recent protests against the appointment of Arturo Chávez Chávez to the post of Attorney General by the organizations Ni Una Más and Las Mujeres de Negro, and argue that the images and strategies used by these groups are more effective at representing the humanity of the victims than the popular culture tributes.

ARE THEY ENOUGH?: 
THE TWO POLITICAL CHANNELS TO SOLVING DOMESTIC VIOLENCE IN INDIA
Tess Mattingly
Mentor: Sunita Parikh and Jami Ake

The political response to domestic violence in India can be defined through two channels: the formal policies of the government and the grassroots-level efforts of non-governmental organizations (NGOs). This essay investigates the connections between the state and NGOs through government-generated statistics, surveys of female empowerment NGOs and qualitative analysis of current Indian newspaper articles to determine where their agendas align and diverge to empower women from domestic violence. Through this multi-tiered data analysis I conclude that it is the interaction of the two that enables women to resist violence; when state and NGO efforts are aligned both achieve their ultimate goals.

CORRELATING HOST METAPOPULATION SIZE AND PARASITE SPECIES RICHNESS AT MULTIPLE 
SPATIAL SCALES IN AN AMPHIBIAN HOST-PARASITE SYSTEM
Joseph R. Mihaljevic
Mentor: Jonathan M. Chase

With emerging evidence for the importance of parasite communities in shaping free-living biodiversity patterns and even ecosystem health, a rigorous understanding of the mechanisms driving parasite community structure is necessary. Parasite richness was historically studied as a
function of host characteristics and immunity, but recent evidence suggests that landscape characteristics in which host populations are embedded can greatly influence parasite richness patterns. Because the spatial dynamics of hosts influence the movement of their parasites, host metapopulation characteristics can influence parasite species richness. In this study, I collected metamorphs of the pond-dwelling frog, *Rana clamitans* from ponds throughout southeast Missouri, surveyed their endoparasite communities, and correlated the parasite species richness with *R. clamitans* at within-frog, within-pond, and within-site spatial scales across regions that varied in the number of ponds present (i.e., metapopulation size). It was found that parasite species richness was strongly positively correlated with host metapopulation size at the within-frog and within-pond scale, and marginally so at the within-site scale. Additionally, within a subset of common parasite species, individual parasite species’ prevalence (presence/absence in a host) was also positively correlated with host metapopulation size. Through exploring the effects of host metapopulation size in this study, both host- and parasite-relevant landscape dynamics are shown to be integral to explaining parasite richness patterns at multiple spatial scales.

**QUANTITATIVE TRAIT LOCI AFFECTING LIVER FAT CONTENT IN MICE**

Olga Minkina  
Mentor: James Cheverud

Dietary obesity is a complex trait influenced by the interaction of genes and the environment. Although the recent increase in the prevalence of obesity is largely driven by changes in diet and activity levels, individual variation in the response to an increasingly obesogenic environment is due in part to genetic variation between individuals. In humans, obesity is associated with non-alcoholic fatty liver disease (NAFLD), a condition in which excess fat accumulates in the liver. This disease has the potential to progress to steatosis and cirrhosis, in which the production of reactive oxygen species (ROS) and pro-inflammatory cytokines promotes hepatocyte apoptosis, eventually leading to liver failure. To study the genetic basis for variation in liver fat content in response to a high fat diet, nuclear magnetic resonance imaging (MRI) was used to determine liver fat proportion in 479 mice in 16 LG/J X SM/J recombinant inbred (RI) mouse strains fed either a high fat (42% kcal from fat) or low fat (15% kcal from fat) diet. The LG/J X SM/J intercross has previously been characterized as a good model for the study of obesity as a complex trait. An analysis of variance (ANOVA) confirmed that there is a genetic basis for variation in liver fat proportion within the population. This study revealed three new quantitative trait loci (QTLs) that contribute to liver fat proportion but not body weight or liver weight, identifying regions of the genome with effects on fat accumulation in the liver.

Andreas Mitchell  
See Nathaniel Hausfater

**COMPONENTS OF THE NCoR CO-REPRESSOR COMPLEX REPRESS LYTIC REPLICATION OF GAMMAHERPESVIRUS 68 IN MACROPHAGES**

Jerome M Molleston  
Mentor: Herbert W Virgin IV

Gammaherpesvirus 68 (γHV68) is a murine virus which is both genetically and biologically related to human Epstein-Barr virus and Kaposi sarcoma-associated herpesvirus, thus providing a useful system for modeling gammaherpesvirus pathogenesis. A very important feature of all herpesviruses is the establishment of a latent state, which, in contrast to lytic replication, involves no production of infectious virus and expression of only a limited subset of viral genes. It is known that γHV68 establishes latency in macrophages, B cells, and dendritic cells, but the genetic mechanisms of latency regulation are poorly understood.

One such complex that may be involved is anchored by the nuclear receptor co-repressor (NCoR). It binds to hormone receptors such as retinoic acid receptor and recruits histone deacetylases (HDACs) to promoters to mark histones for transcriptional silencing. Previous work showed that inhibition of HDAC activity led to increased lytic growth, so we explored the possibility that the NCoR complex is involved in regulating latency.

Here we show a novel connection between lytic replication in macrophages and HDAC3, HDAC4, NCoR, and retinoic acid. Expression of gene 50, an immediate-early viral gene associated with lytic replication, is decreased in macrophages when HDAC3 or HDAC4 are overexpressed. In addition, gene 50 expression, as well as viral growth, is increased in macrophages when NCoR protein levels are lowered by siRNA treatment. Gene 50 expression and viral growth are also increased in macrophages by treatment with retinoic acid. However, in fibroblasts, neither lytic viral protein expression nor viral growth are dependent on HDAC activity.

We thus postulate a potential role for the NCoR co-repressor complex in regulating the decision of lytic or latent fate of virus upon infecting a cell. Future directions will involve investigating any direct binding of the NCoR complex to the gene 50 promoter, as well as investigating further any differences in NCoR complex function between macrophages and fibroblasts which might explain the difference in viral growth between the two cell types.
ILLEGAL SURVEILLANCE IN COLOMBIA:
THE ROLE OF POLITICAL IDEOLOGY IN PUBLIC RESPONSE
TO THE SECURITY VS. LIBERTY DEBATE

Millicent Moon
Mentor: Guillermo Rosas

During “times of threat,” such as war or a threat of terrorism, democratic governments have historically implemented security policies that violate individuals’ liberties. Such policies often provoke a national debate over security versus liberty, and political ideology has proven to be a crucial factor in the public’s response to this debate. In Colombia, the public was forced to reconsider its security vs. liberty debate in 2009, when governmental investigations revealed that the national security agency (Departamento Administrativo de Seguridad, “DAS”) had been illegally spying on human rights defenders, Supreme Court judges, trade unionists, journalists, and other public figures since at least 2003. During the investigations into the DAS, Colombia was suffering from a “heightened level of threat” due to its internal armed conflict between insurgent, counterinsurgent, and governmental forces. In addition, the conservative and liberal sectors of society had become viciously polarized since President Álvaro Uribe’s election in 2002.

In this research the role of political ideology in the public’s response to the 2009 DAS investigations is analyzed in order to gauge Colombians’ attitudes towards principles of their democracy during a “time of threat,” and political hostility. To evaluate the role of political ideology, I examine editorials published by three Colombian newspapers throughout 2009. Analysis of the editorials and of research conducted by the Latin American Public Opinion Project explores plausible explanations for the unanimous condemnation of the DAS’s illegal surveillance in Colombia.

THREE COURTLY NOUVELLES:
TRACING VESTIGES AND MODIFICATIONS OF THE COURTLY LOVE TRADITION
IN MARGUERITE DE NAVARRE’S HEPTAMÉRON

Teresa Marie Moore
Mentor: Colette H. Winn

The courtly love tradition experienced its most illustrious period between the eleventh and thirteenth centuries in the courts of Southern France. It was in this setting that troubadours—like Jaufré Rudel and Arnaut Daniel—composed poetry and songs hailing the beauty and virtue of their beloved ladies. The feudal relationship between lord and vassal shifted in the context of courtly love so that the lady took the role of lord and the courtly lover became her vassal. Codification of the rules of the courtly love tradition occurred in Andreas Capellanus’ work De Amore. Marguerite de Navarre’s Heptaméron, written several centuries after the decline of courtly love, still shows traces of its influence. Through an examination of the cultural institutions of feudal relations between lords and vassals, marriage, and the religious life, it becomes possible to highlight the remnants of courtly love in three of the Heptaméron’s nouvelles. However, the relationship between the nouvelles of Marguerite de Navarre and the courtly love tradition proves itself more complex when considering the ways the tradition has been modified.

SENeca’S PHILOSOPHY OF THE EMOTIONS

Ian August Mosley
Mentor: George Pepe

This work examines the work of Lucius Annaeus Seneca, (4BC – 65AD) concentrating on his philosophy of the emotions, and particularly his seminal work De Ira (On Anger). It begins by attempting to give a systematic account of his principles for understanding the emotions in his intertwining accounts of ethics and psychology—how we are to understand the place of emotions in the soul, and why Seneca holds it to be a moral duty to strictly exclude emotions from one’s mind. The essay explores how these positions are derived from certain fundamental arguments, such as his argument that anger is unnatural for human beings, as well as an argument posing a dilemma between reason and emotion as motive powers in the soul.

This account finished, the work then examines Seneca’s account of emotions in relationship to other philosophers, particularly those of the Stoic school. The controversy whether his view of the soul is strictly compatible with what we understand as the “orthodox” Stoic view, that the soul is a single whole, is given particular attention. Seneca, much controversy has alleged, understands the soul to have aspects that are both rational and irrational simultaneously—a position called “dualism.” Ultimately, the view is defended that, when understood in the context of the Stoic system, Seneca’s view of the emotions is compatible with the idea that the soul is a single, undivided whole.
3D SOURCE LOCALIZATION USING ACOUSTIC VECTOR-SENSOR ARRAYS
Evan Nixon
Mentor: Arye Nehorai

In this project, we use an array of two acoustic vector sensors (AVSs) for 3D localization of a single sound source. For each AVS we first use Capon beamforming, a spatial filtering process, to determine the 3D source direction. Then, we apply a triangulation method to combine the directions, estimated by the array of AVSs, to estimate the location of the source. An AVS is composed of one pressure sensor and three orthogonally positioned velocity sensors. Combining these four measurements, a single AVS can uniquely determine the direction of a source in three-dimensional (3D) space. This is a significant advantage compared with a single pressure-sensor, which cannot estimate 3D source direction.

