Abstracts

Individual Projects

Novel Biomaterials for Cell Transfection and Extracellular Matrices
Marie-Caline Abadjian  
*Mentor*: Zhibin Guan

In the area of biomaterials research, our group focuses on the design of new and improved material systems derived from naturally abundant building blocks (carbohydrates and peptides). In using these starting materials we have synthesized biomaterials with: 1) rich functionality, making them ideal for further structural fine-tuning and allowing optimization of polymer systems; 2) inherent biocompatibility, being derived from biotic starting materials; 3) biodegradability, as polymer chains are linked with enzymatically cleavable bonds; and 4) scalability, because of the simplicity with which the polymers are synthesized and the bulk availability of the starting materials. Thus far, a novel class of carbohydrate-derived side-chain polyethers was synthesized by condensation polymerization. These polymers combine biodegradability and functionalizability while resisting non-specific protein adsorption, which makes them excellent candidates for anti-fouling biomaterial applications. Additionally, a series of cationic carbohydrate-peptide copolymers was synthesized as a new class of biomaterials. Through collaboration with colleagues in the biophysics and physiology departments, we found that these polymers allow gene transfection while maintaining excellent cell viability. Encouraged by these promising results, we are now focusing attention on the synthesis of extracellular matrices for tissue engineering. Using the same basic design criteria, we have synthesized a novel hydrogel, which is currently undergoing *in vitro* cellular testing for tissue engineering applications through collaborations with colleagues in our biomedical engineering department. The synthesis of a series of these hydrogels remains the focus of ongoing research.

Double Chiasmatic Invagination: The Diagram in “The Law of Genre”
Amelia Acker  
*Mentor*: John Culbert

In Jacques Derrida’s article titled “The Law of Genre,” the diagram of double chiasmatic invagination of edges appears within a discussion of the textual movement in Maurice Blanchot’s “The Madness of the Day.” The diagram maintains a certain resistance to interpretation(s) because of the silence surrounding its presence in the description of the account. Consequently, this project turned towards the logics of spacing and figuration of the diagram in the Jacques Derrida Papers in the Jack Langson Library Special Collections. The various appearances of double chiasmatic invagination in the archive reveal how methods of transmitting information in the archive shape the nature of the knowledge that can be produced. In “The Law of Genre,” other figurations of feminine elements are linked to the diagram of double chiasmatic invagination in which the sexual differential of “woman” is involved. This creates a constellate effect that draws upon “woman” in particular ways through figures with precarious phallocentric affinities throughout the article. The project attempts to prove how Derrida critiques phallocentric discourse in patriarchal terms. In response, the project offers an alternative reading in which the implications of inscribing figures of the body upon a text are revealed, proving that allegiances to phallocentric discourse are maintained through figurations of feminine elements as textual effects in “The Law of Genre.”

Cardiovascular Responses During Pregnancy and their Effect on Birth Outcomes
Shushmita Ahmed  
*Mentor*: Ilona Federenko

Recent studies have found a relationship between pregnant women’s cardiovascular output and birth outcomes. Using the “Trier Social Stress Test” (TSST) to administer mild stress, changes in heart rate and blood pressure were recorded twice during pregnancy and once after birth. These measures were correlated to each other and to the baby’s birth weight. Results suggest that cardiovascular responses do not decrease as pregnancy progresses and do not correlate with the birth weight of the infant.

Popular Culture Representations of Female Adultery in the 1960s and 1970s
Alison Altuna  
*Mentor*: Carol Burke

Historians and critics of the 1960s and 1970s widely recognize the impact the sexual revolution had on social mores and individual sexualities, particularly on those of women. Following the conservative era of the 1950s, which embraced the ideal of the male breadwinner family, the sexual revolution rejected the postwar model of the sexually submissive and/or sexually repressed housewife in hopes of reviving female sexuality. Research shows that, although the sexual revolution did not mark the beginning of overt female sexuality, it did provide the opportunity for many women, single or married,
to explore less restrictive avenues of sexual gratification and sexual expression. This study focuses on the sexual revolution’s intersection with popular culture mediums such as magazines and film, and, most specifically, it discusses popular culture’s representation of one particular instance of female sexuality, female adultery. As one reflection of popular culture, *Cosmopolitan* magazine addressed the subject of female adultery by progressively publishing articles like “Why Women Stray” (1967), “Low-Fidelity Wives” (1969), and “Adultery for Adults” (1969). Appropriating the sexual revolution’s argument for adultery, these exposes and “self-development” guides ventured outside their conservative, moral boundaries to radically proclaim adultery’s benefits to their female readers. Mike Nichols’s “groundbreaking” film *The Graduate* (1967), however, challenges the new aesthetic of the sexual revolution and assumes a more conservative position in its treatment of adultery. Nichols’s stylistic choices combine to create an unsavory depiction of the female adulterer. With regards to this magazine and this film, the sexual revolution had a surprisingly inverse effect.

**The Influences of Depression Among Latino Male Undergraduates**
Juan Alvarez  
*Mentor:* Jeanett Castellanos

Latina/os are the fastest growing minority group in the United States, projected to reach 98 million by mid-century, yet there is a miniscule amount of research on depression and this population. The ever increasing number of Latinos, together with the gaps in the research on depression and Latinos, creates a need to investigate the correlates of depression within this marginally studied group. This study examines the relationship between psychological, social, and cultural variables, and how they relate to depression within Latino male undergraduates. The predictor variables of Collective Self-Esteem, College Self-Efficacy, Locus of Control, Family Support, Perceived Barriers, Perceived Parental Gender Role, Acculturation, Machismo/Marianismo, and University Environment/Cultural Congruity are tested in relation to the criterion variable, Depression. One hundred and fifty subjects from a southwestern university will participate in the study. A stepwise hierarchical regression will be conducted to examine the influence of each variable on depression. It is hypothesized that all three domains will have an influence on depression, with the psychological domain accounting for the largest amount of variance. Future research and practical implications will be discussed. Recommendations for university officials and university counseling centers will be provided.

**The Relationship Between Acculturation Levels, Values, and Educational Attainment Among Asian American College Students**
Anjuli Amin  
*Mentor:* Thomas Parham

As the demographics of our society continue to change and become more ethnically diverse, the field of psychology, as a result, “continues to develop and refine conceptual models, research methods, and application resources” to fit the needs of the general population. Research conducted on Asian Americans has looked at within- and between-group differences concerning such issues as the manifestation of psychological symptoms and immigration/refugee issues. However, much of the literature has indicated a lack of mental health service usage by Asian Americans, and various explanations have been put forth to attempt to account for this phenomenon. Studies have shown that values and acculturation levels are factors in the help-seeking attitudes of this population, along with demographic variables such as one’s level of educational attainment. Using the Asian Values Scale and the Suinn–Lew Asian Self Identity Acculturation Scale, this study seeks to examine the acculturation levels, values, and educational attainment of Asian American college students, and to identify any correlation between the three factors and the implications such correlations may suggest about the help-seeking attitudes of this population.

**D1 Receptors in MAOEnhanced Nicotine Self-Administration**
Jalpa Amin  
*Mentor:* Frances Leslie

Tobacco smoke contains about 3,000 different compounds, leading to the possibility that some of these compounds might be involved in tobacco’s addictive processes. Among the different compounds found in tobacco smoke, several have been found to inhibit monoamine oxidase (MAO) in humans. MAO is an enzyme responsible for the degradation of the monoamines. Monoamines such as dopamine (DA), norepinephrine and serotonin are neurotransmitters found in the central nervous system and are responsible for regulating sleep, arousal and pleasure. It has recently been hypothesized that a synergy between nicotine and MAO inhibition (MAOI) could be of importance for tobacco addiction. Our lab has found that MAOI increases nicotine self-administration. It has been shown that dopamine D1 receptor is involved in addictive processes. To better understand the mechanism of MAOI enhancement, I tested whether SCH23390, a selective D1 receptor antagonist, blocks tranylcypromine-enhanced nicotine self-administration. Rats were implanted with jugular catheters and self-administered...
nicotine (10 µg/kg/inf) following 1 hr pretreatment of tranylcypromine (3 mg/kg, i.p.). The involvement of the D1-dopaminergic receptor was tested by injecting a D1-specific antagonist, SCH23390 (0.02 mg/kg, s.c.) or saline vehicle (1.5 ml/kg, s.c.), 15 minutes prior to the beginning of the self-administration session, once a stable baseline responding for nicotine self-administration had been reached. Rats were run an additional day to see if responding returned to baseline. I found that SCH23390 treatment on nicotine self-administration following tranylcypromine significantly decreased nicotine intake ($F_{1,18} = 12.91, P < 0.01$). These results show that the dopamine D1 receptor is involved in MAOI enhancement of nicotine self-administration.

Addressing the Health Concerns of Transgender Latinas in Transition

Christian Anguiano
Mentor: Deborah Vargas

“Transgender” is an umbrella term used to describe any individual in the state of gender androgyny. The purpose of this study was to fully understand the realities of transgender Latinas “in transition”—individuals who are physically transitioning from male to female—and the social oppressions that create alarming health disparities for this community. I attempt to show that transgender Latinas must deal with homophobia, transphobia, racism, classism, sexism, and, in many cases, xenophobia, which hinder their acquisition of proper health care and professional medical assistance. Due to their circumstances and the social oppressions at play, transgender Latinas are marginalized within the public health sphere. This marginalization results in the production of a black market hormone economy and the use of other alternatives that create an unhealthy and often deadly process of gender transitioning. The non-profit organization Bienestar Human Services, Inc. was contacted for assistance in obtaining participants. Bienestar is committed to enhancing the health and well-being of the Latino community and accomplishes this through community education and specialized groups such as Transgeneros Unidas for transgender Latinas. In addition to a literature review, data were collected via questionnaires and structured interviews with the women in TU. Workplace discrimination and unemployment were the most common hurdles in their acquisition of health insurance and the funds needed for their transitions. My study revealed that the women in TU are resisting such oppression by creating a support network that empowers and encourages them to be educated about healthy transitions and how to become more visible in the public sphere.

The Interrogation and False Confession Link: Beyond Common Knowledge?

Jaclyn Appleby
Mentor: Richard Leo

A large body of social science research supports the occurrence of false confessions under psychological criminal interrogation; however, there have been no published surveys on the public’s perceptions of psychological interrogation and its role in eliciting false confessions. Anecdotal evidence suggests that police officers, other criminal justice officials, and the average person believe that a psychological interrogation will not lead a person to falsely confess, an idea that has been termed the myth of psychological interrogation, but the opinions of the public remain systematically untapped. This study was designed to fill this empirical gap by studying what the public believes regarding police interrogation and its ability to elicit both true and false confessions. 268 participants responded to a survey assessing the perceived coerciveness of interrogation techniques and the perceived likelihood of those techniques to elicit true and false confessions. The participants rated psychological interrogation techniques as coercive, yet they did not acknowledge that the coercive interrogation techniques would lead to false confessions. Though preliminary, this is the first demonstration that the average person does not understand the link between coercive interrogation and false confessions, thus the belief in the myth of psychological interrogation has received preliminary empirical support.

Impact of RF Attenuation on Data Throughput and Connection Reliability in 802.11b/g Wireless Networks

Victor Aranda
Mentor: Roger McWilliams

The modernized world has effectively made desktops and wired connections a thing of the past, and wireless communication is quickly becoming the standard media through which a student learns, socializes, and works. The explosion of wireless technology and portable computers in educational environments has led to widespread implementation of wireless networks in buildings whose original design considerations could not have foreseen the importance of RF propagation through internal structure. Thus, building construction details are frequently the primary determining factor in quality of service for campus wireless networks. Using a laptop, access point, and specialized software, data is collected via field experimentation to determine relationships between connection quality and attenuation. The dynamic throughput design details of the 802.11x protocols are taken into consideration. These data are used to investigate the direct consequence of various levels of RF at-
Does Alan Greenspan Deserve all the Credit?
Luis Arellano  
**Mentor:** Fabio Milani

Over the years, Alan Greenspan has been well respected for accomplishing a difficult task: keeping prices low. We sought to find a correlation between the economic policies of the Federal Reserve and the price of production for multinational corporations, many of which have minimized their costs over the years. Professor Milani and I wanted to know if this was due to Alan Greenspan’s ingenuity, or if globalization had anything to do with it. Our research method was to get data from Compustat North America—a database that collects data on corporations—and compare the it. We searched with a set criteria and found companies that supported our hypothesis. We found a correlation between the expansion of globalization and the declining costs for multinational corporations. We found that Alan Greenspan’s policies to fight inflation were well done. However, he cannot take all the credit for the state of our economy. Due to the globalization expansion over the years, American businesses have thrived due to the low cost of production that is accessible outside the US. Thus, economic policies to stimulate economic interests are almost worthless. Corporations need a low cost of production to make large profits. Therefore, Alan Greenspan cannot take all the credit for our strong and resilient economy. Globalization needs to be given its place since, it also has its hand on our economy.

Mango Blog: An Extensible and Customizable Blog Engine
Laura Arguello  
**Mentor:** Hadar Ziv

Blogging has become a popular vehicle for communicating ideas, information sharing, and journal publishing. Several blog engines are available that allow individual bloggers to get started with relative ease. Most engines are constrained to a specific implementation, such as using PHP and MySQL, or are otherwise unable to support the customization and extensibility expected by today’s bloggers. This paper describes the Mango project, which addresses the above shortcomings by providing an open-source, extensible, and customizable blog engine that uses and benefits from Adobe’s ColdFusion. Mango’s architecture is easily extended by the use of plugins, custom tags, and interchangeable skins. In addition, most blog engines today do not provide full-text indexing of the content. Mango blog uses the built-in Verity indexing engine to allow full-text searches. Mango exposes administrative tasks in several popular formats, and syndication data in the form of RSS and ATOM feeds. Thus, the content of blog postings can be modified from a number of different clients, and can be accessed by any RSS reader. Currently, Mango is used at UCI in a classroom environment for team communication and document publication. We plan to make it available for public download as soon as the initial tests have been passed. A demo and documentation can be found at http://www.mangoblog.org.

Preservation of Culture Through Art
Rosie Aroush  
**Mentor:** Samuel Gilmore

Cultural maintenance, finding one’s own identity, and pressures from the community have all been issues that Armenian living in the United States have had to and continue to struggle with. This study depicts the methods that Armenians living in the United States have adopted to preserve their culture; specifically, how Armenian artists use their art as a tool to preserve their culture, whether it be through their paintings, their music, or other forms of art. I have conducted 12 interviews. My participants consist of both male and female Armenian artists living in Southern California, ages 18 and above. I interviewed six musicians and six painters. I depicted variances in their preservation methods based on their ages, the form of art they participated in, their Armenian background, their immigration status, and through their levels of involvement in the Armenian community.

Identification of Cell Signaling Lattice Specific Apoptotic Genes in Drosophila Eye Discs Using FLAG-tagged PABP
Hikmat Assi  
**Mentor:** Carrie Brachmann

The signaling mechanism used by *Drosophila* to intricately regulate the final patterning step utilizing apoptosis in the retina remains unknown. As cells differentiate in the developing fly eye, an organized structure begins to form. Over time, cells die as the retina undergoes a final landscaping effort resulting in an intricate hexagonal array. Our lab has evidence that points to a system of spatial regulation of this cell death process that might be responsible for providing death signals to neighboring cells. By isolating mRNA from lattice cells (cells that receive the death signal) we hope to profile gene expression at two time points (before and during the period of...
cell death) and identify possible gene candidates that are responsible for the apoptotic stimuli. A new technique has been developed in C. elegans laboratory that allows for the isolation of mRNA from a specific cell type even if that cell is part of a more complex multicellular tissue. We have adapted this method to the fly eye by developing a Drosophila stock that overexpresses FLAG-poly(A) binding protein specifically in the lattice cells. Controls for specificity were designed and tested. However, in each of three trials, we were unable to retrieve the required amount of RNA for microarray analysis. These pilot experiments establish that future experiments will require roughly 20-fold more starting material.