THE CONTRACEPTIVE CHOICE PROJECT
Tiffany Ogawa
Mentor: Jennifer Allsworth

The Contraceptive Choice Project attempts to decrease the number of unwanted pregnancies in the St. Louis area by giving free birth control to 10,000 women between the ages for 14 and 45 for 3 years. The project helps dispel myths of contraceptives and educates women on all the birth control options from intrauterine devices (IUDs) and sub dermal implants to pills and condoms disclosing all the methods and side effects, allowing them to change to another form anytime through the study. We hypothesize that by breaking down the financial barriers, many women will choose the long acting reversible contraceptive methods (LARC). By having follow-up surveys every 6 months, the project can monitor the patient’s satisfaction and side effects of a variety of contraceptives. The project also provides free sexually transmitted infection (STI) testing and treatment in hopes of lowering the rate of STIs throughout St. Louis city and county.

IDENTIFYING AND CHARACTERIZING NOVEL COMPONENTS OF THE ARABIDOPSIS THALIANA JASMONATE SIGNALLING PATHWAY INVOLVED IN PSEUDOMONAS SYRINGAE PATHOGENESIS
Inez Oh
Mentor: Barbara Kunkel

The plant pathogen <i>Pseudomonas syringae</i> produces coronatine (COR), a molecular analogue of the plant hormone jasmonate-isoleucine (JA-Ile), which stimulates the jasmonate (JA) signalling pathway in <i>Arabidopsis thaliana</i>. This results in increased pathogen growth and enhanced disease symptom production in the plant. The <i>jasmonate insensitive 1 (JIN1)</i> gene encodes the AtMYC2 transcription factor, a component of the JA signalling pathway that defines a branch of the pathway enhancing susceptibility to <i>P. syringae</i>, and is essential for the plant's ability to respond normally to JA.

The <i>bHLH64</i> gene, predicted to encode a transcription factor, was previously identified in a microarray experiment to be affected by JA and <i>P. syringae pv. tomato</i> strain DC3000 in a COR dependent manner. I took a reverse genetics approach to studying the role of <i>bHLH64</i> in the JA signalling pathway. Results of various molecular and physiological assays using <i>bhlh64</i> mutants and <i>bhlh64 jin1</i> double mutants indicate the involvement of <i>bHLH64</i> in the JA signalling pathway as a negative regulator of <i>P. syringae</i> growth and symptoms. The <i>bhlh64</i> mutant also displayed increased sensitivity to abscisic acid (ABA), a stress hormone that causes a delay in germination. The JA and ABA pathways are known to be interconnected, leading us to postulate that <i>bHLH64</i> might be a point of cross talk.

A forward genetics approach was also used to identify other genes involved in the JA signalling pathway. A number of mutants were previously identified in a primary screen to be hypersensitive or insensitive to JA, an indication that the mutated genes were involved in the JA pathway. Secondary screens carried out on these mutants confirmed that JAE 73-23 is hypersensitive to JA. Complementation tests show that it is likely to be a new allele of the <i>COH36</i> gene.

ROLE OF GLUCOCORTICOID RECEPTORS IN REGULATION OF PER2 RHYTHMS IN THE MOUSE FOREBRAIN
Chiamaka Onwuzurike
Mentor: Erik Herzog

The mammalian circadian clock regulates daily processes such as metabolism, sleep/wake cycle and hormone production. Disruption of circadian rhythms is correlated with human psychiatric disorders, such as major depression and seasonal affective disorder, suggesting that normal circadian rhythms may be necessary for normal mood regulation. In addition, rhythmic expression of clock genes has been observed in several forebrain structures involved in emotion processing. For example, PERIOD2 protein (PER2) expression is circadian in the basolateral amygdala (BLA), central nucleus of the amygdala (CEA), dentate gyrus (DG), and oval nucleus of the bed nucleus stria terminalis (BNST-OV). It has previously been shown that while DG and BLA rhythms rely on unknown signals from the suprachiasmatic
nucleus (SCN), CEA and BNST-OV PER2 rhythms require rhythmic release of glucocorticoids (GC) from the adrenal glands. Since glucocorticoid receptors (GR) are present throughout the forebrain, we hypothesized that GR expression in each forebrain region is required for their circadian timing. To test this hypothesis, we used a genetically engineered forebrain GR knock out mouse (FBGRKO) with GR disruption throughout the forebrain, including the BLA, DG, and BNST but normal GR expression in the CEA. We compared PER2 expression in FBGRKO and control mice sacrificed at four times of day. We found that the number of PER2-positive cells in both the CEA and BNST were rhythmic but peaked 6h earlier in the FBGRKO compared to controls. In contrast, we found no effect of the FBGRKO on PER2 rhythms in the DG or BLA. These findings suggest that GR expression in the CEA mediates circadian regulation in the CEA and BNST, but not elsewhere in the brain. Furthermore, GR expression elsewhere in the forebrain, likely the BNST, is required to time the circadian peak in the BNST and CEA.

MAKING SENSE OF CHINA’S NATIONAL NARRATIVE: 
THE CHINESE REACTION TO THE EMBASSY BOMBING IN BELGRADE
Christine Orchard
Mentor: James Wertsch

The NATO bombing of the Chinese embassy in Belgrade, Yugoslavia on May 8th, 1999 provides a case study for understanding how the Chinese nation interpreted information of national importance. After the embassy bombing, Chinese were filled with emotion and anger towards the U.S., while Americans perceived this as a regrettable military accident to be quickly forgotten. Based on the same set of “facts,” the differences in national perspectives are stark. Collective memory and the stories that define national identity can help to explain these national responses. Using Chinese newspapers as the primary source, this work explores the underlying interpretive framework particular to China, explains the evolution over time and manifestation of the framework regarding the 1999 incident, and discusses how to deal with these deeply-rooted national narratives.

HOW DO PARENTS AND CHILDREN TALK ABOUT LETTERS AND PICTURES?
Shoko Otake
Mentor: Rebecca Treiman

Children can learn many aspects of the world through conversations with their parents. This research explores the general question of whether children can learn about different symbol systems, writing and pictures, through conversations with their parents. Specifically, we are studying the verbs that parents and children use when talking about letters (e.g., can you write a b?) and how those compare to the verbs that they use when talking about pictures (e.g., can you draw a picture of a dog?). These questions are investigated by using the CHILDES database of parent-child conversations. We have divided the verbs collected into semantic categories, distinguishing between physical actions and mental actions, then identifying various categories within this basic division. This allows us to ask a set of related questions: do parents use more physical verbs for pictures than for letters? Are physical action verbs for writing more likely to involve physical actions specific to writing (e.g., spell) than generic ones (e.g., make)? Also, does talk about letters and pictures differ in terms of which mental verbs are more common; are pictures more likely to involve perceptual verbs (e.g., look), while letters are more likely to involve cognitive verbs (e.g., know)? By looking at how parents and children talk about letters and pictures, further questions about what types of information children may be gaining from these conversations are explored.

REVOLUTION TAKES MORE THAN 140 CHARACTERS: 
CONTEXTUALIZING THE USE OF TECHNOLOGY IN IRANIAN POLITICS
Negin Owliaei
Mentor: Robert Canfield

In the past several years, Internet use in Iran has rapidly increased to the point where technology has been heralded as the future of the country's politics. The recent use of Twitter and other forms of social media as tools of mobilization in the wake of the 2009 elections has captured the interest of popular American commentators, with some going so far as to call the protests a “Twitter Revolution.” This work argues that social media does not represent a paradigm shift in Iranian politics. The rhetoric around the Internet often imagines a technologically savvy opposition facing a traditional Islamic government that censors for both political and religious reasons. Framing the nature of Iranian politics as the Internet versus censorship or modernity versus tradition creates a false dichotomy. This formulation ignores the complex and often paradoxical relationships that oppositional, governmental, and religious groups have all shared with technology since before the Iranian Revolution. Iranians from all backgrounds have long been aware, and wary, of the ability of various groups to exploit media technology for political gain.
CROSS-CULTURAL CONVERSATION: SUPPORT SYSTEMS FOR SURVIVORS OF INTIMATE PARTNER VIOLENCE IN NICARAGUA AND IN LATINO IMMIGRANT COMMUNITIES IN THE UNITED STATES
Marion Pope
Mentor: Jami Ake

Intimate partner violence (IPV) is a serious and pervasive issue in the United States. Some systems are in place for survivors—battered women's shelters are the most common. However, these services are generally designed with a white, middle-class, English-speaking survivor in mind. Those survivors that do not fit this description (for example, Latina immigrants) are left out of the survivor support system and often have no place to go. Furthermore, while many services have moved toward woman-centered advocacy (i.e. employing a response based upon the needs of the individual survivor), it can be very hard to access these services unless a survivor chooses to leave her or his batterer, something which may not be feasible or safe.

Looking at systems in countries like Nicaragua will help us learn how to create culturally appropriate and individually tailored services. Nicaragua has developed extensive services for survivors of IPV despite poor economic conditions and significant social barriers. Many of these services employ greater women-centered advocacy than those available in the United States. In addition, most organizations in Nicaragua will adapt their response according to the needs of the survivor, ensuring she or he receives appropriate care. Studying and adapting some of these Nicaraguan services for use in the United States would improve support for those survivors in the margins, but, more notably, survivors with all different backgrounds and experiences as well. Opening the lines of communication among violence against women advocates in developing and developed countries would benefit survivors from all areas.

EXTRACTING MORE THAN MINERALS: A CASE STUDY IN CONFLICT OVER MEANING, VALUE, AND NATURAL RESOURCES
Stephanie Postar
Mentor: Bret Gustafson

Natural resources are becoming an increasingly important topic as they are increasingly demanded and depleted. The pressure to find natural resources has led to increasing prices and competition for mining the resources and a willingness to use cheaper ecologically and socially destructive extraction tactics. This work investigates the conflicts taking place at Lake Natron, Tanzania over soda ash, wildlife, land, and water. I approach this case looking at the place, the stakeholders, and the discourses in play and analyze the resulting network. The research is based on personal experience, combined with information from key informants. These sources are supported by document searches and the mass media. From this case study of a conflict over natural resources, I found that the stakeholders and discourses were the reason for the current outcome. The implications of this study are multiple and it demonstrates the importance of the case-study format in understanding natural resource conflicts. The findings are important in their ability to be compared to other case studies. Third, this study brings indigenous issues into the frame of discussion for natural resources before the extraction began. It is significant because it could be used as a model for other indigenous groups to stop the process of potentially harmful extraction and allow development on their own terms.

Travis W. Proctor
Mentor: Roshan Abraham

Scholars have long recognized the important role that demons play within the Apologies of Justin Martyr, but frequently limit their studies to exclusive examination of his demonology. In contrast, this work examines Justin's demonology in relation to his Logos theology, and posits that Justin views demons as the evil counterpart to the benevolent Logos in a dichotomized cosmology. The demons and the Logos persistently struggle to convince man to do their bidding. Interestingly, throughout his discussion of demons and their war against the Logos, Justin portrays those who submit to demonic coercion as irrational, while emphasizing good reason as the method by which man could resist demonic advances. Conversely, Justin presents the Christian Logos as the epitome of reason and those follow the Logos as men guided by rationality. Through this rational/irrational dichotomy, Justin's Apologies reveal a dualistic worldview where the Christian Logos, representing rationality, struggles against demons, symbolizing irrationality. When understood within Platonic psychological discourse, I propose that Justin is actually using this cosmological battle as an allegory for the battle within the soul between reason and irrationality. Platonic psychology
provides a proper context through which to understand Justin's *Apologies*, as it is a major part of the Ancient philosophical curriculum in which he was instructed and with which he would likely have instructed his own students. With this allegorical reading in mind, I argue that Justin's *Apologies* may have been intended for a role in addition to apologetic. More specifically, Justin aimed to use the *Apologies* as a pedagogical text to instruct his audience in the ways of Platonic rationalized psychology.

**THE EFFECTS OF ALTERED FLAGELLAR STIFFNESS ON CHLAMYDOMONAS REINHARDTII LOCOMOTION**

*Ellyn Ranz*

Mentor: Philip Bayly

Flagella are thin organelles used by cells for locomotion. They are structurally similar to the cilia found in mammalian airways. Flagella are composed of nine microtubule doublets encircling a central doublet pair. To propel the cell forward, the motor protein dynein, through ATP hydrolysis, causes sliding of adjacent microtubules. This inter-doublet sliding generates large bends in the microtubules, generating propulsive waves in the flagellum. *Chlamydomonas reinhardtii* is a green algae that is an excellent model for the study of flagellar dynamics. The purpose of this research is to better understand flagellar motion by examining the effects of altered flagellar stiffness on flagellar dynamics and propulsion. To alter the stiffness, *Chlamydomonas* cells were treated with an 18 µM concentration of taxol, a microtubule-stabilizing agent. To determine the new flagellar stiffness, cells with paralyzed flagella were put in an optical trap with 5 µm beads. The bead was trapped in the optical laser, and the cell was held in place with a micropipette mounted on a piezo-electric stage. The cell was moved relative to the bead to generate pushing and pulling forces. Matlab software was used to analyze the movement of the flagella, and calculate an elastic bending rigidity. Videos of non-paralyzed flagellar movement were then analyzed to examine parameters such as curvature, bend propagation, and beat efficiency. These parameters were compared to control (untreated) cells. Findings from this project will contribute to the understanding of dynein coordination in chlamydomonas flagella, and ultimately in mammalian cilia and sperm flagella.

**THE SPENSER PROJECT**

*Cecilia Razak*

Mentor: Joe Loewenstein

Who was Edmund Spenser? Edmund Spenser was one of the preeminent poets of the 16th century. He is best known for his epic, *The Faerie Queene*, an allegorical poem written in celebration of Queen Elizabeth I, but his vast corpus includes the pastoral *The Shepheardes Calender*, the unprecedented love poetry of his sonnet sequence *Amoretti*, the marital poem, *Epithalamion*, and the nuptial song *Prothalamion*. Spenser remains one of the four canonical writers of his time, along with Chaucer, Shakespeare, and Milton.

What is the Spenser Project? The Spenser Project is collecting and publishing the complete and collected works of Edmund Spenser. Because all Spenser compilations are outdated by current editorial standards, the Project has the important yet massive undertaking of compiling, collating, and annotating Spenser’s entire corpus.

The result will be a three volume *The Collected Works of Edmund Spenser* to be published by Oxford University Press. In an innovative addition, a digital Archive of the works will be created online, and will offer richly encoded and edited versions of Spenser’s works in an environment accommodating diverse research needs.

**EFFECT OF ANTIOXIDANTS ON THE IMMUNE RESPONSE TO DYING TUMOR CELLS**

*Archana Reddy*

Mentor: Thomas Ferguson

Cancer chemotherapy usually kills tumors by apoptosis, a mode of cell death which generally induces immune tolerance. It would be ideal if anticancer chemotherapy, in addition to directly killing tumor cells, stimulated the immune system to combat tumor cells. The few chemotherapies that do induce immunity have been shown to be highly dependent on this immune response for an optimal therapeutic outcome, especially the release of HMGB1, a danger-signaling molecule. Studies have shown that caspase-dependent oxidation of HMGB1 is necessary for tolerance induction by apoptotic cells; this tolerance has also been converted into immunity by treating the apoptotic cells with an antioxidant, which reduced HMGB1. This study explored whether modulating the apoptotic pathway with antioxidants could alter the immune response to tumors. The hypothesis was that when apoptotic tumor cells are treated with antioxidant, they will induce a stronger immune response against a tumor. The results did not correspond with the hypothesis and in some cases showed the opposite trend, suggesting that factors other than the oxidation state of HMGB1 must be taken into account in converting the tolerance accompanying tumor cell apoptosis into immunity.

Another potential cancer treatment is therapeutic vaccination. DNA vaccines have certain advantages in treating cancer but have low immunogenicity, a problem that can be ameliorated by co-administration of an adjuvant. An auxiliary experiment was done to explore the
role of HMGB1 as such an adjuvant, based on a pilot experiment suggesting that HMGB1 cDNA might inhibit tumor growth. The results, however, contradicted these findings, suggesting that HMGB1 cDNA may have unanticipated molecular repercussions. Despite the ambiguities in the specific mechanisms of tumor cell death immunogenicity, these studies as well as the literature support the idea that in order to effectively combat tumors, we must take into account the interaction of treatments with the immune system.

**ROLE OF TEST STIMULUS IN THE ROD-AND-FRAME EFFECT**

Fady Riad  
Mentor: Dora Angelaki

The rod-and-frame effect (RFE) is a phenomenon in which the presentation of a visual stimulus causes a bias in the perceived orientation of vertical relative to the earth’s axis, referred to as the subjective visual vertical (SVV). Subjects perceive SVV as having a smaller than true angle with the vertical axis of the visual stimulus. This effect is often studied in conjunction with the Aubert effect (A-effect), a phenomenon where tilting subjects induces a bias in the SVV. Subjects perceive SVV as having a smaller than true angle with the vertical axis of their bodies. Both of these phenomena have been studied extensively and some studies have looked at the combined effects, leading to models of how the brain integrates multisensory information to produce percepts of spatial orientation. Such studies have shown that the brain uses prior information about the natural world when making estimations about orientation.

Studies have also shown that the magnitude of the rod-and-frame effect can be varied by manipulating how realistic or robust the presented visual stimulus is, but all studies have measured SVV through a secondary visual stimulus (test stimulus) which is assumed not to affect SVV. The current study asks the question “What is the effect of the test stimulus on SVV?”

Our results show that a more robust test stimulus causes a more profound A-effect. This is a distinctly different phenomenon than the rod-and-frame effect because the A-effect is a fixed bias relative to the orientation of the body, rather than the orientation of the visual stimulus. This finding allows us to make further inferences about how the brain perceives orientation, and gives us more precise insight as to what kind of prior information is used in estimating orientation.

**WHERE IS THE ACTION?: RENEWABLE PORTFOLIO STANDARDS AND THE POLITICS OF CLIMATE CHANGE IN THE AMERICAN STATES**

Jeremy Rogoff  
Mentor: William Lowry

While widespread attention has been paid to the federal government’s effort to adopt a nationwide climate-change policy, relatively little coverage has been given to the bodies that have already produced substantial global warming legislation: state governments. This research examines Renewable Portfolio Standards (RPS), the primary policy tool utilized by U.S. state actors over the past decade. Several studies on the determinants of RPS adoption have been completed in the past two years. Rather than replicate the results yielded from those investigations, this study seeks to build on those findings, and determine what political, economic, social, and environmental factors cause states to adopt stringent and effective RPS policies. The work includes a brief overview of the policy, including its origins and the debate surrounding its effectiveness. After a review of the relevant theoretical and empirical literature, the qualitative experience of four states that span the timeline of state adopters over the last 11 years, since the first mandatory RPS was produced, is described. Findings from quantitative analysis done to assess the effect of certain factors on the stringency and effectiveness of a states’ portfolio standard are presented. Policy implications of the research findings are presented as well as directions for future investigation.

**THE VENEZUELAN DEMOCRATIC DICTATORSHIP: HUGO CHÁVEZ AND THE RISE OF TWENTY-FIRST CENTURY SOCIALISM IN LATIN AMERICA**

Alyse Megan Rooks  
Mentor: Ignacio Sánchez Prado

On February 15, 2009 the Venezuelan people passed a referendum to end presidential term limits, thereby making it possible for current Venezuelan President Hugo Chávez to run for re-election indefinitely. Inspired by this event that embodies the turning point in the growing leftist movement in Latin America, the purpose of this study is to explore the controversy that revolves around Chávez’s political persona in hopes of understanding this enigma. The study begins by exploring Chávez’s emergence into power and goes on to investigate his development as a political leader. As the study navigates through the various events that have shaped Chávez’s political career and identity, it also examines his struggles to remain in power in response to the constant threats of his opposition. Through the transition from his youthful idealism towards a more pragmatic “leftist” position, the study illustrates Chávez’s political development as it examines his efforts to realize his goals of eliminating Venezuelan inequality. As the study explores the successes of Chávez’s revolutionary policies and radical social missions, his influential impact on the rest of Latin America becomes apparent. Offering an alternative solution to the neo-liberal policies that have
plagued Latin America, Chávez and his “twenty-first century socialism” are at the forefront of a wave of “leftist” leaders in Latin America. Ultimately, while the future of Chávez’s presidency in Venezuela is uncertain, this study emphasizes the fact that the passing of the February 15, 2009 re-election referendum was the turning point in the rise of Chávez’s twenty-first century socialism in Latin America.

**MAKING BANK:**

**SOCIAL NETWORKS AND FRIENDLY BUSINESS MODELS**

Victor Roy  
Mentor: Glenn MacDonald

This work develops a framework for analyzing the business models of social networks, using Twitter and Facebook as case studies. The framework introduces the concept of an “interactive arena” as a parameter of analysis. Arenas are the virtual spaces with which users interact; it includes all the functions and features which the network provides as well as how all these are laced together in order to form a cohesive virtual community. Arenas are initially designed for users while business models are often an afterthought. The prolonged (financial) success of a social network will come from creating an effective space for consumer-brand interaction that enhances the network’s value to its users.

This framework is then used to examine the business models of Facebook and Twitter. Analysis highlights their characteristics, draws out differences between their products, and discusses how their commercial uses take advantage of their differentiated arenas and affect user value. Using this analysis, I propose a short business model for Twitter that capitalizes on its specific character and niche, thereby providing a pragmatic example of how this framework might be utilized in design.