Bolivia’s Coca Campaign
Elizabeth Avila
Mentor: Caesar Sereseres
For many centuries, the indigenous people of Bolivia’s highlands, or altiplano, have cultivated and celebrated the salubrious coca leaf. Its lung fortifying nutrients facilitate breathing for residents of high altitude communities along with culturally relevant religious importance, medicinal application, and hunger suppressant properties, all of which confirm the dietary supplement’s importance. This study examines the controversy surrounding coca cultivation, as international condemnation increasingly overshadows its indispensable role in Bolivian society. Factors such as organization among peasant farmers, or cocaleros, and the impact of the crop’s consequent politicization unearths the fruits of an understudied Latin American phenomenon. In addition, this study explores the ascension of an indigenous civilian, Evo Morales, to the democratically elected presidency in 2005. The new leadership’s opposition to United States funded coca eradication projects and motion towards legalization of coca reveal unprecedented aspirations for Latin America’s poorest and least developed country. The coca leaf has become a symbol for the power of a historically marginalized group, Bolivia’s indigenous majority.

Sex-Specific Expression Mediated by the Cis-Acting Control Elements of the AeAct-4 Gene of the Yellow Fever Mosquito, Aedes aegypti
Diane Aw
Mentor: Anthony James
Various means of reducing populations of insects have led to a decrease in transmission of vector-borne diseases such as dengue fever and malaria. Recent approaches include the development of transgenic mosquitoes to express dominant-conditional lethal genes whose expression is driven by stage- and sex-specific DNA control elements. The Aedes Actin-4 gene (AeAct-4) was demonstrated previously to be expressed only in female pupae of the yellow fever mosquito, Aedes aegypti. The AeAct-4 cis-acting control DNA was cloned into the Mos I mariner transposable element and used to drive expression of the DsRed reporter gene. While both males and females transcribe some mRNA, only adult females were found to accumulate the DsRed protein. This transcriptional and translational regulation may be exploited to use the AeAct-4 control sequences to drive expression of a lethal gene in mosquitoes.

Characterizing Molecular Complexes in Interferon Signaling
Arif Azam
Mentor: John Krolewski
Type I interferons (IFNs) play an important role in innate immunity, and also exhibit anti-tumor activity against many common cancers. Although it is known that type I IFNs can act on cells by inducing signal transduction through the well-established JAK-STAT pathway, the relevance of another signaling mechanism involving regulated intramembrane proteolysis (RIP) as a result of IFN stimulation has yet to be determined. The purpose of this study is to ascertain the composition of the protein complex that forms intracellularly in response to RIP and to gauge its affect on transcriptional initiation. We propose that the signal transduction and activator of transcription (Stat2) protein, the interferon regulatory factor (Irf9) protein, and the intracellular domain (ICD) of the interferon receptor form a trimolecular complex that is responsible for initiation of transcription once released from the membrane via the RIP mechanism. To test for the formation of the complex, affinity precipitation was carried out by binding protein lysates derived from cells expressing Irf9, Stat2, or both proteins to glutathione-agarose beads containing the ICD protein. The in vitro formation of the trimolecular complex was then detected for through the use of immunoblotting. It was found that the complex does in fact form and that the binding order of the complex may be that the ICD binds Stat2, which, in turn, binds Irf9. With the formation of the complex verified, there is further evidence supporting the notion that RIP can work in conjunction with the JAK-STAT pathway to induce gene transcription through a tri-molecular intracellular complex.

Oncolytic Virus Therapy: Relationship Between Viral Spread, Viral Fitness, and the Outcome of Treatment
Nika Bagheri
Mentor: Dominik Wodarz
Replication competent oncolytic viruses are known to infect cancer cells, kill them, and spread through the tumor, proving to be a promising mechanism for cancer treatment. Through use of modeling and system theory,
we may better assess the utility of these viruses as therapeutic devices. In this study, we modify existing mathematical models and investigate the relationship between viral spread and viral-induced cancer remission. In particular, we assume that the rate of virus production via infected cells is coupled with the rate of virus-induced cell death. In this case, we observe an intermediate virus-induced death rate of infected cells that maximizes the overall rate of virus spread, and thus, viral fitness. Additionally, we observe an intermediate virus-induced death rate of infected cells, which optimizes treatment. These two optima never coincide. Instead, the virus-induced cell death rate optimizing therapy is always higher than the virus-induced death rate optimizing viral spread and fitness. Therefore, the virus with the best therapeutic potential is not the virus with the highest fitness. This has important implications for the evolutionary dynamics of oncolytic viruses. Bioselection and serial passage experiments would not yield viruses with optimal treatment characteristics. Further, if the patient is infected with a virus that is optimal for treatment, the virus may evolve in vivo towards greater fitness, hence reduced therapeutic efficiency.

**A Comparison of Caffeine Degradation by Microorganisms in Ocean Water and Freshwater**

Kimberly Balazs  
*Mentor*: Oladele Ogunseitan

Caffeine, a pharmaceutical and component of food, is ubiquitous to the human diet. Caffeine from anthropogenic sources enters our oceans in significant amounts daily through sewage treatment plants. No efficient wastewater treatment method exists to degrade caffeine, thus caffeine concentrations in our ocean water and freshwater supplies are expected to increase over time, posing a threat to many marine species, such as coral, algae, and fish. This study measures the degradation of .10mM concentrations of caffeine in fresh water and ocean water kept in the light or in the dark. Using a Spectramax 250 to measure the optical density of caffeine in the samples at the peak wavelength of absorbance for caffeine, 274nm, caffeine was shown to degrade almost completely over a period of 6-7 days in dark fresh water and 6-11 days in dark ocean water. After culturing and analysis of the samples in nutrient medium containing caffeine as the only carbon source, the common caffeine-degrading bacteria, *Pseudomonas putida* Biotype A was isolated from both the dark fresh water and dark ocean water samples. This is the first study to isolate the bacteria from natural waters; previous studies have focused on isolates from soil or sewage. The finding that caffeine could be degraded slowly in natural water systems in the dark and not at all in the light has important implications for the future of wastewater treatment. This research highlights the need to find more efficient methods of degrading caffeine under all conditions.

**Stability of Rotating Black Branes**

Kenneth Bame  
*Mentor*: Arvind Rajaraman

Solutions to the Klein-Gordon equation are analyzed for the case of a rotating black brane in an arbitrary number of dimensions. For generality, *d* spacetime dimensions and *p* compact dimensions are considered. Analytical solutions for *d>*5 are elusive, higher dimensional spacetimes will require numerical solutions. It is shown that small scalar perturbations to the black brane are equivalent to massive scalar perturbations, the equivalent mass of the perturbing field is determined by the metric coefficients of the *p* compact dimensions. The resulting perturbation is found to be unstable.

**A Sustainable Pakistan: Is there hope?**

Razia Baqai  
*Mentor*: Richard Matthew

The name Pakistan means “land of the pure,” but for a country with such a name, Pakistan has had an unexpectedly turbulent political history. Since her independence, environmental conditions have steadily declined. Yet environmental conditions are just one problem of many facing this country. The goal of this study is to examine the effects of environmental conditions on the political and social arenas, and how effective a sustainable development policy would be within Pakistan. This research is meant to evaluate current data and research, but within the context of a developing country as to the costs and benefits of sustainable development, and the political effects of environmental conditions. Sustainable development is the idea of providing for current human needs without depleting resources so resources are available for future generations. As Pakistanis have become more aware of the declining state of their environment, non-governmental organizations have become the key supporter of the Pakistani government’s efforts to make such a sustainable development plan possible.

**The Relation of the Metabolic Syndrome to the Likelihood of Diastolic Versus Systolic HTN**

Michael Barboza  
*Mentor*: Nathan Wong

The metabolic syndrome (MetS) is closely associated with elevated blood pressure; however, the relation of MetS to the likelihood of having diastolic versus systolic hypertension has not been well defined. In a cross-sectional study of 2753 subjects not receiving antihypertensive medications and with sufficient covariates to diagnose MetS (weighted to 117.8 million) aged ≥18 years participating in the National Health and Nutrition Examination Survey 1999–2000, we determined, using logis-
Radiofrequency Ablation Compared to Resection in the Treatment of Hepatocellular Carcinoma
Kaylene Barrera
Mentor: David Imagawa

The incidence of hepatocellular carcinoma (HCC) is increasing around the world. The current gold standards in the treatment of HCC are orthotopic liver transplantation (OLT) and surgical resection. Radiofrequency ablation (RFA) has been studied as an alternative treatment since OLT and resection are not available for most patients. In this study we compare the outcomes of RFA versus resection in the treatment of HCC. Using a liver cancer database, patients with HCC treated by RFA or resection were identified and retrospective chart review was conducted. Kaplan-Meier was used to calculate actuarial survival and disease-free survival. Log-rank, chi-square, Fisher's exact, and T-Test were used to determine statistical differences between groups. Fifty-five patients were identified of whom 37 were treated with RFA and 18 by resection. Patients treated with RFA were more likely to have multiple tumors, while those treated with resection tended to have larger tumors. Okuda and Child-Pugh scores showed no difference between the two treatment groups. The 1-, 3-, and 5-year survival for RFA was 75.6%, 51.1%, and 31.9% respectively, with disease free survival of 43.1%, 30.0%, and 18.7% at the same time intervals. Corresponding survival for resection was 67.7%, 43.2%, and 37.4%, with disease-free survival of 50.0%, 19.1%, and 19.1% at 1, 3, and 5 years. No statistically significant difference was found for overall or disease-free survival between the two treatment groups. This study shows that RFA can achieve long-term results comparable to resection in the treatment of HCC.

Glucocorticoids Require Noradrenergic Activity in Influencing Prefrontal Cortex-Dependent Working Memory
Areg Barsyagyan
Mentors: James McGaugh & Benno Roozendaal

It is well established that glucocorticoid hormones, secreted by the adrenal cortex after a stressful event, influence cognitive performance. While an increase in glucocorticoid levels facilitates memory consolidation, high levels of glucocorticoids impair memory retrieval. Glucocorticoid effects on both enhancement of memory consolidation and impairment of memory retrieval depend critically on interactions with emotional arousal-induced noradrenergic activation. A recent study reported that glucocorticoid administration also impairs working memory, a task that depends on the medial prefrontal cortex (mPFC). This study investigated whether glucocorticoids interact with noradrenergic mechanisms in influencing spatial working memory. Male Sprague...

Without a Home: A Comparative Analysis of the Street Homeless and Shelter Homeless in Downtown Los Angeles
Brenda Barragan
Mentor: David Snow

Los Angeles’ Skid Row area is notorious for holding one of the largest concentrations of homeless individuals in the country. The purpose of my research is to compare and contrast the street homeless and the shelter homeless in Skid Row to assist those who are the most vulnerable: the street homeless. The structural functionalist theory and the “blaming the victim” theory are two theories that try to explain homelessness. It will be interesting to see if these theories are relevant to the causes of homelessness in Skid Row. Moreover, research into the differences and similarities of the two typologies will reveal vital information that will aid in our understanding of acute and chronic homelessness. I was able to begin my research by speaking with the Director of the Institution for the Study of Homelessness and Poverty to become acquainted with the Skid Row locale. I interviewed 13 homeless individuals: eight who were street homeless and five who were shelter homeless. I acquired access to the shelter by contacting the Director for Volunteers of America. However, I still need to conduct three more interviews to have an even number from each category. My work is significant because further analysis of the homeless situation is needed to actively ameliorate homelessness. Currently, I am in the process of coding my data and thus, my conclusions are still in progress.

My work is significant because further analysis of the homeless situation is needed to actively ameliorate homelessness. Currently, I am in the process of coding interviews to have an even number from each category. The prevalence of MetS for men and women, respectively, was 59.3% and 92.5% among those with IDH; 54.9% and 71.6% in those with SDH; and 30.8% and 49.2% in those with ISH. Risk factor-adjusted odds (and 95% confidence intervals) for those with (versus without) MetS were 20.8 (9.9-43.9) for IDH, 6.1 (3.1-11.8) for SDH, and 2.1 (1.4-3.1) for ISH. Taking into account the distribution of hypertension by subtype (IDH 21.3%, SDH 22.9%, and ISH 55.8%), the prevalence of MetS was 18.3% among those with IDH, 20.6% among those with SDH, and 61.1% in those with ISH. We conclude that, due to high prevalence of MetS in diastolic hypertension, IDH is not a benign condition. However, due to the high frequency of ISH in the elderly population, ISH is actually the most common hypertensive subtype in persons with MetS.

Mentors: Brenda Barragan

[Document Content]

Hypertension was divided into three different subtypes—isolated Diastolic hypertension (IDH), systolic-diastolic hypertension (SDH), and isolated systolic hypertension (ISH). The prevalence of MetS for men and women, respectively, was 59.3% and 92.5% among those with IDH; 54.9% and 71.6% in those with SDH; and 30.8% and 49.2% in those with ISH. Risk factor-adjusted odds (and 95% confidence intervals) for those with (versus without) MetS were 20.8 (9.9-43.9) for IDH, 6.1 (3.1-11.8) for SDH, and 2.1 (1.4-3.1) for ISH. Taking into account the distribution of hypertension by subtype (IDH 21.3%, SDH 22.9%, and ISH 55.8%), the prevalence of MetS was 18.3% among those with IDH, 20.6% among those with SDH, and 61.1% in those with ISH. We conclude that, due to high prevalence of MetS in diastolic hypertension, IDH is not a benign condition. However, due to the high frequency of ISH in the elderly population, ISH is actually the most common hypertensive subtype in persons with MetS.

Without a Home: A Comparative Analysis of the Street Homeless and Shelter Homeless in Downtown Los Angeles
Brenda Barragan
Mentor: David Snow

Los Angeles’ Skid Row area is notorious for holding one of the largest concentrations of homeless individuals in the country. The purpose of my research is to compare and contrast the street homeless and the shelter homeless in Skid Row to assist those who are the most vulnerable: the street homeless. The structural functionalist theory and the “blaming the victim” theory are two theories that try to explain homelessness. It will be interesting to see if these theories are relevant to the causes of homelessness in Skid Row. Moreover, research into the differences and similarities of the two typologies will reveal vital information that will aid in our understanding of acute and chronic homelessness. I was able to begin my research by speaking with the Director of the Institution for the Study of Homelessness and Poverty to become acquainted with the Skid Row locale. I interviewed 13 homeless individuals: eight who were street homeless and five who were shelter homeless. I acquired access to the shelter by contacting the Director for Volunteers of America. However, I still need to conduct three more interviews to have an even number from each category. My work is significant because further analysis of the homeless situation is needed to actively ameliorate homelessness. Currently, I am in the process of coding my data and thus, my conclusions are still in progress.

Radiofrequency Ablation Compared to Resection in the Treatment of Hepatocellular Carcinoma
Kaylene Barrera
Mentor: David Imagawa

The incidence of hepatocellular carcinoma (HCC) is increasing around the world. The current gold standards in the treatment of HCC are orthotopic liver transplantation (OLT) and surgical resection. Radiofrequency ablation (RFA) has been studied as an alternative treatment since OLT and resection are not available for most patients. In this study we compare the outcomes of RFA versus resection in the treatment of HCC. Using a liver cancer database, patients with HCC treated by RFA or resection were identified and retrospective chart review was conducted. Kaplan-Meier was used to calculate actuarial survival and disease-free survival. Log-rank, chi-square, Fisher's exact, and T-Test were used to determine statistical differences between groups. Fifty-five patients were identified of whom 37 were treated with RFA and 18 by resection. Patients treated with RFA were more likely to have multiple tumors, while those treated with resection tended to have larger tumors. Okuda and Child-Pugh scores showed no difference between the two treatment groups. The 1-, 3-, and 5-year survival for RFA was 75.6%, 51.1%, and 31.9% respectively, with disease free survival of 43.1%, 30.0%, and 18.7% at the same time intervals. Corresponding survival for resection was 67.7%, 43.2%, and 37.4%, with disease-free survival of 50.0%, 19.1%, and 19.1% at 1, 3, and 5 years. No statistically significant difference was found for overall or disease-free survival between the two treatment groups. This study shows that RFA can achieve long-term results comparable to resection in the treatment of HCC.