**BIOENGINEERING-IMPROVED PHOTOSYNTHETIC PRODUCTIVITY**

**FOR RHODOBACTER SPAHEROIDES VIA SYNTHETIC REGULATION**

**OF THE LIGHT HARVESTING ANTENNA LH2**

Jacob Rubens  
Mentor: Robert Blankenship

A synthetic regulation system to optimize the size of the Light Harvesting Complex II (LH2) in the purple photosynthetic bacterium *Rhodobacter sphaeroides* was designed in this work. *R. sphaeroides* was chosen because of its well-characterized photosynthetic and genetic system. The synthetic regulation system was designed to optimize the expression level of LH2 based on incident light and makes use of natural *R. sphaeroides* genes as well as synthetic genes from *E. coli* and *synechocystis*. It is composed of nine BioBrick parts that were assembled via gene synthesis and restriction digests. Eleven new BioBrick parts were constructed and submitted to the Registry of Standard Biological parts. Two of these new BioBricks were characterized. To test the efficacy of this regulation system, a novel experimental procedure was devised to monitor how varying light availability at different depths in a photobioreactor affects biomass accumulation. It was found that wild type cells exhibit extreme photoinhibition and shading effects, while ΔLH2 cells are capable of greater growth deeper in a photobioreactor. Future work will conduct the same experiment on the synthetic mutant *R. sphaeroides*. This data will be used to refine the system model and to make improvements.

**COMPLETING AN EDITION OF BRITTAIN’S IDA**

Channah Rubin  
Mentor: Joseph Loewenstein

This work includes a critical edition of the poem *Brittain’s Ida* with an accompanying essay on habits of attribution in early modern literary culture. *Brittain’s Ida* was first published in 1628 and attributed to Edmund Spenser, although scholars now believe it was written by Phineas Fletcher, an author of the generation following Spenser’s and one of several English poets especially indebted to him. This edition will become part of the larger Spenser Edition prepared by the Spenser Project and includes notes, gloss, an exploration of the physical bibliography of the poem, and a textual introduction placing the poem within literary and historical context. The accompanying essay on attribution traces the historical disputes over authorship of the poem and proposes comparisons between these disputes and the more modern philosophical writings of Barthes, Foucault, and Derrida.
THE RATIONALE OF FRENCH COUTURE UNDER THE OCCUPATION:
A RETROSPECTIVE HISTORY
Stephanie Ruthberg
Mentor: Steven Hause

This thesis explores, in political and cultural realms, the impact of World War II on the Euro-American fashion industry. It focuses mainly on the issue of French couture under German Occupation in the larger context of American, British, and German fashion. Given the historical and patriotic importance of couture in France, couturiers such as Lucien Lelong did collaborate with the Germans, but for the cause of Parisian Haute Couture. Couture also served as an intellectual form of rebellion against the occupiers, which increased the livelihood of Frenchmen. However, the consequences of the war on fashion, particularly the influence of Nazi Germany on France, did not come without ramifications. Collaborators faced shame and humiliation during the Épuration (Purging) with the liberation of Paris, and the stigmatization of collaboration still remains contentious today. Despite the retrospective criticism that they have received, I argue that French Couturiers had reason to keep their fashion design houses in operation.

QUESTIONING ACHILLES & PATROCLUS:
CONTEXTUALIZING THE OPINION OF ARISTARCHUS
Chase Sackett
Mentor: Ryan Platte

For twenty-five hundred years, scholars have debated the nature of the relationship between the epic heroes Achilles and Patroclus. Representations of Achilles and Patroclus by such ancient authors as Plato and Xenophon reveal key insights into their own efforts to position the Iliad in accordance with their own conceptions of society and the world, as well as their views on sexuality and the ancient Greek institution of pederasty, which involved both pedagogical and sexual relationships between adult males and young males nearing adulthood. Among modern scholars, the apparent attempt of Aristarchus of Samothrace to remove a potential reference in the Iliad to a sexual relationship between Achilles and Patroclus has attracted particular speculation. However, placing Aristarchus’ opinion in the context of his own commentaries and critical style, as well as the methods of his predecessors at the Alexandrian library, reveals that he is an unlikely opponent of homosexual relationship or the institution of pederasty in general. Instead, Aristarchus is more concerned with the notion of prepon, or propriety, as shown in his other works. Furthermore, it is impossible for the modern reader to fully understand why Aristarchus recommended the removal of those lines from the Iliad, or to definitively determine the nature of Achilles and Patroclus’ relationship as portrayed in Homer. As a result, the opinion of Aristarchus is best seen as emblematic of the tensions surrounding both interpretation of the Iliad in the ancient world as well as Alexandrian views on the institution of pederasty.

Alan Sariol
See Sunnie Hsiung

A FAILED FAIRY TALE COLLECTIVE
ACTION, NATIONALISM, AND DEMOCRACY
Viktoryia Schnose
Mentor: Margit Tavits

What explains the divergence of outcomes in post-communist transitions? Why has Belarus failed to democratize despite similar institutional and historic legacies to other Central Eastern European countries? I argue that the failure to democratize in the post-communist context can be partially explained by the inability of political elites to overcome the collective action problem of getting enough citizens to participate in mass mobilization that aims at challenging the political status quo in favor of democratic reforms. Political elites that used nationalism as a mechanism to solve the collective action problem successfully transitioned to democracy (for example the Czech Republic, Slovakia, Hungary, Poland and the Baltic States). When nationalism was not employed, post-communist transitions did not result in democracy as in Belarus.

Morgan B. Schoer
See Samuel A. Kolander
Since its establishment in 1948, Pakistan’s Inter-Services Intelligence (ISI) organization has played a pivotal role in shaping Pakistan’s political agenda. Initially, the ISI was created to monitor India’s activities and to provide military intelligence to Pakistan’s army, but over the course of the last sixty years, the function of the ISI has evolved and extended far beyond its original purpose. The ISI gained American favor by aiding U.S. funded Afghani rebels during the Soviet Union’s invasion of Afghanistan. However, following the Soviets’ defeat, the ISI turned a new page and allocated a number of its American and Saudi Arabian sponsored resources to supporting the Taliban and its anti-Western philosophy. Through ISI efforts, the Taliban was able to transform itself from a rebel group into a dominating political and military force.

Today, as the U.S. continues to devote immense resources to the “War on Terror,” the ISI appears as both ally and enemy to the American war effort. This work examines the evolution of the ISI from an intelligence organization focused on providing information to the Pakistani military, to a more politically minded group that attempts to appeal simultaneously to both the United States and the Taliban. In playing a double game, the ISI’s main objective is to prevent India’s government from building a positive relationship with Afghanistan’s government, and creating a political alliance that could sandwich Pakistan between two potentially hostile countries. Understanding the ideology, motives, and aims of the ISI will assist the United States’ plan of action in the “War on Terror,” and may eventually assist in the global effort to bring peace to the international community.

Recent globalization trends mean that individuals around the world can connect with each other faster, more extensively, and for a lower cost than previously imaginable. On the other hand, globalization has created a system in which not all citizens equally reap the benefits of international integration. For youth especially, globalization may be contradictorily just as much about global connectedness as it is about local isolation. By analyzing in-depth interviews and a survey conducted in the spring of 2009, economic indicators, and other qualitative and quantitative data, this study seeks to address how globalization has differentially impacted youth and their socialization processes specifically in Morocco.

Global market integration in Morocco—particularly following the structural adjustment reforms of the 1980s—has lead to a reduction in the size of the public sector, increased competition in the labor market, and more access to internet and communication technologies and consumer goods from abroad. Among other trends, these changes have fostered feelings of frustration among youth vis-à-vis their domestic opportunities and their place as a young citizen in a developing nation. As adolescence is a transitional period and one of identity formation, I argue that globalization has played a part both in disrupting the growth process from childhood to adulthood and in aggravating feelings of youth social exclusion in Morocco. Given demographic commonalities among the rest of North Africa and the Middle East, youth exclusion in Morocco may have larger implications for understanding youth growth processes and the impact of globalization elsewhere.

In response to widespread public condemnation of the hookup culture as inimical to women’s interests, this study examines what its participants believe are its pluses and minuses, its dangers and pleasures. It focuses on how college students use social media to negotiate their sexual-romantic relationships, and it asks, to what extent do text messaging and Facebook both facilitate and constrain men and women’s sexual self-efficacy? Taking a social interactionist perspective, it queries how students can better manage communication to conduct their social lives within the context of fluid relationships.

The study looks at the effects of technology on courtship and dating culture in American history from colonial times to the twentieth
century, and presents the results of a qualitative study of over 350 college students’ reactions to and assessments of today’s hookup culture and discusses how these students use text messaging and Facebook to participate in that culture. The historical section provides a framework for understanding the interplay between technology and social relationships in the hookup culture.

Ultimately, this study demonstrates that technology and person merge to shape sexual-romantic interaction. As technology progressed from written letter to telephone to automobile to cell phone and computer, from the eighteenth to twenty-first century, different types of sexual cultures developed. Introduction of new technologies has created opportunities for greater sexual freedom but also vulnerability to new dangers. How to manage contemporary social media in order to optimize erotic pleasure while minimizing social distress in the hookup culture requires critical thinking about what is and what is not sexually self-efficacious.

**DOVE’S (R)EVOLUTION: THE DARWINIAN RACE FOR BEAUTY**  
Angela Senne  
Mentor: Nicholas E. Miller

“Evolution,” an award-winning short film released online in 2006 as part of the Dove Campaign for Real Beauty, attempts to illustrate the contrast between “real women” and the “ideal women” commonly portrayed in the media by depicting a seemingly ordinary young woman’s dramatic physical transformation into a glamorous billboard model. Although the Dove commercial explicitly claims that the beauty industry has the power to define what society considers attractive and therefore argues for the cultural derivation of beauty perceptions, in many ways, “Evolution” also suggests a partly biological explanation for concepts about female attractiveness. According to current research in the relatively new field of evolutionary psychology, sexual selection in the form of mate preference for young, healthy, and fertile-looking women, traits that could signal the ability to produce healthy offspring and thereby pass on DNA, may underlie certain universal perceptions of beauty. Furthermore, it is possible that women's current obsession with physical appearance is rooted in the evolutionary force of female intrasexual competition, or the drive for women to compete for mates. As the Dove film points out, however, the media does play an undeniably significant role in modern women's pursuit of attractiveness; “racing” imagery in “Evolution” conveys an anxiety that the spread of media influence has turned the drive to improve physical appearances into a race for beauty. It seems, therefore, that competitive behavior, which may have been adaptive for much of our evolutionary history, has been stretched beyond its natural limits.

**EATING DISORDERS IN BUENOS AIRES: A PUBLIC HEALTH PERSPECTIVE**  
Sonia Sequeira  
Mentor: Carolyn Sargent

This research examines the general context of eating disorders in Buenos Aires, Argentina and the public health and government response to the problem. It specifically investigates *La Ley de Talles* (clothes law) that mandates all retail and designer clothing stores in Buenos Aires to carry a full range of sizes, from 36 to 48 (US XXS to XL). The public and professional reaction to the intervention is reviewed and its potential effectiveness based on current eating disorder literature evaluated. I argue that while the law is a commendable effort, its efficiency is severely hindered by the lack of public and industry support and the continuation of a culture of slenderness. Stronger prevention methods for eating disorders as well as ways that *La Ley de Talles* can be incorporated into these methods are recommended.