Glucocorticoids Require Noradrenergic Activity in Influencing Prefrontal Cortex-Dependent Working Memory
Areg Barsyagyan
Mentors: James McGaugh & Benno Roozendaal

It is well established that glucocorticoid hormones, secreted by the adrenal cortex after a stressful event, influence cognitive performance. While an increase in glucocorticoid levels facilitates memory consolidation, high levels of glucocorticoids impair memory retrieval. Glucocorticoid effects on both enhancement of memory consolidation and impairment of memory retrieval depend critically on interactions with emotional arousal-induced noradrenergic activation. A recent study reported that glucocorticoid administration also impairs working memory, a task that depends on the medial prefrontal cortex (mPFC). This study investigated whether glucocorticoids interact with noradrenergic mechanisms in influencing spatial working memory. Male Sprague...

Mentors: Brenda Barragan

[Document Content]
Dawley rats received bilateral infusions of vehicle or the glucocorticoid receptor (GR) agonist RU 28362 (3.0 or 10.0 ng) alone or together with either the β-adrenoceptor antagonist atenolol (1.25 μg), the α1-adrenoceptor antagonist urapidil (0.3 μg), or the cAMP/protein kinase A (PKA) inhibitor Rp-cAMPS (4.0 μg) into the mPFC 60 min before testing on a delayed alternation task in a T-maze. Both doses of RU 28362 significantly impaired working memory performance. Importantly, atenolol, but not urapidil, blocked the working memory impairment induced by the GR agonist. Rp-cAMPS also blocked the effect of RU 28362 on working memory impairment. These findings indicate that glucocorticoid effects on working memory impairment depend on an activation of β-adrenoceptors but not α1-adrenoceptors in the mPFC and that the effects involve activation of the PKA second messenger system.

**A Computer Game to Teach Mathematics and English to Children in Pakistan**

Jared Beam  
*Mentor: William Tomlinson*

In Pakistan, a large number of children are unable, whether economically or socially, to attend school. Developments in Literacy (DIL) is a charity that operates schools for some of these children. The chairperson of DIL, Fiza Shah, and I have worked together to create a computer game specifically to teach math and English to these Pakistani children, using Urdu and other culturally specific aspects to customize it. A prototype of the game was tested in Pakistan, but failed due to file location inconsistency. This opened a branch of research into deploying software in a foreign country with no means of communication between developers. At present, the game is being tested in local schools for educational and entertainment value. It is hoped that this project will be part of a larger movement toward research projects to bridge gaps between cultures.

**Role of DAG Lipase in the Synthesis of 2-Arachidonoylglycerol and its Role in Neurite Outgrowth**

Mariam Behbehani  
*Mentors: Kwang Jung & Daniele Piomelli*

Endocannabinoids are endogenous lipids capable of binding to cannabinoid receptors CB1 and CB2 that belong to the superfamily of G protein-coupled membrane receptors. Two lipid-derived endocannabinoid substances have been thoroughly characterized thus far: anandamide (N-arachidonoylthanolamide) and 2-arachidonoyl-glycerol (2-AG). 2-AG may be produced by phospholipase C (PLC)-β-mediated hydrolysis of membrane phosphoinositides, which produces 1,2-diacylglycerol (DAG), and is followed by the diacylglycerol lipase (DGL)-catalyzed conversion of DAG to 2-AG. Recent evidence suggests that activation of the CB1 receptor is critical in neurite outgrowth of mouse neuroblastoma cells. The purpose of this study was to elucidate whether: 1) the recently cloned DGL-α or β is involved in the generation of 2-AG, and 2) the endocannabinoid 2-AG generated by the enzyme mediates neurite outgrowth. To achieve this, we exogenously overexpressed DGL-α or DGL-β in Neuro-2a cells and analyzed the pattern of neurite outgrowth. The results indicate a significant increase of neurite outgrowth and a number of neurites in DGL-β-overexpressing cells, suggesting the essential role of endocannabinoid 2-AG in neurite outgrowth.

**Social Exclusion in Post-Authoritarian/Crisis Argentina**

Carolina Beltrán  
*Mentor: Heidi Tinsman*

This study uses descriptive statistics obtained from INDEC, the Institute of Statistics and Census, Ministry of the Interior and Ministry of Justice of Argentina, and non-government organizations to examine changes in economic, social and political indicators of social exclusion, to determine improvements or declines in Argentine democracy from 1983 to 2005. To assess economic inclusion I have looked at unemployment levels, average income, levels of poverty and indigence, and breac between basic goods basket and average income. In analyzing social inclusion, I have looked at citizen security indicators such as crime statistics, victimization reports, incarcerated population, along with civil causalities and deaths in police confrontations. Moreover, I have looked at responses from Argentines in annual Latinobaròmetre surveys, to see if there have been increases or decreases in perceptions of economic stability and opportunities and as well as feelings towards improvements or declines in security and welfare. Latinobaròmetre surveys relating to confidence in political institutions and representation along with figures of election participation were consulted in assessing political inclusion. By looking at economic, social and political indicators of social inclusion, I sought to discern whether, in the twenty years of civilian democratic rule, Argentina has extended inclusion to its citizens or excluded them by failing to improve access and opportunities.

**UCISAT-1: Designing a Pico Satellite Communications System**

Matthew Bennett  
*Mentor: Derek Dunn-Rankin*

UCISAT-1 is the university’s first team assembled to develop a pico-spec satellite for launch into Low Earth Orbit (LEO). A pico-spec satellite must be 10x10x10 cm...
cubic, and weigh less than 1 kg. These physical requirements present significant challenges to the development of a communications system, including component size and weight constraints, reduced power storage and output, and limited attitude correction capabilities (directly relating to antenna pointing). In addition, one must consider effects of the space environment, ionosphere, orbital position, orientation, and Doppler effects, and must account for all subsequent signal losses. The results of the research conducted led to the development of a prototype communications system designed to overcome these effects, as well as the development and construction of the K6UCI Ground Station (located in HTC). These preceding design considerations, as well as the development of the K6UCI Ground Station, will be presented and demonstrated.

Revolution: Tales of the Genetic Surgeons
Elizabeth Black
Mentor: Jayne Lewis

On June 26, 2000, researchers in London announced the completion of a rough draft of the human genome sequence. On that day, President Bill Clinton called it the “...most wondrous map ever produced by humankind.” Since then, genome blueprints for several species from the Plant and Animal Kingdoms have been completed. These successes have ushered in many hopes for finding solutions to problems facing the human race and our Earth. There have also been some concerns. If we are to revolutionize the world into a more peaceful and sane Earth. There have also been some concerns. If we are to revolutionize the world into a more peaceful and sane place, would such changes need to be nurtured first within our hearts and minds? Accordingly, is evolution our best chance? If so, is it safe to force changes? Somewhere, in a junction of our optimism and anxiety, our children’s future will arrive. Revolution: Tales of the Genetic Surgeons is a collection of interrelated short stories that examine a world twenty-five years from today—a future at once gifted and plagued by the harvest sowed with current research in the field of Genetics. In this Symposium session, I will read an excerpt from my short story “In the Woods.” This tale considers the entangled nature of Earth’s system of prey and predator, in which even a small shift on one end of the progression may ripple down the line and skew it in unexpected ways. Those who are accustomed to life at the top of the food chain may find much to learn in a world in which the charming little hummingbird holds an amazing secret.

Mommy, Where are You? A Study of Sleep Interventions and Infant Attachment
Megan Blair
Mentor: Wendy Goldberg

New parents must often learn how to manage their infant’s night wakings and other purported “sleep problems.” Physicians and other professionals vary in their advice, with some suggesting sleep intervention methods that can be as extreme as putting the infant into a crib, leaving the room, and not responding to his or her cries. Conversely, attachment theory posits that consistent, responsive care produces a secure attachment that holds benefits for the infant throughout life. However, attachment research has not studied responsiveness at night, nor has research examined links between security of attachment theory and sleep intervention methods. The goal of this study is to investigate the association between type of sleep intervention methods and security of child-parent attachment. Specifically, this study addresses the question of whether proximity to the mother at night and the type and extent of infant distress and maternal responsiveness during the night are related to the security of child-parent attachment. Participants were 30 toddlers and their mothers who were recruited from a larger, longitudinal study at UCIMC. Data were collected through a maternal survey for background and sleep intervention data, and the Ainsworth Strange Situation, an observational method for obtaining attachment data. The results of this study are expected to provide parents and professionals with greater insight into the associations between sleep intervention methods and young children’s well-being.
environment with a proactive White House seeking to implement presidential policies.

Curtain Call

Briana Bowie

Mentor: Donald McKayle

It was in my first year at UCI that I discovered I chose the right University for my dance education. Personal growth and creativity are always encouraged, and, more than anything, I knew that by creating a four year goal for myself I was going to use my education here wisely and grow tremendously. My goal became to choreograph dances that challenged me artistically and to present them in a retrospective show on the UCI campus during my final year. Progressively, each dance was to be very different from the last in choreography, thematic content, and costuming. My goal was not only to create dances but to research what kind of work it entailed to possibly someday have my own dance company. Finding space to produce the show was not the hardest part. Rather, finding time to rehearse with dancers and finding a lighting designer for the show were. To make this show happen I will need to be in constant communication with my Stage Manager, make the costumes, hold rehearsals weekly, and assemble the dance space for the show. The show will be a group effort from the technical team and the group of dancers in the show. This show, which will be presented on June 9th and 10th in the Winifred Smith Hall has been a dream of mine since day one, and the abundance of knowledge I will have gained from having created it will only prepare me more for the outside world.

Contemporary Dance in England: Experiments in Kinesthetic Instincts

Alexandra Bradshaw

Mentor: Loretta Livingston

London-based contemporary dance artists Jane Mason, Charlie Morrissey, and Scott Smith engage themselves in movement research exploring the evolving emotional landscape of an individual in relation to others and to his or her immediate physical environment. These artists conduct movement studies that examine the ways in which interpersonal and intrapersonal relationships influence a dancer’s instinctive kinesthetic reactions in an improvisational dance environment. Accordingly, these emotional dynamics produce the fundamental form and composition of the artists’ choreographic works. This past summer, I traveled to London, England to research the method and practice of these artists. Upon my return to UCI, I sought to challenge my own choreographic prerogatives by engaging fellow dancers and myself in these improvisational, psychoanalytical movement exercises that seek to “trace the tangible contours of internal emotional landscapes.” My research culminated in the realization of two choreographic works, Allegro 120-168 and Tra La Tango. The former is a male-female duet exploring the dynamics of human intimacy through repetitive, antagonistic contact, and the latter is a female solo using affected, theatrical movement to create a comedic, yet intimate portrait of a woman. My oral presentation will further discuss the ways in which Mason, Morrissey, and Smith have informed my own choreographic process, and will include a video excerpt from Allegro 120-168.

Analysis of the Presentation and Perception of the Paradigms of Archaeology and the Effect on the Discipline

Ashley Brenner

Mentor: William Maurer

The goal of this project was to understand the history of archaeology, how this history and its accompanying theories have affected the way archaeology is practiced by professionals, and to determine the public thought about archaeology and how it was presented by professionals. This project used three different methods to understand archeological theory, practice, and perception: library research to determine the theory behind archaeology, participation in archaeological fieldwork and museum attendance to determine professional presentation of archaeology, and analysis of films and a computer game to determine the public’s perception of archaeology. Archaeology has had a complex history from the antiquarian paradigm to the present post-processualist paradigm. The evolution of this theory is not actually reflected in professional archaeological fieldwork, but there exists a combination of the four paradigms, with an emphasis on the acquisition of knowledge, multi-vocalism, and preservation (processualism and post-processualism) as opposed to the mere acquisition of shiny objects (antiquarianism). However, this is distorted by the public’s perception. Although archaeology can be acknowledged as tool for learning, due to the nature of entertainment, the public imagines archeologists either to be the hairy-chinned academics accompanying an adventurer, or the adventurer himself, but archaeology is nonetheless always presented as an adventure. This can be detrimental to the discipline, because it means that professional archaeologists are then expected to conform to this exciting standard, either lessening the academic quality of their work, or receiving less funding in the pursuit of knowledge.
“The People Brought to Life by the Word of God”: The Trinity of Reasons for Khoisan Conversions to Christianity in Early Nineteenth-Century South Africa
Ashley Brenner

Mentors: Laura Mitchell & Victoria Silver

By the early 1830s, Xhosa peoples of the Eastern Cape in South Africa acknowledged the extraordinary religious conversion of their Khoisan neighbors, calling them “the people brought to life by the word of God.” By this time, South Africa had been colonized for almost two hundred years, but had only recently opened up to missionary efforts. From the late eighteenth through the beginning of the nineteenth centuries, Khoisan converted dramatically to Christianity, a phenomenon due in large part to its spiritual appeal. Though there are other explanations for conversion, namely chaos theory and materialist theory, these theories are not completely satisfactory. Chaos theory concludes that in a time of social turmoil, Christianity provided an organizing principle and an explanation for the deep disruptions experienced by Khoisan. The materialist theory claims that Christianity provided Khoisan with greater economic, social, and political opportunities, so they converted for these practical reasons. However, chaos theory does not explain why Khoisan people turned to Christianity as opposed to any other religion, and a materialist explanation is not entirely complete, since Khoisan had survival alternatives to conversion. This paper argues instead for the importance of a spiritual explanation for conversion, one that frequently has been discounted by other historians: Khoisan converted to Christianity because they were religiously drawn to it. Seeking to build on the literature of chaotic and materialist explanations, the paper provides a case study that explores the conditions under which people convert in colonial society and their reasons for conversion.

Vertical ZnO Nanowire Field Effect Transistor
Evan Brown

Mentor: Grace Lu

To fully use the scaling advantage of quasi-one-dimensional nanostructures, vertically grown ZnO nanowires have been successfully fabricated in a highly ordered anodic aluminum template via AC, DC, and pulsed electrodeposition (PED) methods. Three generations of device design have materialized to reduce the design on thermal resistance considerations. Vertically aligned Field Effect Transistors (VFET) will be constructed in the future, which will serve as the building blocks for nanoscale memory and logic devices. This presentation is a comprehensive report of the evolution of the project and a proposal for future work. Details regarding each generation device—the successful electrodeposition techniques used, the unique hurdles faced, the subsequent electrical characterization of the as-grown nanowires—are discussed.

A New Composite Approach to Engineering Functional Smooth Muscle Tissue and its Application to Engineered Vascular Grafts
Michael Brown

Mentor: Andrew Putnam

Smooth muscle cells (SMCs) adopt a proliferative (synthetic) phenotype in tissue culture as opposed to their normal differentiated (contractile) phenotype adopted in their native environment. To engineer tissues that mimic native smooth muscle tissue in which SMCs express genes characteristic of the contractile phenotype, it is imperative to provide both chemical and mechanical morphogenetic inputs in the context of a realistic three-dimensional environment. In this study, we proposed that a collagen sponge injected with a cell suspension mixed with a collagen gel solution would provide a microenvironment that permits the expression of smooth muscle differentiation markers such as alpha-actin. Adopting a published approach, we sutured the collagenous sponge around an impermeable mandrel to create a tubular matrix and injected a collagen gel precursor solution containing human aortic SMCs. Upon gel formation, SMCs were entrapped within a composite collagenous environment consisting of both an intimate microscale network (the gel) and a larger macroscale scaffold (the sponge). After five weeks of in vitro culture, total cell numbers and smooth muscle alpha-actin expression were analyzed. Although numerous cells remained viable inside the construct, the actual amount was less than we injected into the matrix. Smooth muscle alpha-actin was expressed in the tissue constructs, but only in very small amounts. Given that the diffusion of oxygen and nutrients was likely unable to penetrate the composite matrix to support cell viability throughout the entire 3-D space, future work will focus on generating a bioreactor system capable of providing active (i.e., convective) transport of nutrients and oxygen.