**THE EFFECTIVENESS OF MOBILE MEDICAL UNITS: A STUDY IN THE SOUTH AFRICAN AND AMERICAN CONTEXTS**  
Sara Silbert  
Mentor: Carolyn Sargent

This study is an analysis of the effectiveness of mobile medical units in the provision of primary health care to underserved populations. Mobile health units bring health care to people, thereby increasing access and availability in communities where there exist significant barriers to care. The notion of bringing care to patients, rather than requiring them to travel to health services is one that developed in a variety of contexts throughout history. Mobile units studied in the current day are vehicles equipped to provide health services in temporary locations within the communities they serve. This exploration of mobile healthcare is based on research of mobile clinics in rural KwaZulu Natal (KZN) Province in South Africa and the mobile medical units serving urban, underserved children in New Orleans, Louisiana. A detailed study and comparison of the ways in which these mobile medical units function, as well as the communities they serve, and the services they provide, allow for an analysis of their ability to provide primary health care. I demonstrate how mobile medical units have the ability to fill gaps in healthcare systems and provide the primary care services necessary to reverse the inherent lack and inaccessibility of care in underserved populations. The future uses of mobile medical units in the realm of healthcare are also discussed.
GLYB4 AS A NOVEL NEUREGULIN ANTAGONIST TO DISRUPT NEUROMUSCULAR DEVELOPMENT IN CHICKEN EMBRYOS
Erika Sims
Mentor: Jeffrey Loeb, Wayne State University

Neuregulins (NRGs) are a family of transsynaptic growth and differentiation factors believed to be important in strengthening and fine-tuning synaptic communication. The type of NRG involved in this research is the soluble isoform that has a heparin-binding domain (HBD) and EGF-like domain. To better understand NRG, the Loeb lab made an antagonist “GlyB4” to mask its effect. GlyB4 is a fusion protein that fuses human NRG’s HBD to the soluble ectodomain of HER4 with high affinity for EGF-like domains. GlyB4 can target the same heparin-rich cell surfaces that bind NRG. Here, normal neuromuscular development in chicken embryos serves as a control against GlyB4 treated embryos and allows a better understanding of synapses at different stages of development. Normal nerve junction development in the gastrocnemius, illiofibularis, and tensor fascia latae leg muscles were observed at stages E12 and E14. Synapses were observed through staining techniques and quantified using a program called Metamorph. E14 synapses are larger, more intense, and more colocalized. In order to see GlyB4’s effect on synapse development, GlyB4 was inserted in a pTriex expression vector to try and observe its effects in chicken embryos. However, due to a point mutation in HBD of GlyB4 during the procedure, not enough time remained to complete the expression vector. If it had been completed, the DNA plasmid would have been injected into the spinal cord of a chicken embryo at E2.5 using an electroporation technique.

BOLIVIAN IMMIGRATION IN ARGENTINA: MIGRANT SOCIAL NETWORKS AND BUENOS AIRES GARMENT INDUSTRY
Elizabeth Slater
Mentor: Bret Gustafson

One of the many impacts of globalization and capitalism is an increase in migration between countries and a corresponding growth in migrant laborers working in the informal sector of the economy. While this phenomenon is common world-wide, it is clearly seen among migrant workers from Bolivia and other neighboring countries who have found an economic niche in the garment industry. They provide cheap labor for many garment sweatshop owners and for many well-known clothing manufacturers, and have also taken advantage of the flexibility and informality of the industry to start their own small clothing factories, called talleres.

By analyzing the personal narratives of a group Bolivian immigrants, this study seeks to understand why these immigrants decided to leave their home country and what steps they went through to find work in Buenos Aires’ garment industry. It highlights the crucial role social networks play in connecting immigrant laborers with employment opportunities. It finds that while these networks help in finding employment opportunities, they also tend to restrict workers to the informal sector of the economy. Social networks, therefore, help to form the foundation of migratory movements, but they do not necessarily have the power to confront larger socioeconomic problems, such as a lack of regulation within the garment industry and an absence of labor rights for Bolivian workers.

LE PATIENT MALGRÉ LUI: A STUDY OF THE DOCTOR-PATIENT RELATIONSHIP IN THE SIXTEENTH CENTURY
Ronald Andrew Slipman
Mentor: Colette H. Winn

Attitudes regarding medicine in the sixteenth century, a time of veritable infatuation for the sciences, varied considerably, from uncertain mistrust to pure rejection. Though history provides a general understanding of the state of medicine at this time, to better comprehend the mentalities of doctors and patients, one must appeal to the literature of the period. In particular, one must consider the works of Michel de Montaigne (1533-1592), an educated yet exemplary sick man and humanist who criticized medicine, and of Laurent Joubert (1529-1582), a physician and well-respected medical professor who analyzed both the medical practice and the attitudes toward medicine and physicians in his time. The present study notes complementary ideas expressed in Montaigne’s Essais and Journal de voyage and in Joubert’s La médecine et le régime de santé, enabling a holistic comprehension of the state of medicine in this period of both scientific renewal and stoicism.

This study reveals the state of flux that characterized the doctor-patient relationship itself. Doctors were subject to the caprices of the sick, whereas patients were at the mercy of uncertain practitioners, and it was therefore natural that their rapport should be dynamic, complex, and paradoxical. Facing the medical institution that sought to cure humanity according to its own rules, the patient was without choice, despite his mistrust of medical science. Yet as medicine ultimately proved to be his only saving grace to restore health, the sick individual was forced to become a patient despite himself.
Amazighis, or Berbers, are the indigenous peoples of North Africa. In Morocco, a social movement has developed to advocate for Amazigh cultural rights in a nation dominated by Arab culture. Through interviews with several activists, this research examines the evolution of the movement from an informal group focused on culture to a formal entity that strives for political involvement. Many activists seek to participate in a formal political movement as a group-making project, but this entry requires compromises on the different levels of Amazigh identity. Amazigh activists redefine their identity in order to avoid legal hurdles and legitimize the need for a political party or to deny its value. Moroccan activists’ involvement in international groups and communities also changes the conception of “Amazighité.” Meanwhile, women in the movement are transitioning from their roles as traditional reproducers of culture into political activists. Finally, the social movement portrays Amazigh demands as equivalent to the democratization of Morocco. Organizations of Amazigh activists are attempting to “Amazighize” Morocco through alternations in the identity of a movement, people, and nation.

LOCALIZATION OF SYNUCLEIN PROTEIN IN MOUSE AUDITORY TISSUE
Apollo Stacy
Mentor: Brian Faddis

Synucleins are a family of proteins comprising alpha-, beta-, and gamma-synuclein. Synucleins are widely researched because of the role they may play in neurodegenerative diseases, including Alzheimer’s and Parkinson’s. Synucleins are also important for the normal hearing sensitivity of mice. Despite research efforts, the normal cellular function of synuclein is still unknown. One means of addressing this question has been to find how synuclein localizes in synuclein-expressing tissue. The goal of this research was to investigate the localization of synuclein in auditory tissue and to thereby come closer to understanding the function of synuclein in hearing. To date, light microscopy studies have revealed that alpha-synuclein localizes to synaptic terminals at the base of inner and outer hair cells and at synaptic terminals in the dorsal cochlear nucleus; beta-synuclein localizes to spiral ganglion cells and synaptic terminals in the ventral cochlear nucleus; and gamma-synuclein localizes to the cytoplasm of Dieter’s cells.

ANALYZING THE IN VIVO FUNCTIONS OF MYOSIN VI IN DROSOPHILA MELANOGASTER.
Andrew P. Stein
Mentor: Kathryn Miller

Myosin VI is a ubiquitously expressed actin-based motor protein that is involved in numerous cellular processes. In Drosophila melanogaster, myosin VI-deficient animals show low viability and male sterility. More specifically, myosin VI localizes on the front of an actin structure called the actin cone that is involved in sperm individualization. Actin cones consist of two domains: a region of parallel actin bundles at the rear and a meshwork of branched actin filaments at the front. In this work, we hoped to further demonstrate the in vivo functions of myosin VI in D. melanogaster. Work focused on the phosphorylation of myosin VI and myosin VI’s role in stabilization of actin cones. To examine the importance of phosphorylation at a threonine residue in the head domain of myosin VI, we engineered fly lines that expressed nonphosphorylatable, phosphomimetic, and unmutated versions of myosin VI, and analyzed the capacity for these transgenes to rescue myosin VI mutant defects. We also observed the effect of phosphorylation on the process of border cell migration, since myosin VI has been implicated in this process. Although we could not find the importance of phosphorylation in the head domain in this work, we suggested that overexpression of myosin VI might slow border cell migration. Second, we investigated the mechanism by which myosin VI stabilizes actin cones. We hypothesized that myosin VI stabilizes the front of the actin cone by supporting a function of Arp2/3 complex, which is an actin nucleator and generates actin branch points to form the actin meshwork. An Arp2 mutant (Arp2H161A) allows the Arp2/3 complex to remain bound to actin branch points for a longer period of time. If myosin VI stabilizes the branch points of actin filaments, then this Arp2 mutant should rescue actin cone structure in myosin VI deficient flies. Results showed that flies with the Arp2H161A transgene partially compensated for loss of myosin VI by forming better actin cones.
FROM CARAVANS TO CAMIONES: 
THE EFFECTS OF MECHANIZED TRANSPORTATION 
AND SHIFTING ECONOMIC CONTEXTS ON BOLIVIAN SOCIAL INSTITUTIONS 
Samuel Lawrence Steinberger 
Mentor: Bret Gustafson 

The unique ecology of the Bolivian Andes, and the resultant adaptations of the people living there, produced a subsistence system based on complementarity, that is, the production of different products in different altitudinal (ecological) zones and the exchange of those products. Today’s faster, cheaper, and easier mobility challenges established norms of social interaction, economic structures, and subsistence strategies. This work examines the effects of improvements and expansions in mechanized transportation on social relations in changing economic and social contexts. Specifically, the social institutions addressed are the desconocido, conocido, casero, and compadrazgo relationships, as well as the position of ayudante. Backed by observations, interviews, in-country experience, and bibliographic sources, this work argues that instead of current transformations resulting in a depersonalized and socially stagnant marketplace, social institutions are still impactful in Andean Bolivian economic activities. The social institutions present in these marketplaces are, in some cases, continuations of institutions formed and used during the era of llama caravans. Llama caravans, employed before all-weather highways and high-tonnage trucks, were once the major means of goods distribution across long distances and between altitudinal zones. Shifts in technological and economic contexts have not eradicated social interaction; instead, interaction between people is still governed by culturally informed social norms.