Does Trypanosoma cruzi Infection Increase HIV-1 Replication in Human Monocyte Derived Macrophages?
Erin Bufalini

Mentor: David Camerini

The chemokine receptor CCR5 is one of the main coreceptors used in HIV-1 infection. Trypanosoma cruzi (T. cruzi) infection has been shown to increase the expression of CCR5 on peripheral blood mononuclear cells (PBMCs). We purified human monocyte derived macrophages (MDMs) from normal donor blood, and evaluated the expression of CCR5 on cells treated with heat...
killed *T. cruzi* (HKTc) and infected with live *T. cruzi*. The cells were stained with fluorochrome-conjugated monoclonal antibodies (Mab) specific for CD14, which are highly expressed on MDMs, and CCR5, the chemokine receptor in question. The cells were analyzed by flow cytometry, and the data showed that the expression of CCR5 increased on cells treated with heat killed *T. cruzi*, along with those infected with live *T. cruzi*. HIV-1 replication was assayed via RT-PCR specific for p24, and the replication rate of HIV-1 was found to increase in cells treated and infected with *T. cruzi*. This positive relation between the increase in CCR5 expression with *T. cruzi* exposure and increase in HIV-1 replication may play a role in the high incidence of HIV-1 infection in Latin America where Chaga’s disease is pandemic.

**Incidence of Ovarian Cancer and Other Ovarian Pathology in Aging Drosophila melanogaster**

Irvin Bussel  
*Mentor: Michael Rose*

*Drosophila melanogaster* have been used in cancer studies, especially those studying mutants in which tumors occur at a high rate. Although cancer develops in these mutants, cancer has not been reported to occur during normal *Drosophila* aging. Consequently, it has been assumed that cancer is not a normal cause of death, or a normal phenotype of aging in fruit flies. This is different from what we find in aging mammals, including humans. In this project, we studied aging *Drosophila* ovarian pathology for the incidence of cancer without the effects of carcinogens. Daily egg production declines starting in mid-life until it plateaus at low levels in very late ages. The reasons for this decline are unknown; age-related diseases, like ovarian cancer, could be the cause. Because *Drosophila* ovaries have the necessary requirements for age-related incidence of cancer, we evaluated two cohorts of flies with normal life spans. Females at specific intervals were examined for excess cell proliferation and ovarian abnormalities. The discovered pathology showed an incidence of cancer as well cyst-like structures. Phenotypes of absent ovaries were found as well. These results allow for a greater understanding of cancer biology in *D. melanogaster* and provide insight into mechanisms of aging and cancer.

**Characterization of mtDNA Damage in Keratoconus Families Leading to Altered Gene Expression and Mitochondrial Dysfunction**

Virat Butani  
*Mentor: Maria Kenney*

The cornea is a transparent avascular tissue that allows light to pass through to reach the retina. After exposure to UV light, an increase in reactive oxygen species (ROS) levels causes cytotoxic products such as malondialdehyde (MDA) or peroxynitrite to be released and cause damage to the corneal tissue. As the ROS formation increases, it leads to a non-inflammatory disorder of the cornea called keratoconus (KC). In past studies, the mitochondrion has been known to play an integral part in oxidative damage, which causes aging and diseases such as cardiovascular disease, arthritis, and adult respiratory distress syndrome. Our recent studies showed mtDNA damage to KC corneas. We then hypothesized that subjects with a family history of KC may also have damaged mtDNA. Long Extension Polymerase Chain Reaction (LX-PCR), a method that amplifies the mitochondrial genome, was used to show alterations (i.e., rearrangements and deletions) in mtDNA nucleotide sequences. If the nucleotide sequence is altered, small-sized products are produced by LX-PCR. Based on the size of the LX-PCR products, one can infer the size of the mtDNA deletions. At this time, we have analyzed the mtDNA of subjects from KC families and found smaller bands in addition to the 16.2 kb band that represents the intact mtDNA. We are currently in the process of comparing the different sized bands in the mtDNA of KC families with the mtDNA of normal, non-affected families.

**The Effect of Armed Conflict on Nepalese Children**

Jennifer Carden  
*Mentor: Karen Leonard*

The armed conflict in Nepal has been creating political instability and subsequently increasing security risks for civilians over the past ten years. In violent conflicts, children are the most vulnerable group, carrying the weight of future of the conflict. This paper discusses the effect that the armed conflict has on children from different levels of society. It suggests that children are vulnerable to numerous abuses, both directly and indirectly, through attacks by Maoist rebels and government forces. To view the changes taking place, it is necessary to look at the traditional role of Nepalese children in society, and then focus on the violations taking place against them. Previous studies have looked at the general violations, such as attacks on schools, abductions, disappearances and detention of children, and torture and killings. This study aims to analyze these effects, focusing on the different violations against children living in rural and urban regions of the country. Rural children have been more directly affected—especially in areas where Maoists have strongholds—than urban children. Rural children encounter forced participation and disruptions in their daily routines, while urban children are currently less directly affected. However, as tension grows between the fighting parties, urban centers are coping with Maoists’ tactics aimed at expanding the conflict into their streets. If this escalation of the armed conflict is not checked and a peace agreement negotiated, the
abuses against children are very likely not only to continue, but to escalate with it.

Expression of Brain-Derived Neurotrophic Factor Protein in the Mouse Hippocampus Declines Gradually After Exercise Stimulus Is Removed
Nicholas Castello
Mentor: Carl Cotman
Voluntary exercise increases hippocampal concentrations of brain-derived neurotrophic factor (BDNF) mRNA and protein, a neurotrophin critical to the processes of learning and memory as well as neuron survival. In this study, we examined the effects of various exercise regimens on BDNF protein levels in the mouse hippocampus. BDNF protein levels were significantly elevated over baseline after as little as two days of exercise, and were further significantly increased after an additional 19 days. Moreover, BDNF protein levels remained significantly elevated over baseline for as long as two weeks after exercise was stopped, and showed no signs of decay at this time-point. These results contrast with previous findings in rats, where BDNF protein was stable for several days, but decayed to nearly baseline levels two weeks after exercise ended. These findings confirm that BDNF protein remains increased in mice after exercise has ended, and indicate that the protein remains stably elevated for longer duration in mice than in rats. The sustained elevation of BDNF protein levels in mice could be influenced by the natural tendency for mice to remain more active than rats when a running wheel is not available. An understanding of the mechanisms of exercise-induced BDNF induction may be important for optimizing routine and therapeutic exercise regimens.

Japanese Internment: A Closer Look
Rodney Cavazo
Mentor: Yong Chen
As a History major, my attention was captured by the history of Japanese internment during World War II. Being a first generation American, like many of the Japanese Americans imprisoned, I wanted to know more about the situation. However, I did not want to focus entirely on primary or secondary sources. Rather I sought to find individuals who actually lived through the ordeal and, in particular, were either teenagers or young adults at the time. Through a process of interviews and research of the time period, I got a first-hand perspective on how it affected normal everyday Americans who had their constitutional rights stripped away during a time of war. In my interviews, I covered three areas of concern. I asked what their lives were like before Pearl Harbor, and shortly thereafter. I also wanted to know where they were imprisoned, and how they felt to have their rights taken away through no fault of their own. Lastly I wanted to know how they rebuilt their lives after the war. The answers to these questions give a glimpse into the harsh reality of a confusing time in our nation’s history.

Comparative Study of Developing Premature Infants
Melissa Cerro
Mentor: Elysia Davis
Current evidence suggests long-term effects of stress on neonates, often as a result of “early exposure to procedural pain” in the hospital. Infants tend to respond to these stressful events in one of two ways: with withdrawal/avoidance behaviors (i.e. grimacing, arching of the back) or with approach/self-soothing behaviors (i.e. sucking, placing hand on face). This study investigated the behavioral and physiological differences in premature infants born up to 34 weeks gestational age. Forty-nine premature infants’ behavior and heart rate were observed prior to, during, and following a painful stimulus, a heelstick blood draw. The results demonstrated a trend for younger premature infants born at 28-31 weeks to exhibit fewer approach/self-soothing behaviors, compared to older premature infants born at 32-34 weeks. These younger premature infants also displayed significantly higher heart rate during recovery relative to baseline, when compared to the older premature infants. These results suggest the importance of limiting the pain and stress premature infants are exposed to, due to their inability to properly regulate their reactions. If a greater amount of energy is going towards regulating their reactions after stressful events, which are plentiful in Neonatal Intensive Care Units, then there is in turn a cost to other developing systems. This cost could then prolong the time needed for the infant to mature to a healthy, stable state—in essence, its development as a whole.

Heritage Language Instruction/Spanish for Native Speakers: The Construction and Consolidation of Cultural and Ethnic Identities in Second-Generation High School Youth
Cynthia Cervantes
Mentor: Jeannett Castellanos
Spanish has become central in the formation of cultural and ethnic identities amongst Spanish speaking communities. Despite abundant research in support of Heritage Language Instruction, which fosters cultural and ethnic identity, and promotes English language acquisition through the use of students’ primary languages, few public schools with high concentrations of language minority students implement such programs. Researchers in the field of immigration and second-generation immigrants indicate that an increasing number of second-generation Chicano/Latino youth choose English as
their preferred means of expression, while proficiency in their native tongue suffers. This study pays specific attention to the social stigma toward Spanish as a spoken language in the United States, and the part that stigma plays in the acquisition and retention of the language, and consequently in the formation of Chicano/Latino cultural and ethnic identities. Quantitative questionnaires (n=200) were gathered from two Orange County high schools’ Spanish programs to conceptualize the importance of Heritage Language Instruction or Spanish for Native Speakers courses in the construction of positive cultural and ethnic identities in second-generation Chicano/Latino high school youth. As an objective, this study seeks to promote the implementation of Spanish for Native Speakers programs in the public school system curriculum, in conjunction with necessary improvements within Heritage Language Instruction programs, to better serve the holistic well being of second-generation Chicano/Latino high school youth.

Achilles and Socrates: Long and Short Run Implications of the Progression of Virtue Within the Western Warrior Code
Travis Chamberlain
Mentors: William Bristow & Kyle Stanford

Observing the ethical code of the youthful Homeric warrior, it becomes obvious that, while creating effective short run solutions, the code tends to cause inefficacy and even self-destruction in the long run. Dissatisfaction with this code leads to the evolution of a wiser Greek ethic that focuses conflict inward in preference of peaceful virtue. Exemplars who embody this evolution are Homer’s Achilles, one of the oldest and most dominant warrior figures of Western culture, and the warrior philosopher Socrates. Both of these warriors share a zealous willingness to die for personal beliefs conjoined with a general dissatisfaction of the surrounding warrior community’s dominant codes, yet Achilles champions Homeric values while Socrates values virtue and harmony over either wealth or honor. These ethical differences allow for a game theoretic exploration of the Homeric and Socratic warrior codes that illuminates the efficacy of each, ultimately substantiating a bow possible evolution of conflict from passionate outward manifestation to peaceful control of conflict from within. The analysis of Achilles and Socrates is illuminating in a contemporary sense, for, as shall be shown, the stories of Achilles and Socrates relate to all warriors, and thus to humanity in general.

Surface Treatment Effects on the Bending Rotation Fatigue of Superelastic NiTi Wire
Stephanie Chan
Mentor: James Earthman

Bending rotation fatigue properties were investigated in superelastic NiTi wire. The superelasticity of NiTi enables achievement of large reversible strain values, a result of the stress-induced phase transition of austenite to martensite at a temperature above the austenite finish temperature. This study implements an apparatus and a rotary endodontics instrument to test the effects of surface treatment on the cycles to failure testing and stress analysis of NiTi wire. Cycles to failure depends on stress amplitude, which is a function of the bend radius of curvature imposed on the wire sample. The test procedure includes a method of achieving the desired bending angle and radius of curvature; a ninety-degree bending angle and various radii of curvature were employed in this study. As-received samples of wire were compared to samples that were longitudinally polished with 600 grit SiC paper. The data indicate that polishing NiTi samples of wire results in significantly greater fatigue life in a simulated saliva environment. SEM micrographs denote similar fatigue fracture in both sets of samples. The same method of testing can be used to compare and predict failure in NiTi devices, such as dental files used for root canal enlargement.

A Preliminary Study on the Advantages and Disadvantages of Specialization in Hummingbird Flowers
Teresa Chan-Law
Mentor: F. Lynn Carpenter

This preliminary study evaluated the trade-off between pollination efficiency and visitation rate of generalist and specialized hummingbird flowers. I predicted that, in an unmanipulated population, generalists would have a higher visitation rate, but specialists would have higher visitation efficiency by hummingbirds. Pollination success is evaluated by fruit set, and I predicted that generalized and specialized flowers would have similar fruit set per flower. However, if flower densities were reduced, I predicted that specialized flowers would have a lower visitation frequency and decreased fruit set, while visitation rate and fruit set of generalized flowers would remain the same. My study was a 30-day experiment conducted on a farm in Costa Rica. The plant species that I used were: a generalist, Stachytarpheta arcticifolia, and two specialists, Heliconia bihai and Phaeomeria magnifica. I measured visitation rates of these three plant species under three treatments: initial baseline period, a period in which flower density was reduced (bagged), and a period when flower density was restored (unbagged). My results showed that the visitation rates of Stachytarpheta...
did not change in baseline or bagged treatments, as I had predicted. Also, as predicted, the visitation rates of Phaeomeria decreased upon bagging. However, Heliconia did not fit my predictions. Furthermore, from my baseline visitation rates, I expected to find the highest fruit set in Stachytarpheta followed by Phaeomeria, and lowest in Heliconia. However, there was no difference in fruit set in Stachytarpheta and Phaeomeria, and none of the marked Heliconia flowers set fruit.

The Effect of Electroacupuncture on Hypertension
Brian Chang
Mentors: Peng Li & John Longhurst
The objective of this study is to develop basic scientific understanding of the role and mechanism involved in electroacupuncture (EA) stimulation of acupoints P5-6 and St36-37 on hypertensive patients. We have examined feline models that exhibit reduction in blood pressure (BP) during EA in response to induced pressor reflex. Physiological studies indicate that the arcuate nucleus, ventrolateral periaqueductal grey, and the rostral ventrolateral medulla are crucial regions in the feedback mechanism of the EA response. To test the clinical application of the results, we administered EA on hypertensive patients in clinical studies. A significant decrease in SBP was observed after continual EA stimulation of P5-6 and St36-37 once weekly for eight weeks. EA at control acupoints GB37-39 & LI6-7 failed to produce any significant changes. These results suggest that EA at P5-6 & St36-37 have significant therapeutic effects in hypertensive patients. This inhibition is slow onset and long lasting. Additional physiological studies are required to assist further understanding of how EA alleviates hypertension.

Uncultivated Rabbits: Identity and Community Through Spoken Word, Poetry, and Performance
Caroline Chang
Mentor: Rudy Vega
Underground art forms, such as spoken word and slam poetry, or those belonging to what is often seen as “low culture”, are often created because of a lack within traditional art mediums. Often they are seen as a necessity for a particular group to gain a voice, empower the self, or tackle an issue when traditional art mediums are not accessible or representative of their ethnicity, gender, orientation, religion, or experience. Uncultivated Rabbits created a space in which students could develop self-identity by taking these underground forms of art and bringing them to the masses, and in conjunction, created a community in which the audience became the performer and vice versa. Because the mediums of spoken word, slam poetry, and performance art are not bound by specific rules and were created upon the notion of fluidity, I chose those forms to help develop identity that holds the same characteristics. Through performance workshops, open mic nights, word of mouth, and watching other performers, the two final performance Slams (contests judged by the audience) culminated in a community effort, in which different marginalized entities—artists, students, musicians, writers, student leaders—became empowered by the space created, one where they could fulfill each others’ needs. The interaction between audience and performer became blurred; performers became the catalyst for the community and the community became fuel for the performers. In the act of performing a dialogue was created to usher in a new form of expression and art.

Spectroscopic Studies of Alzheimer’s Aβ(1-40) Peptide Oligomers in Lipid Bicelles
Yu-Ching Chang
Mentor: Nien-Hui Ge
Most neurodegenerative diseases in the brain are related to an abnormal protein conformation. The conversion of a normal protein structure into an insoluble, aggregated, β-sheet rich form is the major cause of many neurodegenerative diseases. The diseases caused by the deposition of the amyloid fibrils are called amyloid diseases. Alzheimer’s disease has been associated with the conversion of water soluble α-helical Aβ peptides to insoluble β-sheet fibrils. Recent studies on the oligomerization of Aβ suggest that oligomers are toxic to cells. The purpose of this research is to study the structure evolution of the Aβ(1-40) peptide oligomers in the presence of lipid bicelles using FTIR, circular dichroism, thioflavin T binding, and immunoblotting techniques. The intent of the bicelles is to mimic the phospholipid bilayer environment of cell membrane. Our results suggest that Aβ(1-40) peptide oligomers convert to fibrils in a much slower rate in bicelles than in aqueous solution.

The Localization and Altered Expression of nAChR Subunit mRNAs in the Hippocampi of Aged Rats and Rats Expressing APP Fragment
Stephanie Channual
Mentor: Katumi Sumikawa
Neuronal nicotinic acetylcholine receptors (nAChRs) are multimeric proteins made up of two different subunits, α and β, with different arrangements and functional properties. These receptors mediate neurotransmission in many central synapses and seem to be affected in human degenerative disorders. In this experiment, the localization of nAChR α2- α7 and β2 β4 subunit mRNA was examined in the rat hippocampus by using non-radioactive in-situ hybridization. Furthermore, APP fragment-induced change in the expression of nAChR.
subunit mRNAs of young and aged rats were examined using real-time RT-PCR. Results from in-situ hybridization showed that nAChR α2 subunit mRNA was mainly localized in the dorsal subiculum, and the CA1 and CA3 region, while α3 subunit mRNA was mainly distributed in the CA1 region and the dorsal subiculum. α4 mRNA was found to be localized on the ventral side of the CA1 region. However, α5 mRNA was distributed in the dorsal and ventral subiculum, dentate gyrus, and included weak staining in the anterior CA1 and CA3 region. α7 mRNA was expressed in all areas of the hippocampus. β2 and β4 mRNA was mainly localized in the dentate gyrus, dorsal and ventral subiculum, and the CA1 and CA3 region. No significant localization of α6 and β3 subunit mRNA occurred in the hippocampus. Real-time RT-PCR results showed a decrease in expression of nAChR subunit mRNA for young and aged rats expressing APP compared to controls. However, aging alone can reduce the expression of nAChR subunit mRNA. These findings have implications for the development of drug therapies for age-related diminished expression of nAChR in the hippocampus, which is particularly severe in pathologies such as those associated with dementias, including Alzheimer’s disease.

How Tissue Architecture may Protect against Cancer
Philip Cheng
Mentor: Natalia Komarova
A mathematical model to study the epithelial tissue layer of the colon was developed. In particular, the model describes the rate of cancer initiation in the epithelial crypts, a quantity that depends on the mutation rates of the stem cells and daughter cells that make up the crypts. The probability of forming a cancerous lineage in a crypt also depends on the relative number of stem cells to daughter cells, and several other factors. The main objective of our study was to see if there is an optimal number of stem cells per crypt, one that minimizes the chance for cancer. By this, we hope to mathematically verify the hypothesis that tissue design can protect against the onset of cancer. Both numerical simulations and mathematical analysis of the model were performed. The result was that, for short times, it is always best to have the maximum number of stem cells, but in most instances the optimal case eventually switches to having only one stem cell per crypt. This enabled the results to be interpreted in an evolutionary context: if the mutation rates are such that the switch occurs early in an organism’s lifetime, then nature should select for a tissue design that minimizes the number of stem cells, but if the switch occurs late in life or not at all, it should select for the maximal number of stem cells.

Modeling PID Control of Blood Glucose by Insulin and Glucagon
Philip Cheng
Mentor: Tau-Mu Yi
The concentration of blood glucose in our bodies is constantly being disturbed away from an optimal steady-state, or homeostatic, value. Yet, in most cases, glucose levels are able to return to the optimal steady-state, due to the actions of two hormones, insulin and glucagon. This suggests that integral control, a feedback mechanism that ensures that the optimal steady-state value will eventually be reached, underlies the regulation of blood glucose. We developed and compared a one-hormone integral control model involving insulin only to an existing two-hormone model. Later, we implemented proportional control into our model, which improved the transient response to the disturbances. Derivative control by glucagon was then added to form a two-hormone PID controller. We propose that this second hormone is needed to help regulate against steep drops in glucose. MATLAB was used extensively throughout this project. Analysis involving the fine-tuning of the PID control parameters in order to enhance robustness may be presented if time permits.

The Effects of Allosteric Inhibition of Nicotinic Receptors on Nicotine Self-Administration in Rats
Carleen Cho
Mentors: James Belluzzi & Kelvin Gee
Tobacco abuse accounts for at least 20% of premature deaths in developed countries. Unfortunately, there is a 97% relapse rate in unaided quitting. To aid smokers in quitting, mecamylamine was tested and had various success rates in smoking attenuation because it is a nicotinic-acetylcholine receptor (nAChR) blocker, reducing the reward smokers receive when smoking. However, through its multiple uncomfortable peripheral side effects, it was unsuccessful as a drug for smoking cessation. To address issues of peripheral side effects, as well as establishing a ceiling effect and preserving patterns of synaptic transmission, we looked into negative allosteric modulators. We used a non-selective negative allosteric modulator of nAChRs, compound 30002, to see if it attenuated nicotine self-administration in food-trained rats, since it also reduces the activity of nAChRs. We found that 30002 significantly reduced nicotine self-administration by 61.2%. With these results, we will continue to delve into allosteric modulators to determine their effects on nicotine self-administration in rats.
Does Nitrogen Addition Alter Competition Between Mycorrhizal and Decomposer Fungi?
Nathan Choi
Mentor: Kathleen Treseder

Mycorrhizal and decomposer fungi differ in their biological roles in the ecosystem. Mycorrhizal fungi form symbiotic relationships with their host plants, exchanging inorganic nutrients for photosynthetically-derived carbon. Decomposer fungi do not form such relationships, but break down compounds to those that can be used by plants and other organisms. To understand how these two different groups of fungi compete against one another under the effects of human pollution, I surveyed fungi that grow in boreal forests that range from high to low nitrogen levels in the soil. I hypothesized that mycorrhizal fungi will not grow as well under nitrogen fertilization, because plants will reduce carbon allocation to mycorrhizal fungi. This response will reduce the ability of mycorrhizal fungi to compete with decomposer fungi under high nitrogen ability. By measuring the signatures of nitrogen-stable isotopes in mushrooms, I could differentiate mycorrhizal fungi from decomposer fungi. I found that ectomycorrhizal fungi were most abundant where nitrogen availability is highest. In contrast, the prevalence of decomposer fungi did not vary across the nitrogen gradient. These results did not support my hypothesis. Instead, it appears that the growth rates of mycorrhizal host plants may have influenced the relative abundance of mycorrhizal versus decomposer fungi. Plant growth rates were highest in the nitrogen-rich site, so host plants there may have had a greater supply of carbon to allocate to their mycorrhizal fungi.

TNF Induces a Tip Cell Phenotype in Endothelial Cells (EC) Grown in a 3D Model of Angiogenesis
Henry Chu
Mentor: Christopher Hughes

Angiogenesis, the growth of new blood vessels from pre-existing vasculature, is a complex process mediated by many cell signals, including tumor necrosis factor (TNF). TNF is an interesting signaling molecule, in that it exhibits both positive and negative effects on endothelial cells (EC), the cells that line blood vessels, depending on other environmental cues. It has been hypothesized that TNF exhibits this bipolar behavior because it may act through more than one signaling pathway. We have used an EC culture model to investigate this problem. We find that TNF initially blocks sprouting of vessels, but once removed, sprouting is extremely vigorous. Thus, TNF acts to “prime” EC. In addition, TNF induces a phenotype associated with the lead, or tip cell, in each sprout. Both the NFkB and MAPK signaling pathways are involved in this process. In summary, TNF enhances angiogenesis by inducing EC to become tip cells and thus sprout from the parent vessel.

Crime Lab Scandal: Understanding the Causes and Culture
Jessica Clark
Mentor: William Thompson

Science and technology are two powerful sources of knowledge that have earned powerful positions in today’s society. Yet, these tools are wielded by scientists, who are human. Thus, human nature makes science not only questionable, but also malleable. Forensic science, with its infinite possibilities for solving crimes and catching criminals, is one of the most valued technological advances. Yet this science is being abused and manipulated. Crime labs, which are responsible for using such science and technology, have been plagued with scandal and inaccuracy. In this study, I explore the broader causes of problems common to crime labs, in order to formulate a solution. Through archival research, which included investigative reports, court transcripts, articles, and so on, I was able to closely examine the problem. I discovered that the general problems that plagued crime labs, like the Houston Police Department Crime Lab, were due to deeper issues than I had first thought. While poor management and lack of protocol did hinder the progress and efficiency of the lab, a sociological context better accounted for the lab’s behavior. This sociological culture, specific to the lab, affected behavior and decisions in relation to the world of the lab. Through my analysis, it is now possible to better understand the crime lab culture and, thus, begin to make the appropriate changes.

Stability of Heme Proteins in Surfactant Films
Amber Coluso
Mentor: Patrick Farmer

In our lab, we work with surfactant films to study the redox activity of heme proteins. The methodology was created about twenty years ago by the Rusling group. A recent article was published, suggesting that the surfactant, specifically didodecyl(dimethyl)ammonium bromide (DDAB), denatures myoglobin (Mb) on pyrolitic graphite (PG) to cause the heme group to be released. This would mean that electrochemical data obtained using DDAB film-modified electrodes would be a study of the heme rather than the protein as a whole. The article made inferences from UV-Vis and cyclic voltammetry (CV) data. To verify the findings of de Groot et al, I repeated their UV-Vis experiment and looked at varying heme proteins. I found that, although I was able to obtain the same UV-Vis spectra, the conditions set by the group are such that the Mb and hemin crash out of solution. This is why the de Groot et al spectra showed simi-
lar results for Mb and hemin. Also, de Groot et al were unable to obtain CVs from cytochrome c and horse radish peroxidase (HRP), which has already been extensively studied by the Rusling group. Thus we have specifically performed electrochemistry on these films with both native and Co porphyrin cytochrome c, using all combinations of ITO and PG as electrodes with polyethylene glycol, nafion, and DDAB as the immobilizing films for Mb. Our data so far has shown that the use of Mb-DDAB films on PG electrodes does not denature the protein.

**Berkelian Concepts of Activity in Shakespeare's King Lear**

Amy Cooper

*Mentor: Alan Nelson*

King Lear raises the question of whether a conscience can actively control man’s actions or whether it merely names the notion of man’s ability to distinguish between right and wrong. By questioning the activity or passivity of the conscience, King Lear enters a broader debate between the classical Greek notions of fate and free will. Although George Berkeley’s *Treatise Concerning the Principles of Human Understanding* came almost a century after Shakespeare’s death, a twenty-first century consideration of these texts reveals Berkelianesque concepts of activity in the play’s rhetoric regarding fate. Shakespeare’s Early Modern audiences believed the external world of natural forces had a direct correlation with, and effect on the internal world of the human body via the four humors; occurrences in external world caused changes within fluids of the human body influencing behavior over which men subsequently had no control. A small group of experts in Early Modern drama argue that, because Shakespeare employs the rhetoric of the humors, he subsequently agrees with all the ramifications of the resulting dogma; or as Berkeley would later say, “endless scruples and errors of dangerous consequence in morality.” While it is true that Shakespeare could not write outside the then accepted perception of the body’s relationship to its environment, it is feasible to conclude he did not agree with his contemporaries. Rather, lines 131-146 in Act IV of King Lear employ both syntactical and imagistic ambiguity to suggest free will is the absence of, not power over, the classical Greek notion of fate.

**Cuba’s Tourist Industry: An Impetus for Social and Structural Change**

Marika Csapo

*Mentor: Mark Petracca*

As a result of globalization, or, according to some theories, Westernization, the world is shrinking as borders become more permeable. Just over 15 years ago, Cuba was an exception to these Western influences. Since Castro’s victory, Cuba has been closely associated with the USSR and Communist Bloc, a closed economy, and an articulated disgust for Western tourism. Thus, Cuba managed to avoid close contact with Western society for 30 years. Now, its major supporters are gone and it has turned to the tourist strategy to salvage its economy, which faltered with the loss of Soviet support, and continues to endure the harsh conditions of the U.S. blockade. Cuba receives over one million tourist arrivals each year, the majority of which come from Canada and Western Europe. Since Cuba was fairly isolated economically for such a long time with a uniquely well-preserved socio-cultural structure (in an era of globalization), the effects of the recent importation of Western influence through tourism in Cuba should be considered an important topic for academic study. However, Western research has not paid it due attention. Therefore, my research, conducted during a three-month period I spent in Cuba, focuses on identifying and analyzing the effects of the Western element facilitated by Cuba’s economic strategy of tourism. I found that many of the effects of tourism on Cuban society could be generalized into one of three broader categories: growing socio-economic class distinctions, growing underground free market exchange, and Western ideological changes within Cuba’s borders. These findings contribute to the broader study of the globalization, or Westernization process.

**A Study of Congressional Casework—Process, Impact and Effectiveness**

Anne-Marie Dao

*Mentor: Mark Petracca*

One prevalent school of thought on the impact of casework on policymaking argues that constituent complaints offer valuable feedback on existing laws and the need for new legislation. This project analyzes the problems and concerns brought to congressional offices, how those matters are handled, the impact correspondence from constituents has on the member’s position on substantive policy issues, and how effective congressional offices are at solving problems brought to a member’s attention through constituent correspondence. The data gathered and analyzed leads to the conclusion that there is a weak link, if any at all, between casework and policymaking.

**Physics and Patent Law**

Marcus Dawes

*Mentor: Roger McWilliams*

The right to property is a fundamental aspect of our society, and intellectual property is no exception. To investigate this further, I have extensively researched the definition of patent law and how this notion affects our everyday lives. I have also done a large amount of back-
ground work in the physics behind patents, information that is so critical when understanding and interpreting them. This was done by taking a specific patent (Method for Fabricating Multi-layer Optical Films; patent number 4,142,958) and going over it step by step so as to understand the physical concepts and principles that it contains. I was also able to get some hands-on experience with an important aspect of this patent in real life by recreating and studying it in the laboratory. The point of understanding the physics that goes into an invention or patent can be a crucial element in a patented invention.

**China’s New Frontier: A Constructivist Approach to Xinjiang**

**Omar De La Riva**  
*Mentor: Robert Uriu*

In international relations theory, Constructivism deals with the intangible factors that propagate conflicts and actions of peoples and states. Unlike its predecessors, Constructivism forgoes the examination of physical elements that might dominate the policies and actions of a nation-state. Instead, Constructivism focuses on non-traditional aspects of international relations theory, such as language, culture, history, and identity of a people within a nation-state. Constructivism can therefore bring forth a new method of explaining conflicts around the world that might otherwise lack explanation. The Xinjiang Uyghur Autonomous Region, located on the northwestern corner of China is home to over one-sixth of China’s territory and many of China’s energy resources. With a rich Islamic and Arabic history, the native people of Xinjiang feel closer to Mecca than they do to Beijing. Following brief periods of independence, Xinjiang (known as East Turkestan while independent) has been firmly under the control of the Chinese Communist Party. This control has allowed Beijing to develop the region of Xinjiang economically, gain monetarily from its natural resources, and eased the population burden of the eastern provinces by serving as a new home to millions of Han Chinese. These actions have created great friction between the native minorities of Xinjiang and the powerful, wealthier Han Chinese. This study seeks to use a Constructivist method to analyze the methods currently deployed by Beijing to control Xinjiang and its minority populations. It is clear that the role of language, identity and religion can be as powerful as military force when attempting to control a region.