FEEDBACK CONTROL OF CLIMATE DYNAMICS 
Jessica Stigile 
Mentor: Jr-Shin Li 

Climate change has become a topic of great importance in recent years. Interest in climate change has even reached the government level as policymakers are looking for ways to mitigate the effects of global warming. We are interested in studying complex climate models with carbon-cycle feedbacks using control theoretic techniques. Formulation of an optimal control problem and solution via the pseudospectral method give insight into emission scenarios needed to global mean surface temperature to a specific value by a specific date.

BIOCHEMICAL VALIDATION OF CANDIDATE MODULATORS 
OF THE NOTCH SIGNALING PATHWAY 
Author: Colin Stomberski 
Mentor: Maxenia Garcia Ilagan 

Primary screens of a kinome/phosphatome siRNA library and a small chemical compound library utilizing a novel Notch-dependent split-Luciferase-based assay system have identified several candidate modulators of the Notch signaling pathway. Using various assays monitoring agonistic and antagonistic effects, Notch pathway specificity, cell viability, and effects on baseline luciferase activity, secondary screening of these candidate modulators has distinguished false positive hits from strong candidate modulators of the Notch signaling pathway.

LANDS OF THE LAKOTA: POLICY, CULTURE AND LAND USE 
ON THE PINE RIDGE RESERVATION 
Joseph Stromberg 
Mentor: Clare Palmer 

Land is invested with tremendous historical and cultural significance for the Oglala Lakota Nation of the Pine Ridge Indian Reservation. Widespread alienation from direct land use among tribal members also makes it a key element in exploring the roots of present-day problems—over two thirds of the reservation’s agricultural income goes to non-Natives, while the majority of households live below the poverty line. In order to understand how current patterns in land use are linked with federal policy and tribal culture, this study draws on three sources: (1) archival research on tribal history, especially in terms of territory loss, political transformation, ethnic division, economic coercion, and land use; (2) an account of contemporary issues facing the reservation, with an analysis of current land policy and use patterns; and (3) primary qualitative ethnographic research conducted on the reservation with tribal members. Findings indicate that federal land policies act to effectively block direct land use. Tribal members’ response to policy has been subject to the expression of cultural values, and the intent of policy has been undermined by a failure to fully understand the cultural context of the reservation. A discussion interprets land use through the themes of policy obstacles, forced incorporation into the world-system, and resistance via cultural sovereignty over land use decisions.
PREDICTION OF FINGER MOVEMENT FROM ECOG USING ARTIFICIAL NEURAL NETWORKS

Marshall Strother
Mentor: William Smart

In this work, we present a method for predicting finger movement from electrocorticographic (ECoG) brain recordings of human subjects using an artificial neural network. Patients were asked to perform a simple finger-movement task while bilateral ECoG data were collected. Precise measurements were also taken of the flexion of each of the fingers of the hand. A two-layer artificial neural network was then constructed to model the relationship between these two sets of data. The first layer of this network is modified to model the delay between cognition and physical motor response, and the second is a generalized linear model. Once the network is trained, it can be analyzed to discover the relative importance of (1) the different frequencies of the recorded signal, (2) the position of the recording electrodes on the cortex, and (3) the lag between the recorded signal and the observed movement. Results are presented from training this model on a variety of artificially generated data sets as well as a subsample of the ipsilateral data collected from a single patient.

THE INDIVIDUALIZATION OF THE POST-APARTEID IDENTITY: REPRESENTATIONS OF CLASS, GENDER, AND THE URBAN EXPERIENCE IN RECENT SOUTH AFRICAN FICTION

Juliana Sullam
Mentor: Jean Allman

In December of 2006, Rachel Donadio wrote an article for The New York Times concerning the status of post-apartheid literature in South Africa. The article explores the challenges young South African writers face in a distinctly changing political and social climate, particularly the obligation to address apartheid’s legacy in the Rainbow Nation.

This article was the inspiration for an examination of fiction written by young black authors in South Africa, such as Niq Mhlongo and K. Sello Duiker, with the intention of identifying trends found in the works by this new generation of writers. The study focuses on four novels that address a variety of issues specific to being young and black in a South African city from the early 1990s onwards. I argue that the new relevance of social class, as well as evolving definitions of masculinity and the gendered urban experience reveal the post-apartheid identity as undergoing a process of individualization. This literature portrays characters engaging with their environment as individuals rather than as part of a larger cohesive network. Thus, the individualization of the urban experience is significant both in its collective representation of several meaningful themes present in this new genre of fiction, and in how these recent literary works will fit into the larger context of South African literature after apartheid.

HIGH-RESOLUTION COMPUTED TOMOGRAPHY ANALYSIS OF RELATIVE DISTRIBUTION OF EMPHYSEMA IN MOUSE MODEL

Sammir M. Sullivan
Mentor: Jason C. Woods

Determining whether there is a topographical pattern in the distribution of emphysema (the tissue-destruction component of COPD) and accompanying parenchymal inflammation would be useful in understanding disease pathogenesis and future treatment. Lungs from three mice (two after a 77-day infection with a Sendai-viral model of COPD and one control) were resected and fixed with osmium tetroxide, and imaged using high-resolution (6 micron) micro CT. The resulting images were segmented by lobe and analyzed using Amira Imaging Suite (version 5.2.2). The severity of emphysema and inflammation in affected lungs were assessed by measuring relative x-ray attenuation across the five lobes (cranial, middle, caudal, accessory, and right lung). Emphysema was defined here as the percentage of tissue in a given lobe with attenuation one standard deviation below the mean. Inflammation severity was defined as the percentage of tissue with attenuation one standard deviation above the mean (absolute attenuation could not be used since it is not known how osmium tetroxide is differentially absorbed in lung tissue). Quantitative analysis of attenuation was able to distinguish severity of emphysema and inflammation in each lobe, but did not point out any apparent preferential distribution of tissue damage within or between lobes. Results suggest that emphysema in this mouse model does not develop with any affinity for a particular lobe. In the future, we hope to develop in-vivo morphometric imaging techniques at similarly high spatial resolution.
DETERMINING THE ROLE OF VIP NEURONS IN MOUSE CIRCADIAN RHYTHMS

Daniel Sun
Mentor: Erik Herzog

The mammalian suprachiasmatic nuclei (SCN), located in the anterior hypothalamus, are a master circadian pacemaker. Together, these 20,000 neurons regulate daily rhythms in physiology and behavior of the organism. Elucidating the mechanisms behind rhythm generation and synchrony between single cell oscillators in the SCN is a crucial step in the study of disorders related to circadian dysfunction. Recent studies implicate the neuropeptide vasoactive intestinal polypeptide (VIP) as a candidate for generating and coordinating rhythms in the SCN.

We hypothesized that VIP-expressing neurons in the SCN are the pacemaking cells which drive and synchronize rhythms throughout the SCN and coordinate daily running wheel behavior. To test this hypothesis, we generated a transgenic mouse line that could express yellow fluorescent protein (YFP) and conditionally activate Cre recombinase in VIP neurons (VIP-YPFstop-Cre-ERT2) with the ultimate goal of selectively deleting VIP neurons in the SCN. We expect that VIP-cell-less mice will exhibit disrupted circadian locomotor activity.

We have confirmed germline transmission of the transgene in two lines of mice by PCR-based genotyping. Using immunohistochemistry, we have verified the co-expression of endogenous VIP and our VIP-YPFstop-Cre-ERT2 construct in cells of the SCN, olfactory bulb, cortex, and enteric nervous system. In addition, we have observed YFP expression in living cells of cultured SCN explants. Subsequently, we crossed these mice with floxed diptheria toxin (DTA) mice, and found that treating cultured tissue from these animals with tamoxifen decreased the number of VIP neurons compared with controls. We have also delivered tamoxifen into transgenic mice by three different protocols and found no effect on circadian behavior or the number of VIP neurons in their SCN. We conclude that our transgenic construct is faithfully expressed in VIP neurons, is present in live VIP neurons, and can be used to conditionally eliminate VIP neurons in vitro.

BEYOND ROLL CALL VOTING:
DESCRIPTIVE REPRESENTATION’S SUBSTANTIVE IMPACT

Adam Michael Susser
Mentor: Michael Minta

What constitutes representation? Is voting the “right way” all that is required of members of the United States Congress? Representation in Congress is about more than roll call voting and the overwhelming focus of scholarly inquiry on voting misses critical aspects of representation. While there is limited scholarship on forms of representation beyond roll call voting, limited research exists on bill sponsorship and virtually no studies have systematically studied the impact of race and ethnicity on sponsorship of bills that focus on Latino-interests and African American-interests.

I argue that race and ethnicity are extremely important factors in determining whether legislators will introduce legislation that explicitly concerns racial issues. This research indicates that the race of an individual legislator has the greatest effect on the predicted number of African American-interest and Latino-interest legislation. Additionally, the research challenges the concept of “influence districts” for African Americans and provides limited support for these districts for Latinos. Regression analysis combined with case studies and correlation tests suggest that even when significant African American and Latino voting age populations exist, they may not be the best indicator of proper representation.

Finally, examination of bill sponsorships from the 110th Congress indicates that African American legislators are more likely to sponsor legislation explicitly pertaining to African American racial issues than other representatives, and that there is no significant difference between Latinos and White representatives’ bill introductions when controlling for party and voting age populations. The reverse holds true for Latino issues, in that Latino legislators sponsor more Latino-interest bills, and there is no significant difference between African American and White legislators’ sponsorship of Latino-interest bills. This outcome demonstrates that descriptive representation is critical to giving minority-interest legislation a chance to be considered.

INCOME INEQUALITY, PRIMARY CARE EXPERIENCES, AND UNIVERSAL COVERAGE: TRANSLATING INSURANCE REFORM INTO HEALTH CARE REFORM

Kelley Turek
Mentor: Peter Benson

In the United States, problems of access to health care and the mounting inefficiencies and expenses of the system have put health care reform at the forefront of social and political agendas. Current reform discussions revolve around schemes for insurance reform to expand coverage to the 16 percent of Americans under the age of 65 who are uninsured. The push for insurance reform is due in part to the growing public mandate to minimize exclusion of vulnerable groups from equitable access to social policies that enhance quality of life. The popular support for increasing insurance coverage to protect the poor and marginalized groups of society is really a call for equitable access to high-quality care. What this reform discussion does not always directly address is whether insurance reform will lead directly to such health care reforms that benefit vulnerable population groups. This project discusses the inequities in access and quality of care across the socioeconomic
gradient—primarily income levels—that lead to disparities in health outcomes for various groups within the United States. In most developed countries, these disparities and the public mandate for wider social inclusion have been answered by systems of universal insurance coverage. By evaluating data from a recent cross-national comparison of primary care utilization and quality of experiences by income level under varying models of universal coverage in Australia, Canada, and the United Kingdom, this paper explores the potential of broader insurance reform in the United States to address the striking disparities in access to and quality of care for low-income groups.