**This Is a Place of Business**

**Christopher Dea**  
*Mentor: Constance Samaras*

Corporate America often graces the front pages of newspapers with stories detailing the latest accounting blunder, environmental cover-up, labor exploit, illegal political contribution, or consumer scandal. There is little debate concerning the power corporations have steadily amassed during the 20th century and continue to wield to maintain an economically viable, if occasionally socially destructive, position in a global market system. This series of photographs, however, is not an overt display of corporate power, but an examination of influence exerted subtly upon employees and the public through distinct environmental elements. Details as innocuous as the marble-lined niche from which a security guard observes the lobby of a building have the effect of establishing dominance within a space. An area crammed with indistinguishable cubicles for as far as the eye can see may leave an employee feeling anonymous and insignificant within the corporate machine. At the same time I have also photographed the crevices of corporate environments that allow outside life to creep into the workplace; reminders amidst the daily grind of something beyond the taupe office walls and fluorescent light fixtures.

**Can Producers Make an Artistic Impact While Still Concentrating on Monetary Issues?**

**Jessica del Mercado**  
*Mentor: Cliff Faulkner*

By producing UCI’s 2006 production of Eve Ensler’s *The Vagina Monologues*, I have learned about the role of a producer. This role does not have to revolve solely around the business aspect of the theater or conflict with the artistic direction of the show and its main purpose, which, in this case, is to create awareness and speak out against injustice and violence toward women. The producer does not have to limit the creativity of a show, but can not only expand it, but enhance it as well. Money became secondary to the cause of this show, as the exorbitant amount of money ($10,000+) we raised to donate to fund women’s organizations was because of the artistic impact this production had on its audiences. This amount of money has helped confirm that if theater is produced with the right intentions, a person’s generosity can exceed the limits it was once expected to have.

**Expression and Activity of the Transcriptional Co-Activator Pygopus 2 in Human Cancer Cells**

**Andria Denmon**  
*Mentor: Marian Waterman*

Wnt signaling plays an important role in many essential developmental processes, and its deregulation has been associated with cancer. Canonical Wnt ligands initiate the preservation and translocation of β-catenin to the nucleus, where it interacts with LEF/TCF DNA binding proteins. Additional co-factors—the recently discovered Pygopus and its adaptor Legless—work in conjunction with β-catenin to mediate Wnt signaling; however, little
is known about these co-activators and their precise mechanism of action. Here, we report that Pygopus 2 protein amplifies Wnt signaling when low levels of LEF/TCF•β-catenin complexes are present in the nucleus, but it is not essential, as high levels of LEF/TCF•β-catenin complexes are able to activate transcription in its absence. In contrast, Pygopus 2 is not an independent activator, as it requires LEF/TCF•β-catenin complexes to activate transcription of a Wnt reporter plasmid. We also report that, in different cell lines, Pygopus protein differs in apparent molecular weight. Finally, we show that Pygopus protein has the ability to stabilize the levels of endogenous β-catenin protein in transformed cells. We conclude that Pygopus protein plays an important role in amplifying Wnt signaling, but its presence is not necessary if sufficient levels of LEF-1 and β-catenin are present in the cell.

**Effects of Family Environment on Adult Mental Health and Cardiovascular Reactivity**
Leah Dickenson  
*Mentor*: Sally Dickerson  

The Risky Family model theorizes that Risky Families—defined as those lacking in nurturance, and exhibiting overt conflict or aggression, cold interaction style, and/or neglect—can lead to abnormalities of the stress regulation system and deficient emotional responses and social skills in children. While numerous studies support the argument that victims of childhood abuse are more likely to experience adverse health outcomes in adulthood, this study builds on prior research to examine the effects on adult children of growing up in a Risky Family. Previous studies demonstrate a connection between Risky Family exposure and self-rated mental health; however, these studies failed to produce differences in cardiovascular reactivity to acute, non-socially evaluative stress. The study reported here, that half delivered a persuasive speech in front of an evaluative audience, while the other half performed alone in a room. Cardiovascular responses were assessed at baseline, post-task, and throughout recovery. Individuals from Risky Families reported significantly higher levels of depression and shame than their non-Risky Family counterparts. Moreover, cardiovascular responses were significantly higher for individuals from Risky Families, especially within the context of socially evaluative conditions. These results support the Risky Family model and provide new findings pertaining to cardiovascular reactivity in women from Risky Families.

**angaGEDUCI: Anopheles gambiae Gene Expression Database with Integrated Comparative Algorithms for Identifying Conserved DNA Motifs in Promoter Sequences**
Sumudu Dissanayake  
*Mentor*: Anthony James  

The completed sequence of the Anopheles gambiae mosquito genome has enabled genome-wide analyses of gene expression and regulation in this principal vector of human malaria. These investigations have created a demand for efficient methods of cataloguing and analyzing the large quantities of data that have been subsequently produced. As part of efforts to meet these expectations, we provide here a publicly-accessible database and integrated data-mining tool, angaGEDUCI, that unifies: 1) stage- and tissue-specific microarray analyses of gene expression in An. gambiae at different developmental stages and temporal separations following a bloodmeal, 2) functional gene annotation, 3) genomic sequence data, and 4) promoter sequence comparison algorithms. The database can be used to study genes expressed in particular stages, tissues, and patterns of interest, and to identify conserved promoter sequence motifs that may play a role in the regulation of such expression. By combining gene expression, function, and sequence data with integrated sequence comparison algorithms, angaGEDUCI streamlines spatial and temporal pattern-finding, and produces a straightforward means of developing predictions and designing experiments to assess how gene expression may be controlled at the molecular level. The database is accessible on the Web at http://www.angaged.bio.uci.edu.

**Human Trafficking Paradigm in South and Southeast Asia: The Threat to States**
Joanna Do  
*Mentors*: Kamal Sadiq & Caesar Sereseres  

The migration of people in this century has increased exponentially relative to globalization. Within the various migration modes and manners, human trafficking is particularly heinous in nature. Human trafficking, at its core, is the movement of people through deception and coercion for the purpose of exploiting them for profit. Women and children are especially targeted in this crime. The recognition and combat of trafficking in persons by states is a relatively new advent, and regulatory measures and mechanisms are weak and ineffective. In addition, the states addressing the issue and spearheading legislation to combat trafficking in persons are conducted chiefly by Western developed states, whereas a large portion of human trafficking is carried out in developing states. By identifying and acknowledging this fact, this paper contextualizes shared themes and reasons as to why the combat of human trafficking is principally weak.
in developing countries, particularly the states of Asia. Themes and reasons touched upon in relation to the issue and threat include state sovereignty, inter-state relations, human rights, the problems of definition, and the reliability of data. This paper surveys the issues and policy dilemmas surrounding illegal migration specific to the trafficking of women and children through case studies of the states of Indonesia, Malaysia and Thailand. It also discusses the nature of the threat posed by human trafficking, and inadequacies of contemporary states to address the threat and to shift focus from human trafficking regulatory measures and mechanisms of developed countries to developing countries.

The Efficiency of Storm Drain Insert Filters and Urban Water Runoff Pollutants
Allyson Dong

Mentor: Oladele Ogunseitan

According to the California Environmental Protection Agency (CEPA), Section 303(d) of the 1972 Clean Water Act states that territories, authorized tribes, and states must establish a priority ranking for sources on the list and develop action plans that fall within the limit of Total Maximum Daily Loads (TMDL). Research was conducted to determine the effectiveness of storm drain filter inserts and curb inlet filters as part of the USC Sea Grant Project, which involves trying to find the Best Management Practice (BMP) for urban water runoff TMDLs. Five different pollutants that contribute to storm water runoff were tested: Escherichia coli O157:H7, Total Suspended Sediments (TSS), Metals (consisting of Cadmium (Cd), Copper (Cu), Lead (Pb), Selenium (Se), and Zinc (Zn)), and Fats, Oils, and Grease. Ten storm drain filters were donated and tested against the pollutants. Using an interdisciplinary approach with the Department of Planning, Policy, and Design the results of the storm drain insert filters were included and modeled to find the best optimized filter implementation in land use areas. In conclusion, the best optimization for the storm drain filter installation depend on the filter type, the land use area, and the placement of filters.

Investigating the Activation of Caspase Pathways in Human Retinal Pigment Epithelial Cells After Treatment with 7-Keto-Cholesterol
Joyce Dong

Mentors: Maria Kenney & Saurabh Luthra

In the United States, age-related macular degeneration (AMD) is the leading cause of blindness in people older than 65. Anti-cholesterol medications are thought to decrease the risk of developing AMD. Studies show a causative role for 7-ketocholesterol (7kCh), the most toxic element in oxidized cholesterol, in apoptosis in retinal cells. Apoptosis involves complex signaling cascades resulting in the breakdown and packaging of cellular components and their subsequent removal. Although cholesterol has been implicated in the pathogenesis of retinal diseases, the pathways involved have not yet been investigated. In eyes diagnosed with AMD, retinal pigment epithelial (RPE) cells, photoreceptors, and inner nuclear cells have been shown to die through apoptosis. Caspases are enzymes activated during apoptosis. The caspase pathway involves upstream (initiator) and downstream (effector) caspases. We hypothesize that 7kCh causes loss of cell viability via caspase-dependent apoptosis, and acts as an oxidative stressor leading to RPE cell atrophy. Elucidating the specific apoptotic pathways involved may have therapeutic potential for AMD and other retinal diseases. I conducted this study to determine which caspase pathways are involved in apoptosis in ARPE-19 (human RPE) cells. ARPE-19 cells were exposed to 7kCh with or without a pan-caspase inhibitor (PCI). PCI enabled me to determine which specific caspases are activated in apoptosis. Caspase-3, -8 and -9 activities were measured by a Fluorochrome Inhibitor of Caspase assay, I found that in ARPE-19 cells treated with 7kCh both the extrinsic caspase-8 pathway and the downstream caspase-3 pathway were activated, while the mitochondrial caspase-9 pathway was not involved.

Perturbative Effects of Galactic Matter on Oort Cloud Orbits
Evan Dowling

Mentor: Asantha Cooray

The Oort Cloud, a set of comets orbiting the sun at very long distances, forms an interesting testing ground for various theoretical models of the galaxy and the Solar system. Oort Cloud objects, because they are so distant from the sun, are extremely sensitive to the solar system’s interaction with external galactic matter. The system is analytically complicated, but can be analyzed in a detailed way through a numerical simulation. We examine the perturbative effects of extra-solar matter on orbits with stable non-perturbed initial conditions. The best-known external actor on the solar system is the remainder of the galaxy. Aside from nearby passing stars—a very rare occurrence—the solar system is perturbed by two basic galactic forces, that exerted by the bulge at the center of our galaxy, and that exerted by the Galactic disk, a two dimensional distribution of matter along the galactic plane. Additionally, we will explore the effects of dark matter sub-haloes of various masses on both the unperturbed and the perturbed orbits. We hope
to determine whether or not it is possible to algorithmically generate stable initial conditions for both the non-perturbed and the perturbed case and the rate at which Oort Cloud comets are injected to the Solar system through gravitational perturbations.

**Phenotypic Response of SREBP-1a Knock-Out Mice to Induction of Lipogenesis through Feeding Studies**

Michelle Dragojlovic  
*Mentor:* Timothy Osborne

Lipid homeostasis in vertebrate cells is regulated by a family of membrane-bound transcription factors designated sterol regulatory element-binding proteins (SREBPs). SREBPs directly activate the expression of more than 30 genes dedicated to the synthesis and uptake of cholesterol, fatty acids and triacylglycerols. Three major isoforms have been identified in mammals: SREBP-1a, SREBP-1c and SREBP-2. Of the three isoforms, SREBP-1a has the strongest gene activation activity and targets the greatest number of genes. The intent of this study is to further characterize the functional activity of SREBP-1a in vivo. We have used a genetically manipulated mouse model with a targeted gene disruption that inhibits SREBP-1a expression. These SREBP-1a knockout mice have been challenged with two different feeding regimens that are known to induce lipogenesis, i.e., a short-term fasting and refeeding treatment and a long-term high fat/high sucrose diet. By comparing the response of SREBP-1a knockout mice to dietary stress versus control mice, we can determine how the absence of SREBP-1a cellular activity affects the maintenance of lipid homeostasis. We have found that SREBP-1a knockout mice gain more weight, accumulate more body fat, and become more insulin resistant than the control mice. We conclude that SREBP-1a activity is an important factor in the prevention of obesity, diabetes, and other associated health problems.

**The Presence of Gonadal Hormone Metabolic Enzymes and Androgen Receptor in Rat Male Cerebral Blood Vessels**

Bebenaz Ehsan  
*Mentors:* Rayna Gonzales & Diana Krause

In the cerebral circulation, chronic in vivo treatment with testosterone (T) and dihydrotestosterone (DHT) increases, while estrogen (E) decreases, basal vascular tone. Because of these actions, the cerebral vasculature is clearly affected by sex steroid hormones. However, the presence, localization, and functional influence of androgen receptors (AR) and sex steroid metabolizing enzymes have not been determined for the cerebral circulation. The purpose of this study was to: 1) investigate whether AR is present in male rat cerebral vasculature; 2) determine if aromatase and 5 α-reductase type II, metabolic enzymes responsible for conversion of T to E and DHT respectively, are present in cerebrovascular tissue; and 3) determine if AR, aromatase, and 5 α-reductase type II protein levels were modulated by chronic in vivo hormone treatment. Male rats were orchietomized (ORX) and implanted with hormone pellets containing either T, DHT, E, or vehicle. Following a 21-day treatment, rats were euthanized and blood vessels isolated from whole brain. Western analysis revealed specific bands corresponding to AR, 5 α-reductase type II and aromatase. Fluorescent immunocytostaining revealed the presence of AR and 5 α-reductase type II in both endothelial and smooth muscle layers of cerebral arteries while aromatase staining was solely localized in the endothelium. Chronic androgen treatment increased levels of AR but did not alter the levels of either of the metabolic enzymes. In conclusion, understanding the local metabolism and effects of male sex steroids in cerebral blood vessels may provide a better clinical understanding of the outcome of hormone replacement in men.

**Visions of VisION: Hardening Active Spaces**

Mike Elkin  
*Mentor:* Falko Kuester

VizION is a ubiquitous computing system without any security integration; however, in any production environment there is a need for security protections to guarantee the safety of results. I developed both an authentication protocol for the system, and a method for data control. The authentication protocol, dubbed the Gatekeeper, provides a method for logging into the system through biometric, a USB-key storage unit, and a normal console login. By tying together these different components into the single protocol, multiple forms of authentication may be used at once so that, if necessary, n-factor authentication can be mandated for any group of users. To improve the security of information that is stored on the network, all communication was encrypted. Furthermore, all nodes were given a unique certificate for the purpose of persistent data. The issued certificate further allows for certain information to be guaranteed, such as what type of node it is or whether it is allowed to do certain things. Work in this field is important as distributed systems can be very delicate, and imposing security restrictions can bring the entire system down. The aim of my work is to extend distributed frameworks into the information security domain, allowing for the protection of critical data.
Time Evolution of Comparability Structures
Jared Elliott
*Mentor*: Roger McWilliams

Due to its probabilistic predictions, physicists have wondered whether quantum mechanics is a statistical approximation to an as yet unknown deterministic theory. Just positing an underlying deterministic reality, not attempting any description of it, puts constraints on the probabilities quantum mechanics could give. Bell’s theorem shows that these constrained probabilities are incompatible with what is observed of quantum mechanical systems. Abandoning locality is the traditional approach to making sense out of Bell’s theorem. Here, an alternate approach is put forth. Rather than giving up on locality, one can give up on the idea that systems maintain their comparability structure in time. That is, one can give up on the idea that two comparable elements of the posited underlying reality remain comparable throughout time. This is reasonable: a free electron is certainly comparable with a helium ion’s electron; however, after capture, this comparison no longer makes sense. Given a perspectival version of the modal interpretation of quantum mechanics put forth by Gyula Bene and Dennis Dieks, Bell’s inequalities rely on probability distributions that do not exist. This work shows that the nonexistence of these distributions is a result of a feature of quantum reality that goes against our intuition. Although we may be able to compare two elements of reality at a given time, it is not guaranteed that this ability will hold for future times.

Reflections on Experience: A Look into the Perceptions of Progressive Era Orphans at the Masonic Home for Children
John Elliott
*Mentor*: Alice Fahs

An understanding of Progressive Era orphans can be reflected upon orphanages and foster care today. In seeking to understand past orphanages and how the perception of what is good for the orphan developed, it becomes clear that it is not always what the orphans themselves felt was good. The influence and philosophy of children during the Progressive Era is evident throughout the day to day activities of the orphans at the Masonic Home; however, the Home was unique in many ways. Their selective and often strict admissions combined with wealth allowed them to create an environment unique during their time period. By exploring two memoirs of orphans that lived at the Masonic Home it is possible to understand two things: how the perception of orphans during the Progressive Era influenced the actual activities of the orphans, and their living arrangement. Secondly, the feelings, actions and personal accounts of each memoir can be explored to understand the orphans’ perception of their relationship with the administrators of the Home. Ultimately, the orphans enjoyed a level of living that would have otherwise been non-existent during the Great Depression, and they developed their own culture due to their experiences within the Home.

Studying MAP-Kinases and Understanding Docking Site Patterns Using Mutated DNA
Ahmed Elrefaie
*Mentor*: Lee Bardwell

The JNK pathway is an important cell function of the MAP-kinase family that relies heavily on cell signaling and its accuracy. Because the JNK pathway has been shown to stimulate apoptosis, its deregulation has, in turn, been linked to various diseases such as prostate and ovarian cancer. Deregulation can occur when mutated substrates bind to the JNK docking site and stimulate abnormal cell functions, such as increased proliferation. To better understand JNK pathway binding, I used a segment of DNA expressing the c-Jun protein and mutated the strand to test its binding capabilities. It was my hypothesis that the mutated c-Jun protein would bind less to the JNK docking site than the wildtype protein. Through the use of Expression PCR, *in vitro* transcription and translation, and a series of binding assays, I was able to compare the binding capabilities of several differently mutated c-Jun proteins. The results were consistent with my hypothesis, as the wildtype bound better and at a greater frequency than all mutated c-Jun proteins. However, our results showed that some amino acids were more important to the binding of the c-Jun protein than others were, which allowed us to better understand which amino acids are more significant to the efficiency of the JNK docking site.

Extending the Scope of Aza-Cope-Mannich Reactions
Derek Erion
*Mentor*: Larry Overman

In the Aza-Cope-Mannich reaction, a [3,3]-sigmatropic rearrangement is combined with a favorable Mannich reaction to produce an azacyclic ring system. The Mannich reaction is highly favorable in energy, which helps drive the equilibrium of the Cope rearrangement towards the final product. The specific Aza-Cope-Mannich reaction under investigation attempts to show the reaction to take place in a boat topography instead of the more favorable chair conformation. An efficient route has been developed to synthesize substrates needed for the reaction. Several conditions for investigating the key Aza-Cope-Mannich reaction have followed from this initial development and are under way.
Sex Hormone Modulation of Brain Mitochondrial Function
Haleh Fazeli-Tehrani
Mentor: Diana Krause

As mitochondria generate energy, they also produce reactive oxygen species (ROS), an important factor underlying cardiovascular diseases such as strokes. We have shown that the sex hormones, estrogen (E) and testosterone (T), have opposing effects on inflammation, but knowledge of the impact of these hormones on mitochondrial function is sparse. In female rat brain blood vessels, E increases levels of respiratory chain proteins and mitochondrial enzyme activities while decreasing mitochondrial ROS production. Here we compare effects of T and E on mitochondrial function in brains and cerebral blood vessels isolated from four groups of male rats: intact, orchietomized (ORX), T-treated (TEST), and E-treated (EST). After four weeks of hormone treatment, we isolated whole brain and cerebral blood vessel mitochondria and performed biochemical analyses. In contrast to the effect of E to increase cytochrome c protein, cerebrovascular mitochondria from T-doses showed no significant change in cytochrome c. In whole brain mitochondria, T once again did not alter, but surprisingly, E decreased cytochrome c protein levels. Hormone treatment had no effect on brain levels of the mitochondrial-specific antioxidant enzyme, Mn superoxide dismutase. Mitochondrial superoxide inactivates aconitase, a ROS-sensitive mitochondrial enzyme, but has no effect on fumarase. Therefore, the ratio of activities of aconitase to fumarase (A/F) is an indicator of mitochondrial ROS production. We found that T did not alter, but its metabolite E increased the A/F ratio in brain mitochondria, demonstrating decreased ROS production. Thus, modulation of mitochondrial ROS production by E, but not T, may contribute to neuroprotection.

The Impact of Rhodiola rosea on Fecundity in Drosophila melanogaster
Jeffrey Felgner
Mentor: Mahtab Jafari

Recent advances in aging research have revealed many biochemical pathways that influence lifespan in a number of different well-known model species, such as Caenorhabditis elegans and Drosophila melanogaster. In turn, this has opened the door for drug discovery in both pharmaceuticals and botanicals. Botanicals such as Rhodiola rosea have been found to be very powerful antioxidants that could effectively delay the aging process with little cytotoxic effects. Recent studies have provided evidence that Rhodiola rosea decreases mortality rate in Drosophila melanogaster, but the physiological and pharmacological mechanisms for this effect are not understood. Drug effects on reproduction in female Drosophila can indirectly influence the aging process, and it is well-established that decreased fecundity is associated with increased longevity. Here we examined the dose dependent effects of Rhodiola on fecundity in Drosophila. At the high doses (60, 100, and 200 mg/ml) we observed a dose dependent decrease in fecundity. At low doses (15, 30, and 60 mg/ml), in which a significant mortality benefit was observed, there was no statistically significant difference in fecundity relative to the control. This result indicates that the extended longevity previously observed at low Rhodiola doses is not due to decreased fecundity. The discovery of no reproductive impairment at doses that increase longevity suggests that Rhodiola is a promising candidate to treat human aging.

Have it Your Way: Effects of Digestion on Preferred Body Temperature in Burmese Pythons
Charmaine Firme
Mentor: James Hicks

Snakes prefer to bask in the sun after ingesting a meal. This action is known to have evolutionary benefits; however, what and by how much has not been well-established. The aim of this project was to observe and quantify the behavioral change in postprandial body temperature preference in Burmese Pythons. We hypothesized that the pythons will a postprandial temperature warmer than fasting body temperature. This is because temperature is directly related to growth rate and passage time, both of which need to be maximized for optimum survival. A temperature gradient (25 °C to 35 °C) chamber was established using a heat lamp at the high temperature end. A diurnal light cycle was also im-
implemented. Intra-peritoneal data loggers were inserted to facilitate a more accurate measurement of preferred internal body temperature. Behavioral temperature preference of eight snakes were be monitored and recorded under fasting conditions, and then postprandial with data loggers.

Guidelines to Auditioning for a Professional Dance Position Post Graduation
Ann Fischer
*Mentor: David Allan*

Dance majors who seek employment after graduation are often overwhelmed by the annual audition season. The analog I am compiling tracks a series of company auditions and explains what directors are looking for in terms of style and skill level, what puts some dancers in better standing for professional positions than others, which audition locations have a better job return rate, and how strong a role personal contacts play in securing employment for the post grad. Preparation for auditions began Fall Quarter, intensifying dance training as well as enhancing resumes and photos. Auditions participated in include Hartfel Ballet, Boston Ballet, American National Ballet, San Jose Ballet, Molly Lynch’s Summer Professional Project, and a Broadway audition for a new Twayla Tharpe show titled “The Times Are A Changin.’” This analog of a diverse audition tour will enable future UCI Dance Majors to make productive decisions while seeking employment.

Costume Design at the International Fringe Festival and the Presentation of a Student's Work in a Professional Setting
Margaret Foss
*Mentor: Madeline Kozlowski*

Within the arts, the most effective manner of education and research is first-hand exposure to various art forms and experiences. The profession and art of costume design is no different; especially as a student one must challenge oneself in new environments and organizations to continue to grow as an artist. In this manner, over the past summer I traveled to Edinburgh, Scotland with a high school group to produce and perform a show at the International Fringe Theatre Festival. The experience and challenges of this project yielded substantial results. First, it allowed me the opportunity to develop a costume design for a show that would be seen in a professional and international setting, a great accomplishment for a young designer. I was able to accurately gauge the success of my design in a professional yet supportive atmosphere. Second, I was able to experience first-hand the power and excitement that the largest international theatre festival in the world can inspire in the participants. Consequently, my faith in art as a cultural necessity was reinforced and encouraged. Finally, and unexpectedly, I was struck by my loyalty and compassion towards the younger artists with whom I traveled, both by their willingness to create and experience the art and by their absolute dedication to the success of the project. As a result of this project and experience, my career goals have led me to extend my path to graduate school, as I pursue an MFA in costume design and a professional costume design career.

A Comparison of Cocaine-Induced Neuron Activation in Male and Female Adolescent Rats
James Fry
*Mentor: Frances Leslie*

Adolescence is an important period for the initiation of drug addiction. Specifically, in reference to cocaine, both human and animal behavioral studies have indicated that adolescents respond to cocaine differently than do adults, in a sex dependent manner. Although the underlying mechanisms are not clear, the variation in response may be due to an immature central nervous system (CNS) during adolescence. Previous studies, using c-fos as a marker of neuronal activation, have shown that cocaine-induced c-fos mRNA expression differs between adolescent and adult male rats in cortical regions, the striatum, and other stress related brain areas. To test the hypothesis that sex differences exist in cocaine-induced neuronal activation in adolescents, both male and female rats in early adolescence postnatal day (P)28, late adolescence P38, and adults P90 were injected with either cocaine (750 µg/kg/injection x 2), or saline. Animals were decapitated 30 minutes after drug injection, and brains were sectioned for analysis. Using *in situ* hybridization, c-fos mRNA expression of the sections was assessed. The results show that both female and male adolescents have an immature response to cocaine, compared to that of adults. The data from this study provides evidence that the central nervous system is still immature during adolescence.

Private Bankers During the Great Depression in the U.S.
Jessica Galaviz
*Mentor: Gary Richardson*

The objective of this study is to examine how the interest rates of commercial banks in the U.S. were reacting to business conditions in comparison to those of the Federal Reserve. There have been many studies on how the Federal Reserve was largely responsible for the length and depth of the Great Depression, and how their interest rates responded to the different economic changes during that time. However, there has been little empirical research done to investigate the actions concerning the interest rates of commercial banks during
this time. It is important to find out how commercial banks were reacting to the Great Depression, because they were at the heart of the credit channel. By manually gathering data from Bradstreet's Weekly Business Review, I constructed a new database that contains business and banking conditions for the U.S. Using regression analysis, I studied the different factors to which commercial banks set their interest rates. I then performed this same analysis for the discount rate of the Federal Reserve. This allows me to distinctly compare the actions of the Fed, and my research sheds light on the idea that they might have been reacting in the same manner as the rest of the banking system and, therefore, acting appropriately given the beliefs at the time.

Against all Odds: Chicana/Latina Lesbian Mothers Defining “Family” with Pride
Dulce Garcia
Mentor: Deborah Vargas

The Chicano/Latino community is homophobic and sexist; hence Chicana/Latina lesbian mothers not only suffer from societal marginalization, but also disenrollment and oppression from the Chicano/Latino community. Through this research and oral history, I acknowledge and comprehend: 1) how Chicana/Latina Lesbian mothers define “family,” “home,” and “motherhood;” 2) how they form unique families with new traditions and 3) the coming out process of being a Lesbian mother/family to their children, friends and family, and work. Historically, lesbianism and motherhood have been defined as separate social structural categories that do not essentially intersect. Current research in the U.S., “suggest that there are between three and eight million gay and lesbian parents in the United States, raising between six and fourteen million children.” Remarkably, these women continue to pass down cultural traditions and histories while simultaneously challenging heterosexism and homophobia by developing loving and respectful relationships with other women. Through their love, dedication and strength, these Chicana/Latina lesbian mothers are producing a phenomenon through which women are establishing their own families regardless of societal and cultural stereotypes or limitations. I strongly believe that it is essential to research and present how lesbian motherhood “challenges the traditional male power base of the family,” and how their parenting methods differ from those of heterosexual couples. My work is influenced by this need to fill the dearth of research about these very important issues and how they relate to the larger society. Hence, I will present the identified key issues found in each woman’s narrative and compare and contrast reoccurring themes among the women interviewed.

Adaptive Behavior in Adults with Down Syndrome With and Without Associated Alzheimer's Disease
Bela Garg
Mentor: Ira Lott

It is well established that adults with Down Syndrome (DS) are at increased risk to develop Alzheimer’s Disease (AD). It has been observed within the DS population that, with increasing age, there is a decrease in IQ scores, even in the absence of AD. In the DS population with AD and its associated dementia, there is a further regression in cognitive processes and adaptive behavior. No quantitative studies have examined this age related decline in adaptive behavior, which is necessary to understand how dementia affects adaptive behavior in adults with DS. The purpose of this study is to: 1) develop normative data for the Vineland Adaptive Behavior Scale (VABS) in a population of adults with DS with and without associated AD, and 2) compare the adaptive behavior profile of a population of adults with DS without associated AD to DS with associated AD. VABS were completed on 76 subjects with DS and AD and on 55 DS subjects without AD. Tests were scored using the VABS scoring assistant software program. Scores for VABS domains of Communication, Socialization, Daily Living Skills and Motor Skills were entered into the study database. Statistical analyses are underway. Results and conclusions from this study are pending, but will be completed by the end of April.

Cortical Regions Involved in the Processing of Easy and Difficult Auditory-Visual Speech Perception
Sara Ghazi
Mentors: Greg Hickok, Paul Rodriguez, Ginger Stickney & Fan-Gang Zeng

The heavy reliance on lip-reading cues by formerly deaf individuals with a cochlear implant raises a question regarding the nature of auditory-visual integration in the presence of impoverished auditory input. We used fMRI to investigate auditory-visual speech integration for normal-hearing subjects while comparing congruent/incongruent and natural/degraded speech. Subjects identified one of three phonemes, /ba/, /da/, or /ga/, presented aurally, in a natural speech condition or resampled with degraded speech, in combination with a face mouthing a matching or mismatching stimulus. Behavioral data shows comparable accuracy for congruent stimuli between natural and degraded speech. For incongruent stimuli, there was a stronger bias towards the visual modality with degraded speech, especially the more visually salient /ba/ phoneme, although both conditions showed that subjects perceived an illusion known as the
McGurk effect. Analysis of the fMRI data at the whole brain level shows activation of the expected auditory-visual regions of the brain for stimuli compared to no stimuli (stationary face with no sound). Among the main effects within the conditions, we found that the left inferior frontal gyrus (IFG, functionally known for working memory) was more active for the degraded speech versus the natural speech condition with congruent stimuli. Moreover, comparison of congruent speech to incongruent speech in the natural condition shows increased activation of the anterior cingulate cortex (known for conflict monitoring) and the IFG in the former condition. In short, results from the comparison between “difficult” (mismatched, and degraded speech) and “easy” speech conditions, suggest the use of working memory and conflict monitoring as part of speech integration, in a challenging listening condition.