CONSIDERING THE BEST INTERESTS OF U.S. CITIZEN CHILDREN IN THE DEPORTATION HEARINGS OF THEIR UNDOCUMENTED PARENTS
Grace Van Voorhis
Mentor: Claire Solomon

According to the Current Population Survey conducted in March of 2008, there are now approximately 4 million United States-born children living in families in which one or both parents are undocumented, up from 2.7 million in 2003. Following the September 11, 2001 terrorist attacks, the U.S. Immigration and Customs Enforcement developed a comprehensive strategy for “removing all removable aliens by 2012” referred to as Operation Endgame. It has since poured billions of dollars into worksite enforcement operations and home raids in order to identify and deport undocumented persons. However, Operation Endgame’s has serious implications for the millions of children who were born in this country to undocumented parents and possess certain rights and privileges associated with citizenship. The Urban Institute estimates that for every two undocumented immigrants that Immigration and Customs Enforcement apprehends, one U.S. citizen child is implicated. The thousands of U.S. citizen children whose undocumented parents are deported each year must either accompany their parents to a foreign country or experience family separation; in essence, they must forgo either their right to reside in the U.S. or their right to a family life. Under current immigration law, however, federal judges have very little power to evaluate the potential impact of deportation on implicated citizen children when issuing a verdict. In fact, immigration law is the only area of law involving children in which the “Best Interests of the Child” are not a primary consideration in the judge’s decision-making process. This work argues that the U.S.’ handling of deportation cases causes children to suffer unnecessarily and stands in violation of both national and international legal and moral principles. It concludes that federal judges must be given the discretionary power to consider the best interests of the child when deciding whether to deport undocumented parents.

ORTHOLOGOUS CIS-REGULATORY SEQUENCES SHOW NO SIGNIFICANT SEQUENCE SIMILARITY: IMPLICATIONS FOR THE BINDING SITE TURNOVER MODEL
Sandeep Venkataram
Mentor: Justin Fay

The molecular evolution of cis-regulatory sequences is not well understood. Comparisons of closely related species show that cis-regulatory sequences contain a large number of sites constrained by purifying selection. In contrast, comparisons of distantly related species show that cis-regulatory sequences retain little to no sequence similarity but drive similar patterns of gene expression. Gain and loss of transcription factor binding sites is one model by which cis-regulatory sequences can diverge without a change in function. Yet, because cis-regulatory sequences are difficult to align between distantly related species it is difficult to know whether sequence divergence is just a consequence of binding site turnover. To characterize sequence divergence, we generated a database of orthologous cis-regulatory sequences across 14 yeast species. Orthologous cis-regulatory sequences were defined by syntenic relationships with conserved protein coding sequences. Both local and global alignment algorithms show that nearly all orthologous cis-regulatory sequences have no significant level of sequence similarity. Analysis of binding sites found by ChIP-chip as well as well-annotated cis-regulatory sequences show that a simple turnover model cannot explain cis-regulatory sequence divergence. Results indicate that cis-regulatory sequences may be evolving under a complex model of compensatory changes or that many sequences have diverged in function.

Yuqi Wang
See Samuel A. Kolander
THE SPECTRUM OF FREEDOM:
LESTER BURNHAM'S EVOLUTION THROUGH
COLOR SYMBOLISM IN AMERICAN BEAUTY
Mollie Wasserman
Mentor: Aileen Waters

In his film American Beauty, director Sam Mendes uses color symbolism to communicate the hidden emotions and conflicts of seemingly flawless characters and their environment in a suburban neighborhood. Lester Burnham, his wife Carolyn and their daughter Jane seem to live in a perfect little town where outward appearances govern daily activities. In reality, Lester is suffering a major mid life crisis, experiencing inappropriate sexual desires, becoming obsessed with his body image and wishing to abandon his life. After years of subservience to his controlling wife, Lester awakens from his metaphorical coma and decides to pursue his true desires in an attempt to give his life substance. This awakening is best illustrated through his erotic desire and obsession with his teenage daughter’s friend and the resulting sexual fantasies.

To communicate the theme of appearance versus reality, and to help the viewer track the evolution of Lester's metamorphosis, Mendes uses color symbolism and the juxtaposition of colors in Lester's dreams to symbolize his growing internal metamorphosis and its confliction with his posed façade. By analyzing Lester's dream sequences through color explanations provided by other scholars, it becomes clear that Lester's sexual fantasies enable him to evolve and ultimately lead to a total liberation from his imprisoning lifestyle and repressed desire to escape.

THE EFFECTS OF VIBRATION AND LOTUS COATING
ON SOLAR CELL DUST RETENTION
Matthew Watkins
Mentor: Guy Genin

The adverse effects of lunar dust on solar panels could potentially be very detrimental for extended-stay missions on the Moon. The lunar dust could block light to the solar panels, thereby decreasing the power output of the solar cells. Decreased power could result in reduced mission objectives and it could adversely affect the safety of the flight crew. Even during the short-duration Apollo sorties in the 1960’s, lunar dust contamination was evident, thus a method of removing lunar dust from solar panels would be extremely beneficial. Existing research has focused on using electrostatic charges to remove dust, but we explored other possible solutions during our simulated lunar gravity test flight. The objective of the lunar gravity test flight was to determine the effects of vibrating lunar dust-coated solar panels at prescribed tilt angles. Multiple vibration intensities were tested as a removal technique, as well as the effectiveness of lotus coating as a preventative measure.

DORMITORY DISTURBANCES:
A PROPOSAL TO ADDRESS AND PREVENT DATING VIOLENCE
AT WASHINGTON UNIVERSITY IN ST. LOUIS
Lauren Weiss
Mentor: Jami Ake

This project examines the prevalence and types of dating violence among undergraduate students at Washington University and at colleges across the country. Although estimates of such abuse vary widely, academic and health promotion surveys indicate that hundreds of students are emotionally abused each year at Washington University alone, with sexual and physical abuse less common but still problematic. Despite the large numbers of students affected, no judicial policy or campus programming explicitly targets dating violence on campus. Through a literature review of dating violence prevalence, sexual assault prevention programs, and interviews with campus faculty and staff, policy and programming recommendations were developed for Washington University that could be implemented to support survivors of abuse, hold abusive students accountable, and prevent such incidents in the future. I recommend creating a coordinated community response that involves the judicial administrator, Residential Life staff, Washington University Police Department, Student Health Services, and other concerned campus groups, such as Greek Life. In addition, the installation of a campus life staff member to specifically focus on sexual and relationship violence at Washington University is recommended. That staff person would act as an advocate and support person for abused students, oversee campus programming and policy changes, and conduct research on prevalence rates and effective intervention techniques at Washington University.
UNITED STATES DRUG POLICY IN COLOMBIA:
A HISTORY OF CONTINUITY
David Weisshaar
Mentor: Ignacio Sanchez Prado

For the last three decades, United States policymakers have tried persistently to stem the flow of cocaine from Colombia to the United States. Such efforts reached a new level when Congress passed the $1.3 billion Plan Colombia legislation in 2001. Analysts have frequently portrayed Plan Colombia as a constructive, innovative approach in the so-called “war on drugs.”

While many observers have viewed Plan Colombia as a step forward in U.S. drug policy to root out the Colombian cocaine trade, closer examination of the historical record reveals the Plan’s resemblance to past policies. Throughout the last thirty years, critical features of U.S. drug policy in Colombia have remained fixed. First, the focus of the policy has always been on rooting out supply in the source country, not on depressing U.S. demand. Second, U.S. drug policy has consistently relied on military solutions rather than development strategies. Finally, all U.S. attempts to curb drug trafficking in Colombia have failed to significantly decrease the amount of cocaine flowing into the United States or to curb domestic cocaine usage.

This research project traces these continuities in U.S. drug policy from the presidency of Ronald Reagan to the present day, examining primary documents such as national security directives and legislative actions. The paper considers alternative strategies for fighting the war on cocaine, including investing greater resources in domestic drug treatment and usage prevention programs and funding economic development projects in the Andean region. However, the research project concludes that the core focus of United States drug policy is unlikely to change regardless of the ideological bent of any one president because of the entrenched nature of the current supply-side, militarized policy.

ULTRASONIC SOURCE LOCALIZATION
Andrew Wiens
Mentors: Ed Richter and Sandeep Gogineni

An important component of robot navigation is location awareness. In order to navigate through its surroundings, a robot must be aware of nearby obstacles. When multiple robots must operate in the same area it is especially important for each robot to be cognizant of the location of the other robots. There are many different techniques that can be employed to enable robots to locate each other. Here ultrasonic transducers are used to accomplish this task. On one robot we mounted an ultrasonic transmitter and on another robot we mounted two ultrasonic sensors with narrow beams onto a rotating servo motor. The two receiving sensors form our receiver array. We placed the two ultrasonic receivers close to each other so that they are present at the same phase center. Also, we fixed them at a thirty degree angle relative to each other. As a result of this configuration, the signals picked up by these two receivers are in phase but differ in amplitude. We use the difference in the amplitudes of these two signals to infer about the direction of arrival of the signal coming from the robot with the ultrasonic transmitter. Finally, we rotate the servo motor to align the axis of the receiver array with the location of the ultrasonic transmitter. In this manner the angular position of the ultrasonic transmitter is tracked in real-time.

THE EVOLUTIONARY BASIS OF SPECIFIC FEARS
IN 3- TO 5-YEAR-OLD CHILDREN
Lynn Wilkie
Mentor: Pascal Boyer

This project aims to differentiate evolved fears, which automatically develop under normal circumstances, and learned fears, which develop through direct teaching or life experiences. We worked with children between the ages of three and five in order to access a young age group that has been previously difficult to test. We developed new method that tests memory for a fear-inducing versus neutral story, the assumption being that fear will manifest as a significant difference in recall of the details of the story between the two conditions. We looked at fears of animals and social exclusion. There were no differences between the conditions for recall of the entire story, but for the predator story there were significant differences for “key details” relating especially to the description of the animal. Our hypothesis that this fear would decrease as the children aged was correct, suggesting that fear for animals is innate but declines with lack of experience. Additionally, we found no gender difference in fear towards the animal, which is in contrast with most previous studies and suggests bias in self- and parent-report methods. On the other hand, the results for the social exclusion story were inconclusive. More research should be conducted in the future to determine whether the trend for the animal story continues as children get even older.
INDIGENOUS MOBILIZATION: A CASE FOR INTERNATIONAL LAW
Marley Williams
Mentor: Bret Gustafson

On the 13 of September, 2007, the “United Nations Declaration on the Rights of Indigenous Peoples” was adopted by the United Nations General Assembly. Indigenous peoples see the United Nations Declaration as the culmination of centuries of activism and protest on behalf of indigenous peoples rights under international law. Indigenous activists tout the Declaration as a significant step towards addressing many of the social, economic and political issues that have been of primary concern and importance to indigenous peoples around the world. This study addresses several fundamental questions raised by the recent adoption of the United Nations Declaration on the Rights of Indigenous Peoples by the UN General Assembly. First and foremost, as an international law document, what sort of binding force does the Declaration have on member states of the United Nations? Second, what impact has the Declaration had on indigenous communities and governments with large indigenous populations? These questions are approached through case studies of Peru and Bolivia: two Latin American nations that both voted for adoption of the Declaration. The role that the Declaration has played within the political systems of these two nations as an international legal instrument adopted by the United Nations and as an impetus for indigenous mobilization is explored.