**Velocity Profiles of Steadily Sheared Foams**
Christopher Gilbreth  
*Mentor: Michael Dennin*

Complex fluids are materials that fall outside of the usual categorizations of matter, due to the fact that they exhibit both solid- and fluid-like behavior. Examples include granular systems such as sand, grain, and nuts; foams such as shaving cream and dish soap bubbles; and colloids and suspensions such as mayonnaise and ketchup. Such materials, while quite common, do not lend themselves easily to analysis and are not well understood from a physics perspective. This project consisted of measurements of properties of single-layer systems of bubbles as models for more general foams. The bubbles were placed in a circular trough whose outer wall could be rotated in order to apply a shear stress, and where a centrally located torsion pendulum allows measurement of the stress transferred through the bubbles. A video camera was mounted overhead to capture the motion of the bubbles, so that their response could be compared to fluids and other materials. Our goal is to determine whether the system can be described by traditional fluid-like models (such as a Bingham plastic), and, if not, characterize the system and see if it can be consistently described by theoretical models proposed, and if it exhibits the same properties of similar systems that have been investigated elsewhere. We have found that a simple yield-stress fluid model cannot effectively describe such a system; a better characterization may be that the system exists in two different states simultaneously, which can be described by a thermodynamic-like theory. This will be a topic for further study.

**Diversity University Irvine**
Shannon Goldsborough  
*Mentor: Daphne Lei*

Diversity University Irvine was founded in 2004 in response to the lack of opportunities for undergraduate drama students to participate in theater that both celebrated and explored issues of diversity. Since its beginning, Diversity University Irvine has produced nine shows, giving hundreds of undergraduate students the chance to act, design and produce challenging new theater pieces. This year Diversity University Irvine has produced two shows, *Culture Clash in AmeriCCa* and *Silence*, with a third, *Lysistrata*, scheduled for 9th and 10th weeks of Spring Quarter. Research conducted included surveys passed out at each show, which conclude that most audience members felt that Diversity University Irvine shows addressed issues concerning diversity in entertaining and enlightening ways.

**Role of rVLM Glutamate in Visceral Sympathoexcitatory Reflex**
Brenda Gonzalez  
*Mentor: Wei Zhou*

Visceral sympathoexcitatory cardiovascular reflex can be characterized by increases in blood pressure, heart rate, and myocardial contractility. The rostral ventral lateral medulla (rVLM) is involved in processing the visceral sympathetic reflex. However, there is little information on specific neurotransmitters in this brain stem region involved in this reflex. This study investigated the importance of glutamate and glutamatergic receptors in the rVLM during gallbladder stimulation with bradykinin (BK), since glutamate is thought to function as an excitatory neurotransmitter in this region. In an anesthetized cat model, visceral sympathoexcitatory reflexes were induced by application of BK (5-10 µg/ml) on gallbladder. HPLC was used to measure Glu concentrations from samples collected by microdialysis probes inserted bilaterally into the rVLM. We found that BK stimulation increased mean arterial pressure (MAP) and rVLM Glu concentration. Barodenervation did not alter the rVLM Glu concentrations during BK stimulation. Unilateral microinjection of either NMDA receptor blockade with AP-5 (25 mM, 30 nl, n=6) or AMPA receptor blockade with CNQX (2 mM, 30 nl, n=6) into the rVLM significantly attenuated the BK-induced reflex responses. These data suggest that Glu serves as an excitatory neurotransmitter through a baroreflex-independent mechanism during visceral cardiovascular reflex response, and that both NMDA and AMPA receptors mediate this reflex.
At What Cost?: Restrictive Visa Policies and Academic Exchange After 9/11
Justin Goodwin
Mentor: Caesar Serereses

Following the events of September 11, 2001, many Americans falsely believed that a number of the terrorist hijackers had entered the United States using student visas. This false assumption triggered a wave of anti-immigration legislation that focused disproportionately on foreign students. Due to a sharp increase in denials and delays in the visa process resulting from restrictive visa policies, the number of foreign students studying at U.S. institutions has decreased over the past three years. This decrease has potentially negative implications in three general areas. First, the drop in foreign student enrollment has stalled important scientific and technological research that is vital to our national security and economy. Second, foreign students contribute significantly to the national economy, including the billions of dollars spent by foreign students each year on tuition and living expenses. Third, restrictive visa policies are breaking diplomatic ties with other countries and are feeding anti-American sentiment abroad. While concern for stricter immigration policies is valid, lawmakers must understand the important contributions foreign students make to our nation and security.

The Role of Contractile Proteins and Cellular Phenotype in Rat Abdominal Aorta Exposed to Simulated Microgravity
Nadeem Goraya
Mentor: Ralph Purdy

The purpose of this study was to evaluate crucial contractile proteins and the role of vascular smooth muscle cell phenotype in the abdominal aorta of male Wistar rats exposed to simulated microgravity. Myofilament proteins myosin heavy chain (MHC), myosin light chain-20 (MLC20), and α-actin were measured along with myofilament binding proteins calponin, h-caldesmon, and α-tropomyosin, which are markers for phenotype change. Simulated microgravity was mimicked through use of the hindlimb unweighting (HU) model for 20 days. Male Wistar rats assigned either HU or control (CTL) at random, were euthanized, and the abdominal aortas were removed and stored for later use in western blot analysis. The aforementioned proteins were probed, and relative protein levels were quantified and compared between CTL and HU rats. Results indicate a HU-induced down-regulation in all probed contractile proteins, MHC, MLC20, and α-actin. However, HU-induced upregulation of the myofilament binding, contraction inhibitory protein h-caldesmon was observed while no significant change was observed in either calponin or α-tropomyosin. These results suggest that reduced expression of contractile proteins and increased expression of the contraction inhibitory protein h-caldesmon could be possible mechanisms for HU-induced vasoconstrictor hyporesponsiveness.

Finite Element Analysis of Pressure Drop in Fluted Tubes
Oleg Goushcha
Mentor: John LaRue

Efficiency of heat exchangers is becoming extremely important as the need for energy conservation increases. One way of increasing the efficiency of a heat exchanger is to change its geometry. Instead of using the conventional smooth pipe in a heat exchanger, tubes with sinusoidal walls are used to increase the area of heat transfer. Finite element analysis was conducted to determine the behavior of pressure drop through the fluted tube as number of flutes increased. It was concluded that for laminar fluid flow, the pressure drop decreased as the number of flutes was increased.

Shark Vertebrae Prototypes: Models to Determine the Effect of Mineralization Pattern on Mechanical Properties
Carrie Gowan
Mentor: Adam Summers

Elasmobranchs (sharks, skates, and rays) have cartilaginous skeletons, and their vertebrae are mineralized in patterns that differ by species. Because the vertebral column of fast swimming sharks is under considerable compressive force, I attempted to determine the role of the mineralized vertebrae structure in withstanding compression. I made models of real and imagined intermediate designs with varying amounts of structural complexity based on vertebral specimens from Isurus oxyrhincus (Mako shark) and Carcharhinus falciformis (Silky shark). These models were constructed using rapid prototyping, and were tested using infiltrated and uninfiltrated prototypes. I hypothesized that more structurally complex models (Mako) would have lower stiffness and strength than less complex models (Silky), because there is less material (mineral) in the more complex structures. The infiltrated prototypes showed patterns similar to those seen actual shark vertebrae: material properties decreased as structural complexity increased. In contrast, the infiltrated prototype material properties increased with structural complexity. This result did not support my hypothesis, suggesting that more structurally complex prototypes had more surface area to absorb the infiltrant, which was then associated with material property increases. The uninfiltrated prototypes have lower stiffness, maximum force and ultimate strength than the infiltrated prototypes, again an artifact of the infiltrant. My results suggest that the arrangement of the mineral
within the structure is an important contributor to the properties of shark vertebral cartilage. Further studies are needed to show the tradeoff between strength and buoyancy as mineralized cartilage is far denser than unmineralized cartilage.

**Transference: Derridean Terminology and Its Effects on American Academy, French Thought and Postcolonial Contexts**

Reed Grantham  
*Mentor: Dina Al-Kassim*

In 1967, at the age of 37, Jacques Derrida published three seminal works on the idea of language, speech and writing. These works (here in their English translation): *Of Grammatology, Speech and Phenomenon, and Writing and Difference*, helped to establish Derrida’s reputation as one of the world’s foremost critics and philosophers. Dealing with notions of language and Being as defined by previous thinkers such as de Saussure, Rousseau and Husserl, these works critique and call into question what Derrida calls “the metaphysics of the presence.” Using a complex network of embedded terminology—terms such as deconstruction, arché-writing, difference, trace, pharmakon, etc.—Derrida articulated a fabric of phrase-work that served to dismantle the artifice of presence. These terms, born from their insistence on writing, speech and language, have served to, in recent years, emerge at the forefront of our own contemporary criticism. Through the very dissemination of these terms, we have come to witness a movement of terminology, indeed, a transference, out from their original context and into various growing disciplines. This American institutionalization of Derridean terminology has become the center of certain important discourses on the American academy, its departments, and its role within the political framework. In attempting to analyze the non-linear movement outward of these terms, without neglecting their original context, I will trace the unfolding of these terms in reference to their more common usage of today. Ultimately, by following the movement and ‘play’ of these early terms, we can begin to understand our current theoretical climate whose conceptual base draws on the very deployment of early Derridean terms.

**Total Glutathione (tGSH) Levels At 24 and 48 Hours After Arsenic Trioxide, BSO and Disulfiram Exposures in A375 Melanoma Cell Line**

Matthew Griffin  
*Mentor: John Fruehauf*

Glutathione (GSH) is a tripeptide cofactor that plays an integral role in reactive oxygen species (ROS) scavenging. The highly oxidative state within melanoma cells is uniquely dependent on GSH for its scavenging functionality. Given the shortcomings of current therapeutics, a new strategy of treating melanoma is through GSH depletion. Three GSH-depleting agents (L-buthionine-R, S-sulfoximine (BSO), disulfiram (DSF) and arsenic trioxide (ATO)) have been shown to decrease melanoma cell viability. The purpose of this experiment is to correlate the decreased cell viability with the drug’s GSH depletion effects. *In vitro* A375 melanoma cells were exposed to IC50 and IC75 concentrations of each drug for an exposure time of 24 and 48 hrs. The results suggest an early, transient GSH depletion by ATO before 24 hrs. BSO depletes [tGSH] at both 24 and 48 hrs. The oxidation of GSH to GSSG induced by DSF appears to be maximal at 48 hrs. More experiments using direct measurement of reduced GSH are needed to further analyze DSF. The clinical implementation of GSH depleting agents should be explored.

**Variation in Ligand Dependent Activation of Steroid and Xenobiotic (SXR) Single Nucleotide Polymorphisms**

Emily Grossman  
*Mentor: Bruce Blumberg*

The steroid and xenobiotic receptor (SXR) is a nuclear hormone receptor that regulates catabolic enzymes and transport proteins responsible for the metabolism of bile acids, steroids, vitamins E and K, and over 60% of prescribed pharmaceuticals. Individuals exhibit considerable differences in their ability to metabolize drugs. One hypothesis is that single nucleotide polymorphisms (SNPs) in SXR are responsible for some of this variability. We compared expression of SXR-dependent reporter gene (luciferase) activity between wild-type and 10 previously identified SXR SNPs using transient transfection assays. Ligands tested included the antibiotic, rifampicin, and two xenobiocstics, bis(2-ethylhexyl)phthalate, and dibutyl phthalate. Our results indicate that most of the polymorphisms had little or no effect on the ability of SXR to respond to the ligands relative to wild-type. However, D163G and A370T differed substantially. The polymorphism D163G exhibited an 80% reduction in maximum activity, whereas A370T exhibited a 77% increase relative to wild-type. Decreased expression of SXR-dependent target genes could result in diminished ability to metabolize potentially toxic substances. Conversely, increased expression could result in loss of efficacy of therapeutic pharmaceuticals following activation of SXR. These data support the hypothesis that single nucleotide polymorphisms in SXR could be partially responsible for individual differences in drug and xenobiotic metabolism. Future efforts should focus on high throughput screening for unidentified SXR SNPs, further characterization of SXR SNPs in response to additional ligands, and development of a transgenic animal model to test these SNPs *in vivo*. 
A Real-Time Monitoring Viral Entrance Process During the Course of HSV Infection
Howard Guan
Mentors: Guey-chuen Perng & Steven Wechsler

Herpes simplex virus type 1 (HSV-1), after establishing latency in the trigeminal ganglion, can recur in the apical surface of polarized cells in the eye, which may lead to corneal scarring and loss of vision. Glycoprotein C (gC), which resides on the outer surface of the viral envelope, plays a crucial role in cell attachment, although the mechanism is largely unknown. In this project, gC was tagged with a red fluorescent protein (RFP DsRed2) to allow a real-time monitoring of the function of gC during the infection process of HSV-1. Insertion of the RFP gene into a plasmid containing the gC gene yielded the pgC-RFP plasmid that was amplified via PCR and verified using Southern analysis. Afterwards, the RFP gene was incorporated into the HSV genome via cotransfection, and the resulting mutant virus was purified. Tagging the virus at the genomic level allows greater control of viral tagging over many generations compared to conventional methods. Ultimately, information about the mechanism of HSV-1 attachment may promote advances in the treatment of corneal diseases and the use of HSV-1 as a vector in gene therapy.

The Effects of Estrogen on Mitochondrial Biogenesis
Dumindra Gurusinghe
Mentor: Vincent Procaccio

The decline of mitochondrial biogenesis characterizes many metabolic and age-related diseases such as stroke. As a result, the PGC-1 family of transcriptional co-activators, widely implicated in the regulation of energy metabolism, and isoform PCG-1α in particular, has been subject to much study. PGC-1α co-regulates oxidative phosphorylation, the mitochondrially-set energy-generating process of aerobic organisms. Our lab has shown that estrogen-related therapies, which induce mitochondrial biogenesis, down-regulate PGC-1α and up-regulate its isoform PGC1-β (PERC) in cerebral blood vessels. Moreover, their positive effects on biogenesis do not rely on PCG-1α. Estrogen-related compounds then potentially bear therapeutic benefits for patients with mitochondrial disorders. Currently, the role of PERC in the estrogen pathway has not been fully described. To address this, I treated cerebral endothelial and fibroblast cells with estrogen and monitored the change in gene and protein expression of mitochondrial proteins known to be induced: cytochrome c, complex IV, and manganese superoxide dismutase. I then compared the relative change in biogenesis between cell lines bearing mitochondrial DNA mutations versus controls. Preliminary data suggests that estrogen treatment up-regulates cytochrome c, manganese superoxide, and complex IV expression at both the gene and the protein level, providing insight into how estrogen and estrogen-related therapies impact mitochondrial function.

Reasons for the Decline in Motivation Among Middle School Students
Jennifer Han
Mentor: Gilverto Conchas

The primary process of education during one’s adolescent years holds a major importance in one’s life. Education has the ability to open many doors to future success and achievement. For some, however, this path is blocked by obstacles. One such obstacle is the transition from elementary school to middle school. Studies have shown that some of the motivation and performance of students drops during middle school. Some previous research claims that this decline in motivation is due to the radical biological changes that adolescents experience during puberty and is, therefore, unavoidable. Others have an alternative explanation to this phenomenon that focuses on the effects of a student’s surrounding learning environment. This study takes a stance with the latter argument because we see variation between motivations among students. Some students maintain or excel in their level of motivation when entering middle school while others do not. Therefore, this study is designed to specifically identify the environmental factors that positively or negatively affect the motivation of students during this transition to explain the variable differences between students. To implement my study, I will observe students and their learning environments within their middle schools. In all, the objective of this study is to observe and understand what factors cause a decline in motivation in some middle school students and not in others. This study is still in progress; therefore, the results have yet to be concluded.

The Effect of Surrounding Oneself in a Certain Ethnic Group in College Has on Maintaining or Eliminating Certain Cultural Upbringing Values
Shwetha Hareesh
Mentor: Jen’nan Read

When examining the shaping of certain individual values, past research examined pressures from the minority’s community, societal pressures, environment in which one is raised, cultural pressures, and religious beliefs. Though these variables are quite important, the effects of peer influence have not been given much importance. My study examines that values developed earlier in life can be changed or strengthened in college, depending on the ethnic group with whom the student associates. To examine this hypothesis, I performed qualitative study on second-generation Indian females currently attending