PET IMAGING OF THE PRE-METASTATIC NICHE WITH 64-CU-CB-TE2A-LLP2A, A HIGH AFFINITY LIGAND FOR INTEGRIN $\alpha4\beta1$
Jessica Wilson
Mentor: Carolyn Anderson

This project involved trying to image the pre-metastatic niche using radioactive Cu-64 and Positron Emission Tomography (PET) imaging. Research shows that before a tumor spreads to a secondary site, a tumor receptive niche is created that makes it more likely the tumor will spread there. There is experimental evidence that hematopoietic progenitor cells (HPCs) home to the pre-metastatic niche, and alpha-4 beta-1 is an integrin found in high concentrations on HPCs. The research hypothesis is that the pre-metastatic niche can be imaged with the ligand, Cu-64-CB-TE2A-LLP2A, which binds with high (picomolar) affinity to alpha-4 beta-1. Results are promising.

DIRECT-TO-CONSUMER ADVERTISING OF PRESCRIPTION PHARMACEUTICALS: THE CREATION OF THE INFORMED PATIENT-CONSUMER AND THE DEVELOPMENT OF A NEW SICK ROLE
Michaela Wilson
Mentor: Peter Benson

Direct-to-consumer advertising of prescription pharmaceuticals is a paradoxical concept: the targets of this advertising are incapable of directly purchasing the products being promoted, and demand for the products advertised should be limited by the number of people who need treatment, not consumer desire. Despite this apparent paradox, this form of advertising is ubiquitous in American media. This work explores the logic behind direct to consumer pharmaceutical advertising and examines its implications on the expected patient-consumer role, using the idea of biological citizenship as a way of understanding the relationship between the rights and responsibilities associated with pharmaceutical patienthood. Through an examination of public information that is available to patients, this project revealed the ways in which advertising has created the expectation of a confident, informed, pro-active patient, who is in charge of his or her own health. This expectation has created a considerable potential for placing blame on patients who are unable to fit into this new sick role. Because a change in patient roles inevitably impacts the role of physicians, the work also considers the effects of shifting significant healthcare responsibilities from the physician to the patient. Through this analysis I hoped to uncover the obligations associated with being a biological citizen and discover the duties held by those with relationships to these citizens.

THE WELFARE STATE AND MULTICULTURAL POLICIES: EXPLORING INTERACTING EFFECTS OF RECOGNITION AND REDRESS
Amy Xu
Mentor: Ryan T. Moore

State-level policies occur in strange packages. Previous literature and intuition suggests that policies with similar ideological intent occur together, but with regard to policies that focus upon minorities and the welfare state, this is often not the case. I regress per capita welfare spending in the American states against measures of multicultural policies (MCPs), which include affirmative action, bilingual education, gay marriage, and official English legislation. MCPs can be further categorized by the intent of policy, whether it is through recognition of rights or redress of previous social ills to minority groups. Data is analyzed with three methods: studying MCPs as an overarching category,
observing indices of recognition and redress policies, and using counterfactuals to predict the individual effect of a particular MCP in an American state. Results suggest potential validation of the theory, implying that there is indeed a negative relationship between MCPs and the welfare state—a result which may be attributed to the interacting effects of public opinion backlash and state fiscal constraints.

TRACER VALIDATION OF CFT AS POTENTIAL MARKER FOR NIGROSTRIATAL NEURONS
Chen Xu
Mentor: Joel S. Perlmutter

Parkinson disease (PD) is one of the most debilitating neurological disorders encountered. Individuals afflicted with PD experience, among other symptoms, tremor, rigidity, bradykinesia, and postural instability. These behavioral manifestations of PD can be induced in non-human primates by injection of the selective neurotoxin 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP), which destroys dopamine-producing nigrostriatal neurons leading to loss of striatal dopamine, mimicking nigrostriatal neuron reduction and striatal dopamine deficiency that occur in people with PD. An objective measure of the loss of these nigrostriatal neurons is critical for testing new treatments to determine if they can slow disease progression. Several currently available biomarkers have been proposed but none have been proven to faithfully reflect PD severity. The purpose of this study is to validate a neuroimaging marker for the loss of nigrostriatal neurons. Using the MPTP injected non-human primate model, we investigated the potential for a synthesized radioligand, [11C] 2β-carbomethoxy-3β-4-fluorophenyltropane (CFT), to be a marker for nigrostriatal neurons. Nine non-human primates were trained to perform various tasks pre- and post-MPTP injection. Video recordings of these tasks were given to a blinded rater who provided animal behavioral ratings on each non-human primate. Positron emission tomography (PET) scans using CFT were performed on each non-human primate throughout the duration of the study. CFT binding potential (BP), which provides a measure that reflects the number of specific binding sites, was calculated for each scan to show amount of striatal CFT binding. Significant correlations between CFT BP and animal behavioral ratings were revealed (p < 0.01). Upon euthanasia, tissue samples were extracted from non-human primates and striatal dopamine levels were obtained through high pressure liquid chromatography (HPLC). CFT BP showed significant strong positive correlations with striatal dopamine content (p < 0.001). Five separate non-human primates underwent the same training protocol. Upon euthanasia, brainstems were sliced and substantia nigral cell counts were obtained through stereology. Although the number of studies is still very small, the nigral cell counts may correlate with CFT BP. Based upon the present data, CFT has the potential to be a neuroimaging marker for nigrostriatal neurons.

VICES, SCAPEGOATS AND EVIL FORCES: MAGIC IN THE WORKS OF MIGUEL DE CERVANTES Y SAAVEDRA, JUAN RUIZ DE ALARCÓN, AND MARÍA DE ZAYAS Y SOTOMAYOR
Neha Yakhmi
Mentor: Nina Davis

During the Golden Age of Spanish literature (the sixteenth and seventeenth centuries), both popular beliefs in magic and religion coexisted in a paradoxical world. At the time of the Spanish Inquisition, the Catholic Church imposed censorship upon all published works; authors strategized and shaped the content of their works rhetorically in order to see them in print. In this study, I examine one of the Novelas ejemplares of Miguel de Cervantes y Saavedra, “El coloquio de los perros”; two plays by Juan Ruiz de Alarcón, Quien mal anda en mal acaba and La prueba de las promesas; and two novellas by María de Zayas y Sotomayor, “La inocencia castigada” and “El jardín engañoso.” All contain elements of magic—talking dogs, witches, pacts with the devil, and magicians—but each of the authors treats magic in a different manner, both due to censorship and their personal ideologies about magic.

The study focuses on the treatment of several groups who are affected by or use magic. Some people use magic to exploit women, magicians use magic for good rather than evil, Moors and other men use magic themselves or make pacts with the devil, and witches consort with the black arts as well. Not only do I examine the treatment of these characters in the works, but I also attempt to decipher the intents of the authors and to examine how censorship influenced strategies of representation in their writing. Cervantes uses magic as a way to share personal opinions in a context that may or may not be taken literally. Alarcón marginalizes Moors and women while exalting the potential good of magic in the hands of a caring father. Finally, Zayas demonstrates feminism that denounces men’s dependence on magic to control women and applauds the triumph of the virtuous women against such forces.

Han Yuan
See G. Jason Huang
Hanci Zhang
See Nathaniel Hausfater

DEVELOPMENT OF A SINGLE PLASMID BACTERIAL ONE-HYBRID SYSTEM FOR STUDYING TRANSCRIPTION FACTOR-DNA BINDING SPECIFICITY
Nannan Zhang
Mentor: Gary Stormo

Understanding DNA binding specificity of transcription factors provides a basis for studying gene expression and regulation. This study presents a novel modified form of the bacterial one-hybrid (B1H) system to study the transcription factor Zif268 and its interaction with DNA on a single plasmid in vivo in Escherichia coli. The new B1H plasmid expresses a Zif268-RNA polymerase complex, which binds to a target site on a region of the same plasmid, activating transcription of reporter genes that promote cell survival on minimal media. To date, we have verified the utility of the single plasmid B1H system on wild-type Zif268 binding as indicated by a significant presence of positively-selected clones against a negative control. This novel single plasmid B1H system permits the simultaneous randomization of both the transcription factor and binding site, thus allowing for the determination of combinations that promote optimal binding affinity using paired-end sequencing of positively-selected clones.

USING FLUORESCENT BIOPARTICLES TO QUANTIFY EFFECTS OF INTERLEUKIN-7 AND INTERLEUKIN-15 ON PHAGOCYTIC IMMUNE CELLS
Tony Zhou
Mentor: Richard S. Hotchkiss

Sepsis is a severe bloodstream borne infection and is a significant cause of mortality in critically ill patients. One of the most significant complications from this infection is the systemic inflammatory response and loss of immune cells, specifically monocytes, macrophages, and neutrophils which have key phagocytic function to engulf harmful pathogens. Interleukin-7, a hematopoietic growth factor, is an important cytokine that modulates activity of the immune system by stimulating the proliferation of B, T, and NK cells. In this study, we tested the ability of IL-7 to enhance phagocytic uptake of innate immune cells in sepsis. In order to quantify the effect of IL-7 on the engulfment of apoptotic cells by macrophages, we developed an assay using pHrodo succinimidyl ester, a pH sensitive fluorescent dye, and fluorescently labeled E. coli bioparticles. These bioparticles were administered to splenocyte suspensions obtained from septic mice treated with or without IL-7. The effect of IL-7 to improve the uptake of bacteria in sepsis was quantified by flow cytometry.

FORMULA SAE RACE CAR
Ricky Marcus, Daniel Eicholtz, Ryan Kemmet, Brendan O’Mahony, Katharine Brown, Jereme Kramer, Brian Aggrey, Achal Upadhyaya, Armen Nazarian, Zachary Morrison, Aron Lurie, Mihai Rasinariu, Will Slater and Melissa Holtmeyer
Mentor: Pat Harkins

Society of Automotive Engineers (SAE) competes in the Formula SAE competition: an automotive racing event involving hundreds of universities and thousands of students from across the globe. Wash U’s team, WUracing, allows students to apply engineering principles learned in the classroom for the design of an ultra-high-performance vehicle, and it is quickly becoming the training ground for tomorrow’s race engineers.
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12:30 p.m. – 3:30 p.m.
Seigle Hall
The May Auditorium, Simon Hall